United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oregon Fish and Wildlife Office
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266
Phone: (503) 231-6179 FAX: (503) 231-6195

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5-15-2020

Mr. Chad Hamel
Supervisory Environmental Protection Specialist
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon, 97208-3621

Subject: Fish and Wildlife Service's Biological Opinion on the Habitat Improvement Program (FWS reference: 01EOFW00-19FY-F-0710; BPA reference: EC-4)

Dear Mr. Hamel:

This letter transmits the Fish and Wildlife Service's (Service) Biological Opinion (enclosed) on the proposed Habitat Improvement Program (HIP4) for the Columbia River Basin, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (Act). Bonneville Power Administration (BPA) requested formal consultation on the following species: bull trout (*Salvelinus confluentus)*, marbled murrelet (*Brachyramphus marmoratus*), streaked horned lark (*Eremophila alpestris strigata)*, Bradshaw's lomatium (*Lomatium bradshawii)*, Golden paintbrush (*Castilleja levisecta)*, Kincaid's lupine (*Lupinus sulphureus ssp. Kincaidii*), Nelson's checker-mallow (*Sidalcea nelsoniana*), and Willamette daisy (*Erigeron decumbens)* and critical habitat for the bull trout and marbled murrelet. We received your September 9, 2019, request for formal consultation on September 11, 2019.

After reviewing the current status of the species, the environmental baseline, the effects of the proposed action and the cumulative effects, we conclude that the proposed project will not jeopardize the continued existence of bull trout, marbled murrelet, streaked horned lark, Bradshaw's lomatium, Golden paintbrush, Kincaid's lupine, Nelson's checker-mallow, and Willamette daisy. We also conclude that the proposed action will not destroy or adversely modify designated critical habitat for bull trout, and is not likely to adversely affect critical habitat for the marbled murrelet. The attached Biological Opinion is based on information provided in your HIP4 Biological Assessment, discussions, field visits, and other sources of information cited in the Biological Opinion. A complete record of this consultation is on file at

the Service's Oregon Fish and Wildlife office.

The Biological Assessment also included a request for Service concurrence with "not likely to adversely affect" determinations for several species and critical habitat. The enclosed Biological Opinion document addresses your concurrence requests for the following species and critical habitats:

- Oregon spotted frog *(Rana pretiosa)* and its critical habitat
- Canada lynx *(Lynx Canadensis)* and its critical habitat
- Columbian white-tailed deer *(Odocoileus virginianus leucurus)*
- Gray wolf *(Canis lupus)*
- Grizzly bear *(Ursus arctos horribilis)*
- North American wolverine *(Gulo gulo luscus)*
- Northern Idaho ground squirrel *(Spermophilus brunneus brunneus)*
- Pygmy rabbit *(Brachylagus idahoensis)*
- Selkirk Mountain woodland caribou *(Rangifer tarandus caribou)* and critical habitat
- Northern spotted owl *(Strix occidentalis caurina)* and its critical habitat
- Yellow billed cuckoo *(Coccyzus americanus)* and its critical habitat
- Bliss Rapids snail *(Taylorconcha serpenticola)*
- Snake River physa snail *(Haitia (Physa) natricina)*
- Fender's blue butterfly *(Icaricia icarioides fender)*
- Taylor's checkerspot butterfly *(Euphydryas editha taylori)* and its critical habitat
- Howell's spectacular thelypody *(Thelypodium howellii spectabilis)*
- McFarlane's four o'clock *(Mirabilis macfarlanei)*
- Slickspot peppergrass *(Lepidium papilliferum)* and its critical habitat
- Spalding's catchfly *(Silene spaldingii)*
- Ute ladies' tresses *(Spiranthes diluvialis*
- Water howellia *(Howellia aquatilis)*
- Wenatchee Mountain checkermallow *(Sidalcea oregana var. calva)* and its critical habitat
- Critical habitat for marbled murrelet
- Critical habitat for Kincaid's lupine *(Lupinus sulphureus ssp. Kincaidii)*
- Critical habitat for Willamette daisy *(Erigeron decumbens)*

If you have any questions regarding the enclosed Biological Opinion, or our shared responsibilities under Act, please contact Ann Gray (ann_e_gray@fws.gov) or Chris Allen (chris_allen@fws.gov) of my staff at 503-231-6179.

Sincerely,

Christopher Allen, for

Paul Henson, Ph.D.
State Supervisor

Enclosure(s)
Biological Opinion for BPA's Habitat Improvement Program 4

ecc: Gambetta, BPA

Endangered Species Act - Section 7 Consultation

Biological Opinion

Habitat Improvement Program (HIP4)
Columbia River Basin
May 2020

U.S. Fish and Wildlife Service Reference:
01EOFW00-19FY-F-0710
OFWO Tracking System: #19-531

Federal Action Agency:
BONNEVILLE POWER ADMINISTRATION

Consultation Conducted By:

U.S. Fish and Wildlife Service
Oregon Fish and Wildlife Office

Christopher Allen, for
Paul Henson, Ph.D
State Supervisor

5-15-2020
Date

Suggested Citation:

U.S. Fish and Wildlife Service. 2020. Formal section 7 programmatic consultation on BPA's Columbia River Basin Habitat Improvement Program for the Columbia River Basin. May 2020. Oregon Fish and Wildlife Office, Portland, Oregon. TAILS # 01EOFW00-19FY-F-0710. 80 pp.

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INTRODUCTION

This document represents the U. S. Fish and Wildlife Service's (Service) Biological Opinion based on our review of Bonneville Power Administration's proposed Habitat Improvement Program (HIP) in the Columbia River Basin, which includes portions of Idaho, Montana, Oregon and Washington, and its effects on Bull Trout (*Salvelinus confluentus*), Marbled Murrelet (*Brachyramphus marmoratus*), Streaked Horned Lark (*Eremophila alpestris strigata*), Bradshaw's lomatium (*Lomatium bradshawii*), Golden Paintbrush (*Castilleja levisecta*), Kincaid's Lupine (*Lupinus sulphureus ssp. Kincaidii*), Nelson's Checkermallow (*Sidalcea nelsoniana*), and Willamette Daisy (*Erigeron decumbens*), in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et *seq.*). We received your September 9, 2019, request for formal consultation on September 11, 2019.

This Biological Opinion (or Opinion) is based on information provided in the 2019 HIP4 Biological Assessment (BA; BPA 2019a) for the proposed project, discussions with action agency staff and consultants, species experts, field visits and other information. Staff from BPA and the Service worked together to develop the BA, including agreeing on the project description, conservation measures, action area, effects of the action and the Incidental Take Statement. The Service also provided write-ups to BPA with Status of the Species and Critical habitat for several species, which were appended to the BA. This approach is consistent with the Expedited Consultation procedures described in section 402.14(l) in the regulations implementing section 7 consultation (50 CFR 402). The regulations state that conservation actions whose primary purpose is to have beneficial effects on listed species are considered appropriate for expedited consultation. The close interagency coordination in developing the BA allows the Service to prepare this Opinion in an expedited manner by referencing or incorporating the relevant portions of the BA directly into this document. A complete record of this consultation is on file at this office.

Consultation History

National Marine Fisheries Service (NMFS) issued a biological opinion on the effects of the operation of the Federal Columbia River Power System (FCRPS) on ESA-listed salmonid species in 2000. As a result of that consultation, a number of Reasonable and Prudent Alternatives (RPAs) were implemented to improve habitat conditions towards salmon survival and recovery. While the proposed habitat improvement projects are beneficial to many listed species in the long term, some actions produce short-term adverse effects to listed species and thus require consultation under the ESA. Many of the proposed activities are minor in nature and their effects are similar. Because of new ESA listings and the large number of habitat improvement projects proposed under the Fish and Wildlife Program, BPA engaged the Services in 1999 for programmatic coverage on habitat improvement activities; these actions are referred to as BPA's Habitat Improvement Program (HIP). This program is carried out according to the BPA's authority under the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501) throughout the Columbia River basin to mitigate for the effects of the FCRPS on fish, wildlife, and their habitat.

In 2003 and 2008, NMFS completed two programmatic consultations on BPA's HIP to cover listed species under NMFS's jurisdiction (e.g. anadromous salmonids). On August 1, 2003, NMFS issued a programmatic opinion and essential fish habitat (EFH) consultation (NMFS No. 2003/00750); that consultation is referred to as the HIP I BO. On June 21, 2007, the BPA submitted a new biological assessment to NMFS and re-initiated formal consultation for the Habitat Improvement Program. A second NMFS BO (HIP II BO) was signed on January 10, 2008, to cover calendar years 2008-2012.

Beginning in 2010, BPA created a quality control process to review all HIP documents prior to submission to NMFS to improve consistency, and thus more detailed implementation information is available from 2010 forward. Under HIP II, a total of 753 project activities were funded and implemented (one project may involve more than one activity category). During this time, BPA decided that it would seek programmatic coverage for listed species under the jurisdiction of the Service. On November 8th, 2013, the USFWS issued a final Biological Opinion (HIPIII) that concluded that the proposed program and activities authorized under that program would not jeopardize the continued existence of bull trout, Oregon chub (subsequently delisted in 2014), and marbled murrelet, and would not be likely to adversely affect a suite of listed and proposed fish, wildlife, plant, and aquatic invertebrates. NMFS also issued their HIPIII Biological Opinion in 2013, which concluded that the proposed program and activities authorized under that program would not jeopardize the continued existence of any listed anadromous salmonids under its jurisdiction.

Following completion of the HIPIII consultation, BPA, NMFS, and USFWS staff have met on annual intervals to discuss implementation issues and refine the activity descriptions and conservation measures. These changes were compiled and communicated through the HIP Handbook. Under HIPIII from 2013 to 2018, 2,930 project activities were funded and implemented (again, one project may involve more than one activity category; Table 1), averaging 488 projects activities each year. By category, BPA annually funded, on average, the following restoration projects activities under HIPIII:

- Irrigation and Water Delivery/Management Actions – 10
    - Fish Screen Installation or Maintenance -- 260
- River, Stream, Floodplain and Wetland Restoration – 84
- Invasive Plant Control -- 63
- Fish Passage Restoration – 26
- Special Actions for Terrestrial Species -- 23
- Fisheries, Hydrologic, and Geomorphologic Surveys -- 22
- Road and Trail Erosion Control, Maintenance, and Decommissioning -- 4
- Piling Removal -- <1

An average of 42 restoration projects (247 projects total in 6 years) requiring near or in-water work were also completed during that time period. Table 1 provides the number of project categories by year and category.

In March 2018, BPA indicated they wished to reinitiate consultation on HIPIII to better address herbicide applications in the lower Columbia River Estuary and turbidity restrictions during project implementation. BPA also indicated they were going to limit the action area to the

Columbia River Basin, and broadened the proposed action to include prairie restoration and management actions. For prairie actions, BPA indicated they would request consultation on listed Willamette Valley prairie species. BPA provided the Service and NMFS with a draft proposed action and list of species for HIP4. The Service and NMFS reviewed the proposed action and provided comments to BPA, which were included in the final proposed action for HIP4.

The Service and BPA collaboratively developed the BA. The Service provided its most up to date status of the species and effects analysis for inclusion in the BA. The Service also coordinated with multiple species leads in the Service across Oregon, Washington, Idaho and Montana to develop species-specific conservation measures to minimize or avoid negative effects to many species. BPA submitted the final HIP4 BA to the Service on September 9, 2019.

Table 1. Categories, subcategories, and number of project activities implemented each year under HIPIII Biological Opinions issued by the Service and NMFS.

Category -- average # activities/year Subcategory	2013	2014	2015	2016	2017	2018	TOTALS
1. Fish Passage Restoration – 26 project activities/year							
a. Dams, Water Control or Legacy Structure Removal.	1	2	3	2	5	3	**16**
b. Consolidate, or Replace Existing Irrigation Diversions.	3	3	1	0	5	4	**16**
c. Headcut and Grade Stabilization.	3	6	9	9	9	4	**40**
d. Low Flow Consolidation.	0	0	0	0	0	1	**1**
e. Providing Fish Passage at an Existing Facility.	2	6	4	2	4	5	**23**
f. Bridge and Culvert Removal or Replacement.	8	11	9	11	6	4	**49**
g. Bridge and Culvert Maintenance.	0	0	1	0	1	0	**2**
h. Installation of Fords.	2	0	2	0	1	2	**7**
2. River, Stream, Floodplain, and Wetland Restoration – 84 project activities /year							
a. Improve Secondary Channel and Wetland Habitats.	6	11	8	12	17	19	**73**
b. Set-back or Removal of Existing, Berms, Dikes, and Levees.	2	7	10	5	7	8	**39**
c. Protect Streambanks Using Bioengineering Methods.	4	8	10	7	7	11	**47**
d. Install Habitat-Forming Natural Material Instream Structures (Large Wood, Boulders, and Spawning Gravel)	11	20	15	20	25	29	**120**
e. Riparian Vegetation Planting.	19	30	32	33	38	42	**194**
f. Channel Reconstruction.	2	4	3	4	6	9	**28**

3. Invasive and Non-Native Plant Control – 63 project activities /year								
	a. Manage Vegetation using Physical Controls.	18	32	26	25	27	35	**163**
	b. Manage Vegetation using Herbicides.	39	45	39	28	29	37	**217**
4. Piling Removal – < 1 project activities /year								
	Pile Removal	0	0	0	1	0	2	**3**
5. Road and Trail Erosion Control, Maintenance, and Decommissioning – 4 project activities /yr								
	a. Maintain Roads.	2	4	3	2	2	4	**17**
	b. Decommission Roads.	0	3	0	0	2	2	**7**
6. In-channel Nutrient Enhancement -- 0 projects to date.								
	Nutrient Enhancement.	0	0	0	0	0	0	**0**
7. Irrigation and Water Delivery/Management Actions – 268 project activities /year								
	a. Convert Delivery System to Drip or Sprinkler Irrigation.	1	2	2	1	1	4	**11**
	b. Convert Water Conveyance from Open Ditch to Pipeline or Line Leaking Ditches or Canals.	1	5	1	1	3	3	**14**
	c. Convert from Instream Diversions to Groundwater Wells for Primary Water Sources.	0	0	0	0	0	1	**1**
	d. Install or Replace Return Flow Cooling Systems.	1	0	0	1	0	0	**2**
	e. Install Irrigation Water Siphon Beneath Waterway.	2	0	0	2	1	0	**5**
	f. Livestock Watering Facilities.	4	8	5	1	4	4	**26**
	g. Install New or Upgrade/Maintain Existing Fish Screens.	3	4	5	23	737	775	**1,547**
8. Fisheries, Hydrologic, and Geomorphologic Surveys – 22 project activities /year								
	Surveys	18	25	24	23	16	23	**129**
9. Special Actions (for Terrestrial Species) -- 23 project activities /year								
	a. Install/develop Wildlife Structures.	0	0	0	1	1	1	**3**
	b. Fencing construction for Livestock Control	1	5	7	7	14	13	**47**
	c. Implement Erosion Control	0	3	2	0	6	6	**17**
	d. Plant Vegetation.	2	6	7	6	14	18	**53**
	e. Tree Removal for LW Projects.	0	3	1	3	3	6	**16**
YEARLY TOTALS (average 488)		**155**	**253**	**229**	**229**	**991**	**1,073**	**2,930**

Concurrences

The Service concurs with the BPA's determination in the HIP4 Biological Assessment (pp. 1-11 to 1-16) that the actions proposed under HIP4 may affect, but are not likely to adversely affect the following species and designated critical habitat:

- Oregon spotted frog *(Rana pretiosa)* and its critical habitat
- Canada lynx *(Lynx Canadensis)* and its critical habitat
- Columbia white-tailed deer *(Odocoileus virginianus leucurus)*
- Gray wolf *(Canis lupus)*
- Grizzly bear *(Ursus arctos horribilis)*
- North American wolverine *(Gulo gulo luscus)*
- Northern Idaho ground squirrel *(Spermophilus brunneus brunneus)*
- Pygmy rabbit *(Brachylagus idahoensis)*
- Selkirk Mountain woodland caribou *(Rangifer tarandus caribou)* and critical habitat
- Northern spotted owl *(Strix occidentalis caurina)* and its critical habitat
- Yellow billed cuckoo *(Coccyzus americanus)* and its critical habitat
- Bliss Rapids snail *(Taylorconcha serpenticola)*
- Snake River physa snail *(Haitia (Physa) natricina)*
- Fender's blue butterfly *(Icaricia icarioides fender)*
- Taylor's checkerspot butterfly *(Euphydryas editha taylori)* and its critical habitat
- Howell's spectacular thelypody *(Thelypodium howellii spectabilis)*
- McFarlane's four o'clock *(Mirabilis macfarlanei)*
- Slickspot peppergrass *(Lepidium papilliferum)* and its critical habitat
- Spalding's catchfly *(Silene spaldingii)*
- Ute ladies' tresses *(Spiranthes diluvialis*
- Water howellia *(Howellia aquatilis)*
- Wenatchee Mountain checkermallow *(Sidalcea oregana var. calva)* and its critical habitat
- Critical habitat for Kincaid's lupine *(Lupinus sulphureus ssp. Kincaidii)*
- Critical habitat for Willamette daisy *(Erigeron decumbens)*

The Service coordinated internally with species lead biologists across multiple states to develop species-specific conservation measures for these listed species to ensure the effects of proposed restoration projects to these species and primary constituent elements (PCEs) s of critical habitats would be wholly beneficial, insignificant or discountable. BPA incorporated these species-specific conservation measures into their proposed action (pp. 2-87 to 2-114 of the HIP4 BA). BPA and the Service also coordinated on the basis and rationale for the "not likely to adversely affect" determinations on these species. The basis for these concurrence determinations is presented in the HIP4 Biological Assessment (pp. 1-11 to 1-16) and hereby incorporated by reference.

Our concurrences are based on the following summarized information available to the Service and presented in BPA's final HIP4 BA:

- The goals of BPA's HIP program is to restore native habitats to benefit native fish, wildlife, and plant species, including federally listed species.
- By following the General and Activity-Specific conservation measures identified in the proposed action, including species-specific conservation measures, short-term impacts to habitats (including designated critical habitats) that support the federally listed species listed above are limited to those that are insignificant, discountable or wholly beneficial. Adverse effects to these habitats are not anticipated.
- By following the general and species-specific conservation measures, the proposed action is not likely to result in harm or harassment to the federally-listed species above.
- No PCEs or constituent/essential biological elements, as appropriate, in designated critical habitat for the species (listed above) will be adversely affected by the proposed action. The proposed action and all of its proposed conservation measures have been designed to substantially minimize or eliminate the amount and severity of potential effects to the physical and biological habitat components represented by PCEs or constituent/essential biological elements for the species.

These species and critical habitat designations are not discussed further in the Opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Project Overview

The HIP4 is a restoration program funded by BPA. BPA funds habitat improvement activities to fulfill its obligations under the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501), and to meet its obligations under the Endangered Species Act (16 U.S.C. 1531 et seq.) by fulfilling commitments to identifying tributary habitat restoration projects in the 2008 FCRPS Biological Opinion, as amended by a Supplemental Biological Opinion in 2010 and 2014 (National Oceanic and Atmospheric Administration Fisheries 2008, 2010, 2014). The overall goal of HIP4 is to improve fish and wildlife habitats within the Columbia River Basin, especially for federally listed salmon and steelhead (often referred as anadromous salmonids in the HIP4 BA and this Opinion).

BPA has been using this programmatic approach for consultation since 2003 with NMFS, and since 2013 with the Service. As part of the overall proposed action, there are implementation procedures and processes (pp. 1-5 to 1-9 of the HIP4 BA), including review of each individual, site-specific action by BPA. Some projects required additional review and approval by the Service and NMFS, depending on the level of complexity, risk, and the listed species potentially affected. BPA is required to provide the Service and NMFS with a pre-project notification (including project description and species affected) for each project, and a post-project completion report for most project activity categories (herbicide application and surveys are excluded, provided they were conducted as described in the pre-project notification). As part of the proposed project, BPA maintains a HIP Handbook to assist their project partners in the design and implementation of projects and communicate compliance needs. BPA compiles an annual report and hosts annual meetings with the Service and NMFS to review the program's implementation, including the number of types of projects implemented in the previous year, and coordinate on any necessary improvements or changes to the overall program.

The proposed, programmatic action consists of general aquatic conservation measures (pp. 2-20 to 2-34 of the HIP4 BA), several categories and sub-categories of restoration actions (pp. 2-35 to 2-86 of the HIP4 BA), and species-specific conservation measures (pp. 2-86 to 2-115 of the HIP4 BA). These restoration actions are commonly used throughout the Pacific Northwest, and have largely predictable effects to species and habitats, which allows the Service to adequately analyze species effects and use a programmatic approach to this consultation.

Categories of Action

The following are 9 categories of actions that are funded and proposed BPA. These actions are detailed in the HIP4 BA (pp. 2-10 to 2-85).

Category 1: Fish Passage Restoration (Profile Discontinuities)

1a) Dams, Water Control, or Legacy Structure Removal
1b) Consolidate or Replace Existing Irrigation Diversions
1c) Headcut and Grade Stabilization

1d) Low Flow Consolidation
1e) Providing Fish Passage at an Existing Facility

Category 1: Fish Passage Restoration (Transportation Infrastructure)

1f) Bridge and Culvert Removal or Replacement
1g) Bridge and Culvert Maintenance
1h) Installation of Fords

Category 2: River, Stream, Floodplain, and Wetland Restoration

2a) Improve Secondary Channel and Floodplain Connectivity
2b) Set-back or Removal of Existing, Berms, Dikes, and Levees
2c) Protect Streambanks Using Bioengineering Methods
2d) Install Habitat-Forming Instream Structures (Large Wood, Small Wood & Boulders)
2e) Riparian Vegetation Planting
2f) Channel Reconstruction
2g) Install Habitat-Forming Materials (Sediment and Gravel)

Category 3: Invasive Plant Control

3a) Manage Vegetation using Physical Controls
3b) Manage Vegetation using Herbicides (Riverine)
3c) Manage Vegetation using Herbicides (Estuarine)
3d) Juniper Removal
3e) Prescribed Burning

Category 4: Piling Removal

Category 5: Road and Trail Erosion Control, Maintenance, and Decommissioning

5a) Maintain Roads
5b) Decommission Roads

Category 6: In-Channel Nutrient Enhancement

Category 7: Irrigation and Water Delivery/Management Actions

7a) Convert Delivery System to Drip or Sprinkler Irrigation
7b) Convert Water Conveyance from Open Ditch to Pipeline or Line Leaking Ditches or Canals
7c) Convert from Instream Diversions to Groundwater Wells for Primary Water Sources
7d) Install or Replace Return Flow Cooling Systems
7e) Install Irrigation Water Siphon beneath Waterway
7f) Livestock Watering Facilities
7g) Install New or Upgrade/Maintain Existing Fish Exclusion Devices and Bypass Systems

Category 8: Fisheries, Hydrologic, and Geomorphologic Surveys

Category 9: Special Actions (for Terrestrial Species)

9a) Install/Develop Wildlife Structures
9b) Fencing construction for Livestock Control
9c) Implement Erosion Control Practices
9d) Plant Vegetation
9e) Tree Removal for Large Wood Projects
9f) Willamette Valley Prairie Restoration Action

Action Area

The action area is defined 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). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment.

The action area consists of all of the areas within the Columbia River Basin where the environmental effects of actions funded under the HIP4 may occur that is also within the range of ESA-listed freshwater fish (including Bull Trout) and their designated critical habitat in addition to; Avian, Mammalian, Plant and Invertebrate terrestrial species and their proposed or designated critical habitats (Figure 1). As most of the proposed categories of restoration target riverine and riparian restoration for ESA-listed anadromous salmonids, the large majority of actions will occur along and within streams occupied by those listed fish throughout their range.

As part of its Willamette Wildlife Mitigation Project, BPA has requested consultation on its proposed prairie restoration actions that will primarily occur in the Willamette Valley, Oregon. The Willamette River is a large tributary to the Columbia River in Oregon and within the Columbia River Basin boundary. BPA proposed to include prairie restoration actions in the Willamette Valley to cover 1) ongoing management on approximately 3,400 acres, and 2) management on future acquisitions over the next several years. BPA anticipates that approximately 6,800 acres in the Willamette Valley may require ESA coverage for the management and restoration of grasslands and prairies where one or more listed species are present.

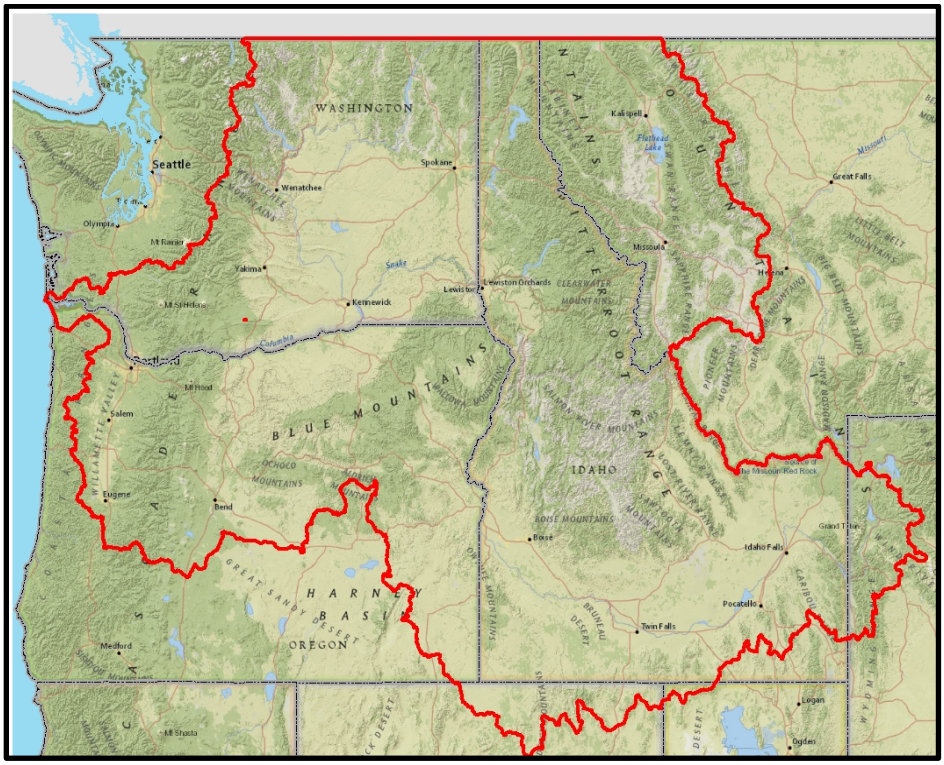

Figure 1. The Columbia River Basin and action area outlined in red (excluding Nevada).

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND DESTRUCTION OR ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

Section 7(a)(2) of the Act requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed endangered or threatened species. The analysis in this Biological Opinion relies on the following four components: (1) the Status of the Species, which evaluates the range-wide condition of the listed species addressed, the factors responsible for that condition, and the species' survival and recovery needs; (2) the Environmental Baseline, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the Effects of the Action, which determines the consequences of the proposed federal action; and (4) Cumulative Effects, which evaluates the effects of future, non-federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of listed species in the wild.

The jeopardy analysis in this Biological Opinion emphasizes the range-wide survival and recovery needs of the listed species and the role of the action area in providing for those needs. It is within this context that we evaluate the significance of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Destruction or Adverse Modification Determination

Section 7(a)(2) of the Act requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. A final rule revising the regulatory definition of "destruction or adverse modification of critical habitat" was published on August 27, 2019 (84 FR 44976); the final rule became effective on October 28, 2019 (84 FR 50333). The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species."

Past designations of critical habitat have used the terms "primary constituent elements" (PCEs), "physical or biological features" (PBFs) or "essential features" to characterize the key components of critical habitat that provide for the conservation of the listed species. The new critical habitat regulations discontinue use of the terms "PCEs" or "essential features," and rely exclusively on use of the term "PBFs" for that purpose because that term is contained in the statute. However, the shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs or essential features. For those reasons, in this Biological Opinion, references to PCEs or essential features should be viewed as synonymous with PBFs. All of these terms characterize the key components of critical habitat that provide for

the conservation of the listed species.

Our analysis for destruction or adverse modification of critical habitat relies on the following four components: (1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat for the listed species in terms of essential features, PCEs, or PBFs, depending on which of these terms was relied upon in the designation, the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determines all consequences to critical habitat that are caused by the proposed action on the essential features, PCEs, or PBFs and how those effects are likely to influence the recovery role of affected critical habitat units; and (4) Cumulative Effects, which evaluates the effects of future, non-federal activities in the action area on the essential features, PCEs, or PBFs and how those effects are likely to influence the recovery role of affected critical habitat units.

For purposes of making the destruction or adverse modification finding, the effects of the proposed federal action, together with any cumulative effects, are evaluated to determine if the proposed action will appreciably diminish the value of critical habitat as a whole for the conservation of the species.

BULL TROUT

The HIP4 BA was developed jointly by the Service and BPA. Thus, the Service will reference and summarize information presented in the HIP4 BA instead of repeating the same information in this Opinion. All HIP4 BA pages referenced throughout the following sections on bull trout are hereby incorporated by reference.

Status of the Species- Bull Trout

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (64 FR 58910), and includes all populations within the Columbia River Basin. Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, incidental angler harvest, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (63 FR 31647; 64 FR 58910). For a detailed account of the status of bull trout, refer to Appendix D of the HIP4 BA (Status of the Species: Bull Trout, pp. D-1 to D-16).

Status of Critical Habitat - Bull Trout

The Service published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (70 FR 63898); the rule became effective on November 17, 2010. The condition of bull trout critical habitat varies across its range from poor

to good. There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout habitat function, and continue to do so. For more information on the status of bull trout critical habitat, refer to Appendix D of the HIP4 BA (Status of the Species: Bull Trout, pp. D-16 to D-23).

Environmental Baseline - Bull Trout

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline 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 or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Current Condition and Critical Habitat in the Action Area - Bull Trout

The action area of this programmatic consultation includes the Columbia River Basin in Oregon, Washington, Idaho and western Montana. The HIP4 BA (pp. 3-116 to 3-121) provides an overview of the conditions (land use practices, hydropower, water quality and quantity in the Columbia River Basin) that generally affect bull trout. The final Recovery Plan for the Coterminous Bull Trout Population formalized six recovery units (USFWS 2015a, pg. 36-43), three of which are within the action area of the Columbia River Basin (Mid-Columbia, Upper Snake, and Columbia Headwaters) and include 84 core areas. The action area also includes a large portion of the Coastal Recovery Unit, specifically the lower Columbia River up to, and including, the Lower Deschutes River (7 core areas in total). Thus, the action area of this programmatic Opinion includes 91 core areas and ~515 local populations. Although significant recovery actions have been implemented since the time of listing, the last 5-year review concluded that bull trout still meets the definition of a "threatened" species (USFWS 2015b, entire). See Appendix D of the HIP4 BA (pp. D-10 to D-16) for additional information.

The action area encompasses most of the critical habitat units designated for bull trout (26 out of 32 units). A justification document describes occupancy and the rationale for why these habitat areas are essential for the conservation of bull trout, available on https://www.fws.gov/pacific/bulltrout/crithab/Jusitfication%20Docs.html. Designated habitats include areas that contain habitat features needed for the conservation of bull trout, and includes reservoirs/lakes and stream miles. For additional information on critical habitat for the bull trout within the action area, refer to Appendix D (Status of the Species: Bull Trout, pp. D-16 to D-23).

Conservation Role of the Action Area - Bull Trout

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63898:63943), which are the closest approximation of a biologically functioning unit for the

recovery purposes. The action area contains a large number of core areas (91) and local populations (~515) within the network of rivers that comprise the Columbia River Basin. The conservation role of the action area is to provide complex and high quality habitats to support and maintain local populations, and provide connected aquatic habitats for these populations between spawning, rearing, overwintering, and foraging habitats.

Climate Change - Bull Trout

BPA provided general information on climate change effects in the Columbia River Basin (pp. 3-197 to 3-199 in the HIP4 BA). Briefly, climate change has the potential to profoundly alter the aquatic ecosystems upon which bull trout depend via alterations in water yield, peak flows, and stream temperature, and an increase in the frequency and magnitude of catastrophic wildfires in adjacent terrestrial habitats.

Climatic conditions associated with aquatic environments strongly affect the ecology of fishes which are ectothermic, so anthropogenic climate change in recent decades has raised concerns about the persistence of local fish populations, evolutionary significant units, and species (Meisner 1990; Rieman and Isaak 2010). Concerns are especially acute for the bull trout (Rieman et al. 2007), which has a cold thermal niche, is confined to the coldest headwater streams and rivers, and often requires large interconnected networks to persist (Rieman and McIntire 1995; Dunham et al. 2003a). Throughout the species' range in the northwestern U.S., most bull trout habitats occur on National Forest System lands (Rieman et al. 1997; Isaak et al. 2015) and are subject to the environmental trends associated with climate change that include: warming stream and lake temperatures (Schneider and Hook 2010; Isaak et al. 2010; Isaak et al. 2012); declining snow packs and summer flow volumes (Mote et al. 2005; Luce and Holden 2009; Luce et al. 2013); increased natural disturbances associated with winter flooding or wildfires and subsequent debris flows (Sestrich et al. 2011; Goode et al. 2013; Luce et al. 2012); and upstream expansion of competitor trout species from downstream areas (Rieman et al. 2006; Al-Chokhachy et al. 2016). In combination, those changes suggest that bull trout habitats are becoming smaller, warmer, more fragmented, and prone to greater disturbances, which in combination are predicted to decrease the viability of bull trout populations in this century (Rieman et al. 2007; Wenger et al. 2013; Isaak et al. 2015).

Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features necessary to support bull trout populations and exacerbate habitat degradation. One objective of the final rule on bull trout critical habitat (70 FR 63898) was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations is important to address potential impacts due to climate change. While climate change has the potential to impact bull trout populations and their habitats across their range, the proposed action is not of sufficient magnitude to alter current trends of climate change; however, some restoration projects implemented under the HIP4 action could support local bull trout populations by increasing the resiliency of habitats at the local scale and improving connectivity among populations.

Effects of the Action- Bull Trout

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

Effects to Bull Trout

BPA provided an effects analysis for bull trout in the HIP4 BA (pp. 3-127 to 3-158). The following information provides a summary of that information. The HIP4 proposes several categories of restoration actions, many of which occur in or near waters that may support bull trout. Restoration projects generally include a series of actions, including pre-construction activities, site preparation, construction, and operation and maintenance actions, and site restoration. Many of these actions use heavy equipment and alter existing and typically degraded habitats to achieve restoration goals. As such, there are many similar potential effects across the restoration action categories. These common effects to bull trout, termed General Construction and Aquatic Related Effects, were analyzed in the HIP4 BA (pp. 3-128 to 3-130), which include specific effects of:

- Vegetation removal
- Exposure and compaction of soil
- Heavy equipment operation
- Work-area isolation and relocation of fish
- Changes in flows
- Contamination of water from heavy equipment use
- Site restoration
- Increase in turbidity and suspended sediments

The most common effect from General Construction activity is increased turbidity and suspended sediments, which can result from vegetation removal, exposure of soil, use of heavy equipment, work area isolation (e.g. coffer dams), and site restoration. The HIP4 BA provided analysis on the severity of effects based on turbidity levels and duration of exposure (HIP4 BA, pp. 3-134 to 3-137). This analysis found that 1) turbidity levels during active, in-water work are expected to be less than 40 NTUs, and 2) work days (when activities are likely to increase turbidity levels) are typically 8-12 hours. Based on their analysis, BPA expects that individual fish are unlikely to experience long-term harm from exposure from turbidity plumes because few restoration projects are anticipated to create conditions (i.e. fish exposure to high levels of turbidity for sustained periods of time) such that long-term negative effects to individual fish would be anticipated (Figure 3 on p. 3-136 of the HIP4 BA). Adult and juvenile fish are mobile and expected to move away from the turbidity.

The Service anticipates that an increase in suspended sediments and turbidity will be visible in the immediate vicinity of, and for some distance downstream, of each project requiring near or in-water construction. The distance that sediment will be visible downstream is proportional

both to the size of the disturbance and to the width of the wetted stream. As part of the proposed action in the HIP4 BA, BPA has proposed a modified "Turbidity Monitoring Protocol" (p. 2-34 of the HIP4 BA), which will limit the exposure to fish in terms of both the duration and magnitude of turbidity. When defined exceedances occur, corrective measures must be taken to address the excessive turbidity. If exceedances occur for more than 8 hours, all activity must be stopped and corrective actions taken. Because the "Turbidity Monitoring Protocol" requires practitioners to stop work when turbidity reaches potentially harmful levels, turbidity levels would drop once work has stopped and sediments are no longer disturbed, negative effects from turbidity would thereby be limited. This protocol will minimize exposure of bull trout to potential harm from excessive turbidity, while still allowing the restoration work to proceed in the most expedient manner and the most limited timeframe possible.

The HIP4 BA provides analyses of effects to bull trout for each category of restoration action (pp. 3-137 to 3-159 of the HIP4 BA). These effects are further detailed in the following sections of the HIP4 BA:

- Category 1: Fish Passage Restoration (pp. 3-137 to 3-140)
- Category 2: River, Stream, Floodplain, and Wetland Restoration (pp. 3-140 to 3-143)
- Category 3: Invasive Plant Control (pp. 3-143 to 3-153)
- Category 4: Piling Removal (pp. 3-153 to 3-154)
- Category 5: Road and Trail Erosion Control, Maintenance, and Decommissioning (pp. 3-154 to 3-156)
- Category 6: In-Channel Nutrient Enhancement (pp. 3-156 to 3-157)
- Category 7: Irrigation and Water Delivery/Management Actions (pp. 3-157 to 3-158)
- Category 8: Fisheries, Hydrologic, and Geomorphologic Surveys (pp. 3-158 to 3-159)

The purpose of the proposed action is to fund and support activities that improve fish and wildlife habitat. Generally, each of these restoration actions are beneficial and improve habitats that contribute to increased survival and recovery of listed species, including bull trout. Negative effects are related to general construction activities (HIP4 BA, pp. 3-128 to 3-130) necessary to achieve restoration goals and objectives, and may affect individual fish and their habitats in the immediate vicinity (and sometimes downstream) of the restoration site. Thus, these activities will have negative, short-term construction-related effects to individuals, but overall are anticipated to provide a long-term net benefit to bull trout and other native fishes and their habitats at the restoration site.

The use of herbicides is the remaining effect of the proposed action to bull trout. BPA's proposed use of chemicals (including the specific herbicides to use and the application methods) to control noxious weeds is designed to minimize the risk of adverse toxic effects on fish and their habitats (HIP4 BA pp. 3-145 to 3-152). While a catastrophic spill of fuels or chemicals reaching waters with listed species would have the potential for significant adverse effects to bull trout (e.g., mortalities), such spills have never occurred during the implementation of actions included in the HIP I, HIP II, or HIPIII Opinions. Thus, the Service considers the risk of an accidental spill to be low, as long as the proposed conservation measures are strictly followed. It should also be noted that the Service finds there will be no effect for estuarine herbicide applications: within the Columbia River, there have been no bull trout documented below

Bonneville Dam (~river mile 146), and thus, the Service would not expect bull trout to be exposed to the estuarine herbicide applications.

As confirmed by modeling and years of experience, application of herbicides (according to the EPA label and applicable conservation measures) is not expected to result in mortality to ESA-listed fish. However, there is some uncertainty about the effectiveness of the conservation measures and the amount of chemical expected to reach the water. While the amounts are expected to be very low, we cannot conclude with certainty that the levels of chemicals that will reach streams with listed fish will be zero; therefore, there may be some sub-lethal effects. Most of the potential sub-lethal effects from the herbicides and adjuvants proposed for use have not been investigated in regards to toxicological endpoints that are generally considered important to the overall health and fitness of salmonids and other fish. The consequences of these sub-lethal effects may be the loss of physiological or behavioral functions that can adversely affect the survival, reproductive success, or migratory behavior of individual fish.

Many environmental conditions can cause incremental differences in feeding, growth, movements, and survival of bull trout during the juvenile life stage. Construction actions that reduce the input of particulate organic matter to streams, add fine sediment to channels, expose fish to herbicides, or disturb shallow-water habitats, can adversely affect the ability of fish to obtain food necessary for growth and maintenance. Bull trout are generally able to avoid the adverse conditions created by construction if those conditions are limited to areas that are small or local compared to the total habitat area, and if the system can recover before the next disturbance, as expected for the proposed restoration actions. This means juvenile and adult bull trout will, to the maximum extent possible, readily move out of a construction area to obtain a more favorable position within their range of tolerance along a complex gradient of temperature, turbidity, flow, noise, contaminants, and other environmental features.

The degree and effectiveness of the avoidance response varies with life stage, season, the frequency and duration of exposure to the unfavorable condition, and the ability of the individual to balance other behavioral needs for feeding, growth, migration, and territory. Small to intermediate reductions in population density at any one restoration site caused by individuals moving out of the area to avoid injury or death as a result of exposure to short-term physical and chemical effects of construction are expected to be transitory and are not expected to alter survival rates.

Given the full range of mandatory conservation measures in the HIP4 proposed action, the threat is low that the environmental changes caused by events at any single site associated with the proposed action, or even any combination of such sites, could cause chronic or unavoidable exposure over a large habitat area sufficient to cause more than transitory direct effects to individual bull trout. Few, if any restoration projects are anticipated to be large enough to affect bull trout at the local population level (pp. 3-167 to 3- 170 of HIP4 BA).

The programmatic nature of the action prevents a precise analysis of each action that will be funded or carried out under this Opinion, although each type of action will be carefully designed and constrained by comprehensive design criteria and conservation measures such that the proposed activities will cause only short-term, localized, and relatively minor effects. From the

effects analysis provided by BPA in the HIP4 BA and consistent with the Service's analysis from our HIPIII BO, the Service found four categories of potential harm to bull trout:

1. Short-term impacts to water quality (e.g. turbidity increases, temperature, dissolved oxygen demand and contaminants),
2. Short-term decreases in function of physical habitat features (e.g. floodplain connectivity, natural cover, riparian vegetation, instream flow, passage conditions),
3. Short-term impacts to water quality (e.g. use of chemical herbicides), and
4. Fish handling during dewatering and work area isolation.

In the HIPIII Opinion, the Service allowed BPA authority to implement up to 90 projects each year that would include near or in-water construction, thereby limiting these potential negative effects to water quality and physical habitat features. In BPA's 2018 Annual Monitoring Report for HIPIII (BPA 2019b, p. 17), BPA implemented an average of 110 projects each year between 2013 and 2018, which included about 42 projects annually that included near or in-water work. For each individual project in occupied bull trout waters, the Service anticipates, small to intermediate reductions in population density in the localized area caused by individuals moving out of project areas to avoid changes in water quality and habitat from near or in-water activities. Thus, the exposure to short-term effects of construction are expected to be transitory and are not expected to alter bull trout survival rates, or negatively impact a core population. Because the proposed restoration actions are likely to be widely distributed across core areas and recovery units over a period of years, adverse effects are not anticipated to be concentrated in time or space within the range of bull trout.

In the HIPIII Opinion, the Service allowed BPA authority to chemically treat up to 1,000 riparian acres, thereby limiting potential negative effects to bull trout from herbicide use. In BPA's 2018 Annual Monitoring Report for HIPIII (BPA 2019b, p. 26), BPA treated an average of 628 riparian acres per year between 2013 and 2018. For each individual riparian herbicide application in occupied bull trout waters, the Service anticipates, small to intermediate reductions in population density in the localized area caused by individuals moving out of project areas to avoid changes in water quality, and some individuals may experience sub-lethal effects. However, the BPA has proposed the use of specific herbicides, application methods, and multiple other conservation measures to minimize such effects to listed fish, and for these reasons, the herbicide applications are not expected to result in mortality to bull trout. Thus, the potential exposure to herbicides and any sub-lethal effects to individuals are not expected to be substantial enough to negatively impact a core population. Because the proposed restoration actions are likely to be widely distributed across core areas and recovery units over a period of years, adverse effects are not anticipated to be concentrated in time or space within the range of bull trout.

In the HIPIII Opinion, the Service authorized an average non-lethal take of five or less bull trout per project (5 fish per project for ~50 projects per year, or 250 total per year) and lethal take of less than 13 bull trout in aggregate annually for all projects implemented under the proposed action. In the HIP4 BA, BPA anticipated the same level of take with regards to fish capture and handling associated with inwater work. Thus, only a very small number of individual fish (too

few to affect the abundance, productivity, distribution, or life history diversity of bull trout) are proposed to be adversely affected by any single action permitted under HIP4. In BPA's 2018 Annual Monitoring Report for HIPIII (BPA 2019b, p. 18), a total of 52 bull trout (~11 fish per year) were captured and released, and no mortalities were reported, for 2013 through 2018; thus, the Service anticipates the actual number of bull trout per project will be lower than estimated.

In summary, the proposed restoration actions are likely to be widely distributed across core areas and recovery units over years, so adverse effects will not be concentrated in time or space within the range of bull trout. In the long-term, these actions will collectively contribute to a lessening of the factors limiting the recovery of bull trout (particularly those factors related to fish passage, degraded floodplain connectivity, reduced aquatic habitat complexity, and riparian conditions), and improve the currently-degraded environmental baseline at the site scale. Because too few fish are expected to be affected to impact characteristics at the population or core area scale (abundance, productivity, distribution, or life history diversity), local populations are not anticipated to be affected, and the likelihood of survival and recovery of the bull trout will not be appreciably reduced by the proposed action.

Over the long term, the sum of the HIP4 activities may result in measurable improvements to population characteristics, particularly if a project is of large enough scale (provides access to many miles of habitat), or if enough projects are implemented within the Columbia River Basin. Given the full range of mandatory conservation measures in the HIP4, it is unlikely that physical and chemical changes caused by construction events at any single site associated with the proposed action, or even any combination of such sites, or will cause delays severe enough to reduce spawning success, alter population growth rate, or reduce the survival rate of a population. Thus, it is unlikely that the biological effects of implementing the activities within the HIP4 will negatively affect the characteristics of local populations or core areas of bull trout. We anticipate the proposed action will have long-term beneficial effects on population abundance, productivity, and life history diversity.

Effects to Bull Trout Critical Habitat

The nine PCEs of bull trout critical habitat are described in Appendix D of the HIP4 BA (pp. D20 to D21). PCEs are habitat components essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. To broadly describe bull trout habitats, the Service often refers to the "4 Cs": clear, cold, complex, and connected habitats. The PCEs for bull trout further describe and explain the 4 Cs. BPA provided analyses in the HIP4 BA that describes how each of the PCEs for bull trout are affected by the proposed HIP4 (pp. 3-159 to 3-166 of HIP4 BA).

Various restoration actions resulting under the HIP4 are anticipated to result in long term benefits to bull trout PCEs and habitats at the local, site-specific scale. Few, if any restoration projects are anticipated to be large enough to affect bull trout critical habitat beyond the site-specific scale. The proposed projects are too small, too distant from one another, and too infrequent to adversely affect the PCEs across an entire critical habitat unit. Thus, the effects of these projects cannot rise to a level to adversely affect the critical habitat within a critical habitat unit, recovery unit, or the Columbia River Basin as a whole.

Cumulative Effects- Bull Trout

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). Future federal actions that are unrelated to the proposed action are not considered in this section because they will require separate consultation pursuant to section 7 of the Act.

Between 2000 and 2010, the combined population of Oregon, Washington, and Idaho grew from 10.6 to 12.14 million, an increase of approximately 14.4%.[1] Each of the three states is projected to grow at a similar rate for the next 5 years. BPA assumes that future private and state actions will continue within the action areas, increasing as population rises.

The most common activities reasonably certain to occur in the action area are agricultural activities, operation of hydropower and flood-control facilities, urban and suburban development, recreational activities, logging, road construction and maintenance, and hard rock and gravel mining; all of these action can negatively affect bull trout and their habitats. Many of these activities would not be federal actions and would not be subject to ESA consultation and would likely result in some adverse effects to bull trout and their habitats. Some of the activities, such as hydropower operations, logging and development, are subject to regulation under federal or state programs, and the effects to fish and stream habitats would be reduced to some degree under these programs. When considered together, these cumulative effects are likely to have negative effects on bull trout population abundance, productivity and life history diversity. Similarly, the condition of critical habitat PCEs are anticipated to be degraded by the cumulative effect of these actions.

Throughout the Columbia Basin, watershed councils, Native American tribes, local municipalities, conservation groups, and others will continue to carry out aquatic, wetland, and prairie restoration projects in support of salmon and steelhead recovery (which would also benefit bull trout) and other aquatic species. Many of these actions will be federal actions, and thus covered by this or other consultations. If covered in other consultations, then their contribution to cumulative effects would be addressed in those consultations, not here. Private or state-funded restoration actions (for which non-federal funding commitments and approvals apply) would not be subject to ESA consultation, and thus their beneficial cumulative effects are considered here. Over decades, these effects will result in small improvements to abundance and productivity of bull trout at the local population scale, and result in some improvement to the condition of critical habitat PCEs. However, these improvements are unlikely to offset the continued impacts to bull trout populations and degradation of PCEs from future development and human population growth.

Summary and Synthesis- Bull Trout

BPA's proposed action, HIP4, is a restoration program to improve fish and wildlife habitats in the Columbia River Basin. Generally, HIP4 will result in long-term benefits to bull trout and

[1] Source: U.S. Bureau of the Census, Washington, D.C.

their habitats, but short-term impacts from construction activities will also occur. It is likely that the rate of development from private and state actions will continue to degrade bull trout habitats and cause negative effects; some of these effects will be localized (such as riprap installation to protect a building in the floodplain), but some could affect local populations (such as a passage barrier that isolates one portion of a bull trout population from another). Climate change may further exacerbate negative impacts that result due to human population growth (such as increased consumptive water use resulting in reduced instream flow and increased water temperatures). Restoration actions other than the proposed HIP4 action are also expected to continue into the future throughout the Columbia River Basin and result in some localized habitat improvements, which could result in some improvements to abundance and productivity of bull trout and to the resiliency of habitats to support bull trout.

The negative impacts from the proposed HIP4 are anticipated to be limited to individual bull trout, and relatively short-term in nature, and not rise to the level of local population effects. The potential impacts to individuals and habitats are minimized by the implementation of the proposed conservation measures that are included in the proposed action. No restoration project is anticipated to occur at such a large scale that it will have effects (beneficial or negative) beyond the local population or critical habitat unit, or at larger population scales. While individual restoration projects are not anticipated to change conditions for the bull trout population range-wide, individual restoration actions can benefit localized sites over the long-term and thus benefit local populations. Cumulatively, as more restoration projects, both within and outside of HIP4, are completed and attain their goals, restoration can benefit the long-term survival and continued existence of bull trout populations and improve PCEs of critical habitat. Thus, the proposed HIP4 provides guidance and limitations that ensure that aquatic restoration actions are implemented in a manner that limits impacts to individual fish and to localized critical habitat PCEs. The specific projects implemented as part of the proposed action will all provide long-term effects beneficial to naturally functioning stream, floodplain, and estuary habitats. These naturally functioning conditions, even if only localized, will 1) increase the resilience of these areas to the adverse effects of climate change and other anthropogenic actions that might otherwise make habitats unsuitable to continue support of bull trout, and thereby 2) increase the conservation value of these habitats for bull trout.

Conclusion- Bull Trout

After reviewing the status of bull trout, the environmental baseline for the action area, and the effects of the proposed action, including all measures proposed to avoid and minimize adverse effects, and the cumulative effects, it is the Service's Biological Opinion that the HIP4 is not likely to jeopardize the continued existence of the bull trout. This "no jeopardy" finding for bull trout is supported by the following:

- The overall goal and intent of the proposed action is to restore degraded habitats, and improve conditions for listed fish. The proposed action was developed in consultation with USFWS and NMFS to include many conservation measures to minimize potential impacts to all listed fish, including bull trout, and their habitats while conducting restoration activities.
- Although short-term, localized impacts to individual fish are anticipated during construction actions, the proposed restoration actions will enhance fish habitat and

passage conditions and benefit bull trout at the restoration site over time, and contribute to their conservation.

- The proposed conservation measures in HIP4 ensure the threat is low that the environmental changes caused by events at any single site associated with the proposed action, or even any combination of such sites, could cause chronic or unavoidable exposure over a large habitat area sufficient to cause more than transitory, direct effects to individual bull trout. The anticipated short-term impacts to individuals are not large enough to effect bull trout at the local population level.
- During the past 5 years of HIP implementation, few bull trout (~11 fish/year) have required capture and release, and there have been no documented bull trout mortalities. Thus, HIP4 has shown the proposed action and conservation measures to be effective in minimizing impacts to bull trout.

After reviewing the status of the species, the environmental baseline for the action area, and the effects of the proposed action, including all measures proposed to avoid and minimize adverse effects, and the cumulative effects, it is the Service's Biological Opinion that the HIP4 is not likely to result in the destruction or adverse modification of designated critical habitat for bull trout. This finding of no destruction or adverse modification of critical habitat is supported by the following:

- Restoration actions will target degraded habitats; the proposed restoration will enhance fish habitat and passage conditions, thus benefitting PCEs of bull trout critical habitat over time.
- Most of the impacts from restoration to PCEs are short-term and localized in nature, and only affect bull trout critical habitat at the local, site-specific scale.
- The proposed conservation measures in the HIP4 ensure the threat is low that the environmental changes caused by events at any single site associated with the proposed action, or even any combination of such sites, could cause chronic or unavoidable exposure over a large habitat area sufficient to result in adverse effects to PCEs over long periods of time.
- Adverse effects are not significant when evaluated at scales larger than the local scale. The projects involved are too small, too distant and too infrequent to adversely affect the PCEs across an entire critical habitat unit. Thus, the effects of these restoration projects cannot rise to a level to adversely affect the critical habitat at the critical habitat unit or larger scales (e.g. Recovery Units and range-wide) or appreciably diminish the value of critical habitat as a whole for the conservation of the species.

[End of Section]

MARBLED MURRELET

The HIP4 BA was developed jointly by the Service and BPA. Thus, the Service will reference and summarize information presented in the HIP4 BA instead of repeating the same information in this Opinion. All HIP4 BA pages referenced throughout the following sections on marbled murrelet are hereby incorporated by reference.

Status of the Species- Murrelet

For a detailed account of murrelet biology, life history, threats, demography, and conservation needs, refer to Appendix E of the BA (*Status of Species and Critical Habitat: Marbled Murrelet*). A summary of that information is provided below.

The marbled murrelet was listed as a threatened species in Washington, Oregon, and California in 1992 under the federal ESA. The primary reasons for listing included extensive loss and fragmentation of old-growth forests which serve as nesting habitat for murrelets and human-induced mortality in the marine environment from gillnets and oil spills (57 FR 45328). Although some threats such as gillnet mortality and loss of nesting habitat on federal lands have been reduced since the 1992 listing, the primary threats to species persistence continue (USFWS 2019a, p. 65).

The 1997 *Recovery Plan for the Marbled Murrelet* (USFWS 1997) identified six Conservation Zones throughout the listed range of the species: Puget Sound (Conservation Zone 1), Western Washington Coast Range (Conservation Zone 2), Oregon Coast Range (Conservation Zone 3), Siskiyou Coast Range (Conservation Zone 4), Mendocino (Conservation Zone 5), and Santa Cruz Mountains (Conservation Zone 6). The Recovery zones are considered to be the functional equivalent of recovery units as defined by Service policy (USFWS 1997, p. 115).

Table MAMU1. Distribution of murrelet nesting habitat (acres) by Conservation Zone, and summary of net habitat changes from 1993 to 2012 within the Northwest Forest Plan area.

Conservation Zone	1993	2012	Change (acres)	Change (percent)
Zone 1 - Puget Sound/Strait of Juan de Fuca	829,525	739,407	-90,118	-10.9 %
Zone 2 - Washington Coast	719,414	603,777	-115,638	-16.1 %
Zone 3 - Northern to central Oregon	662,767	610,583	-52,184	-7.9 %
Zone 4 - Southern Oregon - northern California	309,072	256,636	-52,436	-17 %
Zone 5 - north-central California	14,060	16,479	+2,419	+17.2 %
Totals	2,534,838	2,226,882	-307,956	-12.1 %

Source: (Raphael et al. 2016, p. 80).

The largest and most stable murrelet subpopulations now occur off the Oregon and northern California coasts, where the population trends are positive, while subpopulations in Washington declined at a rate of approximately -3.9 percent per year for the period from 2001 to 2017

(McIver et al. 2019, p. 3). Rates of nesting habitat loss have also been highest in Washington (Table MAMU1), primarily due to timber harvest on non-federal lands (Falxa and Raphael 2016, p. 37), which suggests that the loss of nesting habitat continues to be an important limiting factor for the recovery of murrelets.

Status of Critical Habitat - Murrelet

The following lands are considered essential for the recovery of the murrelet: 1) any suitable habitat in a Late-Successional Reserve (LSR); 2) large areas of suitable nesting habitat outside of LSRs on federal lands; 3) suitable habitat on State lands within 40 miles of the coast; and 4) habitat within occupied murrelet sites on private lands (USFWS 1997, pp. 131-132). For a detailed account of the status of critical habitat for the marbled murrelet, refer to Appendix E of the BA (*Status of Species and Critical Habitat: Marbeled Murrelet*).

In its September 9, 2019, request for consultation, BPA requested formal consultation on critical habitat of marbled murrelet. Upon further review of the proposed action, the Service has determined that the proposed action is not likely to adversely affect PCEs of marbled murrelet critical habitat. This determination is supported by the following:

1. Activities that remove or reduce the capability of suitable, potential, or critical murrelet habitat, including suitable habitat and potential nest structures, are not proposed under this consultation.
2. The limitation of 4 projects per year as described in BPA's effects analysis for murrelet specifically limit the scale of effects within designated critical habitat to a degree that effects to murrelet critical habitat are considered to be insignificant.
3. For each individual restoration project within the range of murrelets, BPA must ensure that site-specific actions would not remove or eliminate the availability of primary constituent elements, thus avoiding adverse effects to murrelet critical habitat.

Critical habitat of murrelets is not discussed further in this Opinion.

Environmental Baseline - Murrelet

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline 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 or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Current Condition and Critical Habitat in the Action Area - Murrelet

The proposed action area is the entire Columbia River Basin, which cover 258,000 square miles. Murrelets are found in the Lower Columbia Basin, which includes portions of murrelet Conservation Zones 2 and 3 (USFWS 1997, p. 114). Land use practices, hydropower, water quality and quantity in the Columbia Basin (pp. 116-120 of the HIP4 BA), as well as the Status of the Species (Appendix E of the HIP4 BA) provides a fairly comprehensive assessment of the environmental baseline of Marbled Murrelet and Marbled Murrelet critical habitat in the Columbia River Basin. The Lower Columbia Basin overlaps small portions of both murrelet Conservation Zones 2 and 3 (USFWS 1997, p. 114).

Conservation Zone 2 (Washington Coast Range Zone) – This zone includes marine waters within 1.2 miles of the Pacific Ocean shoreline south of the U.S.-Canadian border off Cape Flattery and extends south to the mouth of the Columbia River, and extends inland to the midpoint of the Olympic Peninsula and 55 miles inland in southwestern Washington. Most of the forested lands in the northwestern portion of Conservation Zone 2 occur on public (federal and state) lands, while most of the forested lands in the southwestern portion are privately owned. Extensive timber harvest has occurred throughout Conservation Zone 2 in the last century, but the greatest losses of suitable nesting habitat occurred in the southwest portion of Conservation Zone 2 (USFWS 1997, p. 127). Within Conservation Zone 2, higher-suitability murrelet nesting habitat occurred on 603,777 acres as of 2012. Population estimates of murrelets in Conservation Zone 2 were 1,758 in 2017. Murrelets in the Conservation Zone 2 occur at low densities in marine waters and have declined at an average rate of 2.4 percent per year for the period from 2001 to 2017 (Pearson et al. 2018, p. 9).

Murrelet nesting habitat within the Lower Columbia River basin in Zone 2 is highly fragmented by past timber harvest, and most nesting habitat that exists occurs on lands managed by the Washington Department of Natural Resources. Given the small amount of overlap between the action area and Conservation Zone 2, the Service expects no more than 2 BPA funded projects under HIP4 will occur on an annual basis within disruption distances of marbled murrelets during the marble murrelet critical breeding season.

Conservation Zone 3 (Oregon Coast Range Zone) – This zone extends from the Columbia River, south to North Bend, Coos County, Oregon. Conservation zone 3 includes waters within 2 km (1.2 miles) of the Pacific Ocean shoreline and extends inland a distance of up to 56 km (35 miles) from the Pacific Ocean shoreline. While this zone contains the majority of documented murrelet sites in Oregon (610,583 acres of higher-suitability murrelet), these sites and habitats are in coastal watersheds and outside of the action area: maintaining suitable and occupied murrelet habitat in these areas (Elliot State Forest, Tillamook State Forest, Siuslaw NF, and BLM-administered forests) is an essential component for the stabilization and recovery of murrelets (USFWS 1997). Population estimates of murrelets in Conservation Zone 3 were 6,813 in 2016. Murrelets in the Conservation Zone 3 occur at relatively high densities in marine waters and increased at an average rate of 1.1 percent per year for the period from 2001 to 2016 (Pearson et al. 2018, p. 9).

BPA's HIP4 action area overlaps with only a small portion of Conservation Zone 3 in the Lower Columbia River Basin. Given the small amount of overlap between the action area and Conservation Zone 3, the Service expects no more than 2 BPA funded projects under HIP4 will occur on an annual basis within disruption distances of marbled murrelets during the marble murrelet critical breeding season. Murrelet nesting habitat within the Lower Columbia River basin in Zone 3 is highly fragmented by past timber harvest, and most nesting habitat that exists occurs on lands managed by the state of Oregon.

Conservation Role of the Action Area - Murrelet

Murrelet nesting habitat in the Columbia River basin is located primarily on state and private lands and is considered essential for maintaining the current distribution of murrelets. The conservation role of the action area is to continue providing nesting opportunities to murrelets within the context of a highly fragmented and intensively managed landscape where other nesting opportunities may be limited. Given that range-wide productivity is extremely low and habitat loss is considered a primary mechanism for the continued decline of the species, each nest site in the action area has conservation value to the species.

Climate Change

The term "climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2014a, pp. 119-120). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2014a, p. 119). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time. The nature of the effect depends on the species, the magnitude and speed of climate change, and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2014b, pp. 64, 67-69, 94, 299).

Climate change, combined with effects from past management practices, is influencing current forest ecosystem processes and dynamics by increasing the frequency and magnitude of wildfires, insect outbreaks, drought, and disease (USFWS 2011, pp. III-5 to III-11). In the Pacific Northwest, mean annual temperatures rose 0.8° C (1.5° F) in the 20th century and are expected to continue to warm from 0.1° C to 0.6° C (0.2° F to 1° F) per decade (Mote and Salathé 2010, p. 29). Climate change models generally predict warmer, wetter winters and hotter, drier summers and increased frequency of extreme weather events in the Pacific Northwest (Salathé et al. 2010, pp. 72-73).

Predicted climate changes in the Pacific Northwest have implications for forest disturbances that affect the quality and distribution of marbled murrelet habitat. Both the frequency and intensity of wildfires and insect outbreaks are expected to increase over the next century in the Pacific Northwest (Littell et al. 2010, p. 130). One of the largest projected effects on Pacific Northwest forests is likely to come from an increase in fire frequency, duration, and severity. Modeling

specific for Pacific Northwest forests predicts an increase of fire season environments that are conducive to large forest wildfires (Davis et al. 2017, P. 184). Westerling et al. (2006, pp. 940-941) analyzed wildfires and found that since the mid-1980s, wildfire frequency in western forests has nearly quadrupled compared to the average of the period from 1970-1986. The total area burned is more than 6.5 times the previous level and the average length of the fire season during 1987-2003 was 78 days longer compared to 1978-1986 (Westerling et al. 2006, p. 941). The area burned annually by wildfires in the Pacific Northwest is expected to double or triple by the 2080s (Littell et al. 2010, p. 140).

During the next 20 to 40 years, the climate of the Pacific Northwest is projected to change significantly with associated changes to forested ecosystems. Predicted changes include warmer, drier summers and warmer, wetter autumns and winters, resulting in a diminished snowpack, earlier snowmelt, and an increase in extreme heat waves and precipitation events (Salathé et al. 2010, pp. 72-73). Initially, the Pacific Northwest is likely to see increased forest growth region-wide over the next few decades due to increased winter precipitation and longer growing seasons; however, forest growth is expected to decrease as temperatures increase and trees can no longer benefit from the increased winter precipitation and longer growing seasons (Littell et al. 2009, p. 15). Additionally, the changing climate will likely alter the species composition of forest ecosystems. While climate change has the potential to impact marbled murrelets and their habitats across their range, the proposed action is not of sufficient magnitude to alter current trends of climate change. While restoration projects implemented under the HIP4 action could potentially disturb individual nest sites of marbled murrelets (up to 4 sites per year in Oregon and Washington), the proposed aquatic restoration actions will improve conditions for listed fishes and riverine function that may increase the resiliency of aquatic habitats to climate change at the local scale.

Additional information on potential climate change impacts for the Columbia River Basin is provided on pp. 3-196 to 3-198 in the HIP4 BA.

Effects of the Action- Murrelet

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

BPA provided an effects analysis for marbled murrelet in the HIP4 BA (pp. 3-173 to 3-185). The following information provides a summary of that information. The HIP4 proposes several categories of restoration actions to improve aquatic habitats for listed fishes; some of these projects may occur in occupied murrelet habitats.

The USFWS analyzed whether effects related to habitat changes (i.e., habitat effects) and effects related to increased noise (i.e., disturbance/disruption effects) are likely to cause murrelet injury or mortality. The primary focus is disturbance effects, since this consultation does not cover

projects that may adversely affect murrelets via habitat changes, or that adversely affect their critical habitat. BPA anticipates implementing no more than 4 projects per year within the disruption distances of murrelets during the breeding season; thus, up to 20 projects that could adversely affect murrelets could occur during any five-year period. For more information on the effects to marbled murrelet and, see pp. 3-173 to 3-185 of the BA under the section entitled "Effects to Marbled Murrelets."

Habitat Effects

In the HIP4 BA (p. 3-173 of the BA), BPA described below how habitat modifications may negatively impact murrelets and why actions covered under this consultation are not likely to adversely affect murrelets through habitat changes. Specifically, activities that remove or reduce the capability of suitable, potential, or critical murrelet habitat, or the primary constituent elements of murrelet critical habitats, will not be covered under this consultation. This includes suitable habitat and potential nest structures, which are defined in Appendix E of the BA. Therefore, we do not anticipate that the programmatic activities covered by this consultation will result in habitat effects that would result in injury, death, or displacement of murrelets from nesting areas. The conservation measures included in the proposed action limit the scale of effects within designated critical habitat to a degree that effects to murrelet critical habitat are considered to be insignificant.

Disturbance/Disruption Effects

Implementation of in-water habitat improvement projects is typically constrained to summer low-flow periods that directly overlap with the murrelet nesting season. BPA proposes to implement up to two restoration projects per year in Oregon and Washington (four projects total) that "*may affect, and are likely to adversely affect"* nesting murrelets from disturbance and disruption effects. In the HIP4 BA (pp. 3-173 to 3-175), BPA included discussion on the potential effects of disturbance and disruption to murrelets. A summary of these effects are provided below.

Normal murrelet nesting behaviors are likely to be disrupted by loud noises that occur in close proximity to an active nest or when the activity occurs within the line-of-sight of a nesting murrelet. Potential murrelet responses to disturbance include delay or avoidance of nest establishment, flushing of an adult from a nest or branch within nesting habitat, aborted or delayed feeding of juveniles, or increased vigilance/alert behaviors of adults and chicks at nest sites with implications for reduced individual fitness and reduced nesting success. These behavioral disruptions create a likelihood of injury by increasing the risk of predation, reducing the fitness of nestlings as a result of missed feedings, and/or increasing energetic costs to nestlings and adults. We do not expect that noise and visual disturbance will always result in direct nest failure, but such disturbance creates a likelihood of injury due to an increased risk of predation or reduced fitness of both adults and young. While most projects will avoid disturbing murrelets, we assume for the purposes of this effects analysis that up to four projects per year (2 in Oregon; 2 in Washington) may be implemented near nesting murrelets during the murrelet breeding period (p. 3-178 of HIP4 BA).

Since murrelets can be very difficult to locate, the Service has developed a method to analyze expected adverse effects in unsurveyed, suitable habitat. BPA included a description of the Service's methodology in the HIP4 BA, pp. 3-175 to 3-177. This methodology requires some site-specific or estimated knowledge of the likelihood of encountering a nest (i.e., density or home range size) within the project area. The size and shape of action areas is not specified for all actions, and it is possible for some projects to overlap into more than one potential active nest location. Consequently, we quantified the amount of action area (including disturbance buffers) where we might reasonably expect to locate one murrelet nest in unsurveyed, suitable habitat.

Our methodology is to be used as a guide, to help determine a project size where we anticipate finding one nest in continuous suitable murrelet habitat. This does not replace site-specific analysis, but is a tool to determine the probable extent of effects. A wildlife biologist during project design will determine whether there is suitable murrelet habitat or potential nest trees within the project area, which is part of the nest analysis required for pre-project planning (p. 2-101 of the HIP4 BA). This type of information would be provided by BPA to the Service via a Project Notification/Completion form. The USFWS assumes that project areas containing suitable habitat are likely to have a nesting murrelet, until an effects analysis from BPA or their project proponents (based on nest analysis and/or protocol survey) determine otherwise.

Methodology to predict effects in unsurveyed and occupied, suitable habitat
In cases of uncertainty such as unsurveyed habitat, it is USFWS policy to give the benefit of the doubt to the listed species. On that basis, the USFWS considers stands where past murrelet surveys have documented murrelet occupancy behaviors and/or unsurveyed stands with murrelet nesting structure to be occupied. BPA included a description of the Service's methodology in the HIP4 BA, pp. 3-175 to 3-177, which are hereby incorporated by reference.

Based on that analysis, the USFWS estimates that a minimum of one murrelet pair is nesting at each site/stand smaller than or equal to 150 acres of habitat in Oregon, or 414 acres in Washington (Table MAMU2). Individual projects will vary in size and the total area exposed to disruption effects will be depend on the types of activities included. The BPA will evaluate each project area for murrelet nesting habitat and calculate the total habitat exposed to disturbance and disruption effects.

Given BPA anticipates no more than 4 LAA projects per year, we anticipate that in total, BPA could fund and implement up to 20 restoration projects within the disruption distances of murrelets during the breeding season during any five-year period. The maximum area of nesting habitat exposed to adverse disturbance effects would be 300 acres in Oregon, and 828 acres in Washington, annually. We anticipate that on average, no more than 4 active murrelet nests per year would be exposed to adverse disturbance and disruption effects as result of project implementation.

Table MAMU2. Average state-wide murrelet density in nesting habitat and acreage of action areas where activities are likely to encounter active murrelet nests in unsurveyed, suitable murrelet habitat.

Estimated number of active murrelet nests	**Oregon** 150 acres of habitat/pair	**Washington** 414 acres of habitat/pair
	Acres of nesting habitat exposed to disturbance effects	Acres of nesting habitat exposed to disturbance effects
1	0.01 - 150	0.01 - 414
2	151 - 300	415 - 828

Description of anticipated effects
The remainder of our effects analysis relates to disturbance/disruption effects that may occur to the murrelets in Conservation Zones 2 and 3 on an annual basis. In the HIP4 BA (pp. 3-177 to 3-185), BPA included discussion on the anticipated effects from the proposed action to murrelets. A summary of these effects are provided below.

Noise and human intrusion are one of many threats to this species (McShane et al. 2004). Effects to murrelets from noise and human intrusion are not well known, but effects (e.g., energetic expenditure, stress levels, and susceptibility to predation) have been documented in other species (Knight and Gutzwiller 1995). While studies have not directly linked murrelet nest failure, abandonment, or chick mortality to disturbance, they have documented flushes from the nest and missed or delayed feedings at the nest (Singer et al. 1995, Hamer and Nelson 1998, Golightly et al. 2002). Murrelet breeding biology may preclude easy detection of sub-lethal disturbance effects (i.e., flushes from the nest and missed feedings) at the population level. Therefore, potential effects of disturbance on murrelet fitness and reproductive success should not be completely discounted (McShane et al. 2004).

An effect to murrelet behavior may occur when proposed activities occur within the disturbance/disruption distance of active murrelet nests. The disturbance and disruption distances were developed utilizing the best available scientific information (Table MAMU3). Loud noises at distances greater than identified in Table MAMU3 are expected to either have no or negligible effects on murrelet behavior. In Washington the Service considers the murrelet nesting season to span from April 1 – September 23, while in Oregon the Service considers the murrelet nesting season to span from April 1 – September 15. The differences in applied nesting seasons are due to internal evaluations of murrelet biology and nesting season data, which are on-going. Potential effects to marbled murrelets are summarized in Table MAMU4 for Washington, and in Table MAMU5 for Oregon. Additional information was provided in BPA's HIP4 BA (pp. 3-177 to 3-184).

Disturbance from proposed actions that are conducted: 1) outside of the breeding period (between September 24 and March 31 for Washington and between September 16 and March 31 for Oregon); 2) greater than 0.25 mile from occupied or unsurveyed suitable habitat during the breeding season; or 3) within 0.25 mile of surveyed unoccupied habitat during any time of the year, *is not expected to affect* murrelets because these activities are not likely to result in any exposure to nesting murrelets. Murrelets that are not nesting are expected to be able to move

away from disturbance with no increased risk of death or injury. Additionally, in these situations corvid attraction will not cause an increased risk of predation because we believe corvid predation is only likely to affect murrelet chicks and eggs, not adults.

Within the murrelet nesting period in Oregon, the USFWS considers two distinct periods: the critical nesting season between April 1 – August 5, and the late nesting season between August 6 and September 15. In Washington, the USFWS does not incorporate a late nesting period into its management evaluations. During the late nesting season in Oregon, activities other than helicopters are *not likely to adversely affect* murrelets provided that they don't begin until two hours after sunrise and cease prior to two hours before sunset.

In the late breeding period, we believe there is a low likelihood that disturbance will cause injury declines because most murrelets are finished incubating and either have completed nesting (about half of the chicks have fledged) (Hamer et al. 2003) or adult murrelets are still tending the nest. Adults still tending their young in the late breeding period may be heavily invested in chick-rearing making it less likely that adults will abandon their young due to noise from the proposed activities. In addition, between Aug. 6 - Sept. 23, the proposed action limits disturbance activities for the two hours after sunrise and two hours before sunset, when most food deliveries to young are made. This restriction thus reduces the likelihood of nest abandonment or reduced chick provisioning, therefore the likelihood of injury by annoying it to such an extent as to significantly disrupt normal behavior patterns, which includes but are not limited to, breeding, feeding or sheltering, has been minimized. However, some data indicate that murrelets are making more food deliveries during the day than previously assumed and that predation pressures on eggs and chicks exist throughout the entire breeding period. Two-hour daily timing restrictions are still recommended minimization measures.

As the breeding season progresses there are fewer nesting murrelets as nests either fledge or fail. Therefore, projects that start during the end of the nesting season reach a point where the likelihood of a nearby nest site still being active is discountable. In Washington, after September 4th over 95 percent of all nests are estimated to have fledged (USFWS 2012b, p. 2). Therefore, in Washington, disturbance-only projects conducted from September 5 – September 23 are considered not likely to adversely affect murrelets, as the likelihood of exposure to a nest site that is still active is very low. Additionally, the conservation measures that limit project activities to the period starting 2 hours after sunrise and ending 2 hours before sunset ensures that most chick provisioning will occur uninterrupted by noise or visual disturbance. Therefore, the effects of disturbance to murrelets after Sept. 4 in Washington are considered to be insignificant.

In summary, the potential for large-scale disturbance is greatly reduced by the proposed action and proposed species-specific conservation measures. The BPA and their project proponents will use the appropriate disturbance and disruption guidelines to determine whether projects are likely to adversely affect murrelets. Many activities will result in NE determinations for disturbance since most actions will be implemented outside of nesting period windows and/or outside of disturbance distances from murrelet nests and unsurveyed suitable habitat. Additional activities will result in NLAA determinations for disturbance since BPA and their project proponents will implement some actions in the late nesting period with daily timing restrictions

Table MAMU3. Disturbance and disruption distance thresholds for marbled murrelet during the nesting season (April 1 - Sept 15 for OR; and April 1 - Sept 23 for WA). Distances are to a known occupied murrelet nest tree or suitable nest trees in unsurveyed habitat.

Action	Action Not Likely Detected Above Ambient Levels	Disturbance Distances	Disruption Distances	Increased Risk of Physical Injury and/or Mortality
Light maintenance (e.g., road brushing and grading), and heavily-used roads	> 0.25 mile	≤ 0.25 mile	NA[1]	NA
Log hauling on heavily-used roads (FS maintenance levels 3, 4, 5)	>0.25 mile	≤ 0.25 mile	NA[1]	NA
Chainsaws (includes felling hazard/danger trees)	>0.25 mile	111 yards to 0.25 mile	≤ 110 yards[2]	Potential for mortality if trees felled contain platforms
Heavy equipment for road construction, road repairs, bridge construction, culvert replacements, piling removal, etc.	>0.25 mile	111 yards to 0.25 mile	≤ 110 yards[2]	NA
Helicopter: Chinook 47d	>0.5 mile	266 yards to 0.5 mile	≤ 265 yards[5]	100 yards[6] (injury/mortality)
Helicopter: Boeing Vertol 107, Sikorsky S-64 (SkyCrane)	>0.25 mile	151 yards to 0.25 mile	≤ 150 yards[7]	50 yards[6] (injury/mortality)
Helicopters: K-MAX, Bell 206 L4, Hughes 500	>0.25 mile	111 yards to 0.25 mile	≤ 110 yards[8]	50 yards[6] (injury/mortality)

1. NA = not applicable. We anticipate that marbled murrelets that select nest sites in close proximity to heavily used roads are either undisturbed by or habituate to the sounds and activities associated with these roads (Hamer and Nelson 1998, p. 21).
2. Based on recommendations from murrelet researchers that advised buffers of greater than 100 meters to reduce potential noise and visual disturbance to murrelets (Hamer and Nelson 1998, p. 13, USFWS 2012a, pp. 6-9).
3. Based on an estimated 92 dBA sound-contour (approximately 265 yards) for the Chinook 47d (Newman et al. 1984, Table D.1).
4. Because murrelet chicks are present at the nest until they fledge, they are vulnerable to direct injury or mortality from flying debris caused by intense rotor wash directly under a hovering helicopter. Hovering distance is based on a 300-ft radius rotor-wash zone for large helicopters hovering at < 500 above ground level (from WCB 2005, p. 2 – logging safety guidelines). We reduced the hovering helicopter rotor-wash zone to a 50-yard radius for all other helicopters based on the smaller rotor-span for all other ships.
5. Based on an estimated 92 dBA sound contour from sound data for the Boeing Vertol 107 the presented in the San Dimas Helicopter Logging Noise Report (USFS 2008, chapters 5, 6).
6. The estimated 92 dBA sound contours for these helicopters is less than 110 yards (e.g., K-MAX (100 feet) (USFS 2008, chapters 5, 6), and Bell 206 (85-89 dbA at 100 m)(Grubb et al. 2010, p. 1277).

Table MAMU4. Summary of disturbance effects from the proposed action when active marbled murrelet nests are within the disruption distances of actions within Washington State.

Disturbance Type	Time Period[1]	Effects	Rationale for Effect Determination
Noise other than helicopters (*i.e., all actions except surveys*)	Apr 1 - Sept 4	LAA	Effects vary and may cause from little to significant disruption depending on site- and activity-specific factors and the individual murrelet's noise tolerance. Worst-case scenario, adults move from noise, causing increased predation to young, missed feedings, or premature fledging. Based on anecdotal observations and limited studies, murrelets appear generally undisturbed by sharp or prolonged loud noise, and nesting attempts are not easily disrupted by human disturbance except when confronted very near the nest itself (Long and Ralph 1998, USFWS 2003). Most actions will not occur within 100 yards of active nests or likely occupied, unsurveyed habitat from Apr. 1-Sept. 4. For those that do, likelihood of injury to young will mostly occur through the potential for missed feedings and increased risk of predation of abandoned young. However, predation likelihood is reduced by PDCs that are part of the proposed action (e.g., removal of project generated garbage to prevent attraction of corvids). Since this likelihood cannot be eliminated this type of disturbance is considered likely to adversely affect murrelets. Actions will not occur during crepuscular time periods, thereby significantly reducing the probability of missed feeding attempts.
	September 5 – Sept 23	NLAA	This is the tail end of the nesting season when approximately 95 percent of all nests are estimated to have fledged. Therefore in WA, projects resulting in noise disturbance-only (no habitat removal) that are conducted September 5 – September 23 are not likely to adversely affect murrelets as the likelihood of exposure to a nest site that is still active is very low. Application of daily dawn/dusk restrictions ensure most chick provisioning will occur uninterrupted by disturbance, therefore, the effects are considered to be insignificant.
	Sept 24-March 31	NE	This time period is outside of the murrelet breeding season.

Disturbance Type	Time Period[1]	Effects	Rationale for Effect Determination
Noise and rotor wash associated with helicopters (*i.e., some culvert/bridge, nutrient enhancement, LW placement actions*).	Apr 1 - Sept 4	LAA	Noise effects vary and may cause little to significant disruption depending on site- and activity-specific factors and an individual's noise tolerance. Worst-case scenario, adults move from noise, causing increased predation to young, missed feedings, or premature fledging. Young, which are not capable of moving away from noise, may have injury from flying debris caused by rotor wash. Most activities do not use helicopters, and most helicopter use will not occur within 0.25 miles of active nests or likely occupied, unsurveyed habitat from Apr 1-Sept 4. Helicopters will generally hover no closer than 300 feet from the ground and ferry logs at 500 feet altitude for safety purposes. Activities will not occur during crepuscular time periods, thereby significantly reducing the probability of aborted feeding attempts. Helicopter passes over nests are less likely to cause injury than hovering in close proximity to nests. There is some indication that murrelets do not respond to airplanes and helicopters flying overhead unless they pass over at low altitude (Long and Ralph 1998). Prior murrelet studies involved circling/hovering over 125 nests for 3-min intervals within 100-300 m (328-984 feet), which did not flush any of the incubating adults (USFWS 2003).
	September 5 – Sept 23	NLAA	This is the tail end of the nesting season when approximately 95 percent of all nests are estimated to have fledged. Therefore in WA, projects conducted September 5 – September 23 are not likely to adversely affect murrelets as the likelihood of exposure to a nest site that is still active is considered very low. Application of daily dawn/dusk restrictions ensure most chick provisioning will occur uninterrupted by disturbance, therefore, the effects are considered to be insignificant.
	Sept 24-March 31	NE	This time period is outside of the murrelet breeding season.
On-the-ground human presence (*i.e., all actions*)	Apr 1 - Sept 4	LAA	Murrelets are susceptible to an increase in predation levels within an action area when groups of humans attract corvids.
	September 5 – Sept 23	NLAA	This is the tail end of the nesting season when approximately 95 percent of all nests are estimated to have fledged. Therefore in WA, disturbance-only projects conducted September 5 – September 23 are not likely to adversely affect murrelets as the likelihood of exposure to a nest site that is still active is considered very low. Application of daily dawn/dusk restrictions ensure most chick provisioning will occur uninterrupted by disturbance, therefore, the effects are considered to be insignificant.

Disturbance Type	Time Period[1]	Effects	Rationale for Effect Determination
	Sept 24-March 31	NLAA	This time period is outside of the murrelet breeding season.
[1] - All activities in the breeding season affecting murrelet habitat will have daily 2-hour dawn/dusk timing restrictions applied.			

Table MAMU5. Summary of disturbance effects from the proposed action when active marbled murrelet nests are within the disruption distances of actions with the state of Oregon.

Disturbance Type	Time Period	Effects	Rationale for Effect Determination
Noise other than helicopters (*i.e., all actions except surveys*)	Apr 1 - Aug 5	LAA	Effects vary and may cause little to significant disruption depending on site- and activity-specific factors and the individual's noise tolerance. Worst-case scenario, adults move from noise, causing increased predation to young, missed feedings, or premature fledging. Most actions will not occur within 100 yards of active nests or likely occupied, unsurveyed habitat from Apr 1-Aug 5. For those that do, likelihood of injury to young will mostly occur through the potential increase of predation of abandoned young. However, predation likelihood is reduced by PDCs that are part of the proposed action (e.g., removal of project generated garbage to prevent attraction of corvids). Actions will seldom occur during crepuscular time periods, thereby significantly reducing the probability of missed feeding attempts. Based on anecdotal observations and limited studies, murrelets appear generally undisturbed by sharp or prolonged loud noise, and nesting attempts are not easily disrupted by human disturbance except when confronted very near the nest itself (Long and Ralph 1998, USFWS 2003).
	Aug 6 – Sept 15	NLAA[1]	In this period nests have been established, most of incubation is complete and many young have fledged. Project design criteria in the proposed action require daily 2-hour dawn/dusk timing restrictions, which will allow feedings of murrelet young to occur during crepuscular periods.
	Sept 16-March 31	NE	Based on nest fledging data this time period is past when most murrelets fledge.

Disturbance Type	Time Period	Effects	Rationale for Effect Determination
Noise and rotor wash associated with helicopters (*i.e., some culvert/bridge, nutrient enhancement, LW placement actions*).	Apr 1 – Aug 5	LAA	Noise effects vary and may cause little to significant disruption depending on site- and activity-specific factors and an individual's noise tolerance. Worst-case scenario, adults move from noise, causing increased predation to young, missed feedings, or premature fledging. Young, which are not capable of moving away from noise, may have injury form excessive noise levels and/or flying debris from rotor wash. Most activities do not use helicopters, and most helicopter use will not occur within 0.25 miles of active nests or likely occupied, unsurveyed habitat from Apr 1-Sept 15. Helicopters will generally hover no closer than 300 feet from the ground and ferries logs at 500 feet for safety purposes. Also, helicopters will not hover within 500 feet of active nests. Activities will seldom occur during crepuscular time periods, thereby significantly reducing the probability of delayed feeding attempts. Helicopters passes over nests are less likely to cause injury than hovering in close proximity to nests. There is some indication that murrelets do not respond to airplanes and helicopters flying overhead unless they pass over at low altitude (Long and Ralph 1998). Prior murrelet studies involved circling/hovering over 125 nests for 3-min intervals within 100-300 m (328-984 feet), which did not flush any of the incubating adults (USFWS 2003).
	Aug 6 – Sept 15	LAA	For young that have not fledged, the action could cause a chick to fall off a nest branch, prematurely fledge or may cause the chick injury form excessive noise levels or from being hit by flying debris.
	Sept 16-March 31	NE	Based on nest fledging data this time period is past when most murrelets fledge.
On-ground human presence (*i.e., all actions*)	Apr 1– Aug5	LAA	Murrelets are susceptible to an increase in predation levels within an action area when groups of humans attract corvids.
	Aug 6-Sept 15	NLAA[1]	In this period nests have been established, most incubation is complete and many young have fledged. Project design criteria in the proposed action require daily 2-hour dawn/dusk timing restrictions, which will allow feedings of murrelet young to occur during crepuscular periods.
	Sept 16-March 31	NE	Based on nest fledging data this time period is past when most murrelets fledge

NLAA[1] - The activity is NLAA because daily 2-hour dawn/dusk timing restrictions will be applied.

and outside of the disruption distance from murrelet nests and unsurveyed suitable habitat. The conservation measures for marbled murrelets proposed by BPA will ensure that most projects will not rise to the level of an LAA determination.

Based on the assumption provided in the effects analysis, no more than 4 projects per year are anticipated to adversely affect murrelets during nesting periods. For those few projects, the anticipated disruption of normal nesting behaviors will result in an increased likelihood of injury to murrelets nesting within those affected acres but it is not reasonably certain to result in direct nest failures. The anticipated increased likelihood of injury is not anticipated to appreciably reduce murrelet numbers or reproduction at the scale of the action area or any larger scale because 1) most nests exposed to disturbance are not expected to fail given the variability of responses to noise, smoke, rotor wash and visual disturbance; and 2) no direct mortality of adult murrelets is anticipated, so there would be no reduction in the current population of breeding adults, and no loss or degradation of murrelet nesting habitat.

If we assume (worst-case scenario), that the noise and visual disturbance from the proposed activities results in nest failure for up to 4 nests per year, the scale of the effect on murrelet numbers and reproduction would be so small as to be immeasurable against the baseline of murrelet population trends. Although adult murrelets have high annual survival rates, murrelets suffer high rates of nest failure due to various causes, including nest predation, nest abandonment, malnourishment, and accidental death (chicks falling from a nest) even in pristine habitats located far from human disturbance (Nelson 1997, p. 20, Lorenz et al. 2019, p. 162).

The murrelet population for Conservation Zones 2 and 3 is estimated at over 10,000 murrelets, representing nearly half of the total estimated population within the listed range of the species (McIver et al. 2019, pp. 8-17). A potential loss of reproduction of up to 4 nesting pairs per year is not anticipated to appreciably reduce the likelihood of survival and recovery for murrelets at the scale of the Conservation Zones or range-wide. The total number of adult murrelets that attempt to nest in any given year is variable, and the overall nest success rates are variable and generally very low. Considering the limited areas likely to be exposed to disturbance effects, the incremental loss of reproduction anticipated is not expected to appreciably increase the present rate of estimated population decline in Conservation Zone 2, or alter the estimated positive population trend observed in Conservation Zone 3.

The effects of the proposed action will not appreciably reduce the likelihood of persistence through a reduction in murrelet numbers, reproduction, or distribution at the scale of the action area or any larger scale because: 1) the total area exposed to disturbance effects is limited and corresponds to very low numbers of murrelets that are likely to be exposed to disturbance effects relative to the available nesting habitat in the action area; and, 2) no direct mortality of adult murrelets is anticipated, so there would be no reduction in the current population of breeding adults.

Cumulative Effects- Murrelet

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). Future federal actions that are unrelated to the proposed action are not considered in this section because they will require separate consultation pursuant to section 7 of the Act.

Washington

The project action area contains both State and private lands. Non-federal lands in the area are managed primarily for timber production, but almost all forest that was potential murrelet nesting habitat on these lands has been previously harvested. Private timber harvest in the area must comply with the Washington Forest Practices Act (RCW 76.09) as well as the Washington Administrative Code with respect to the Washington Forest Practices Rules (WAC 222).

The Service completed a formal consultation on the Washington State Forest Practices Rules in 2006 and anticipated that essentially all potential murrelet habitat located on private lands that is not associated with occupied sites or other protected areas will eventually be lost due to timber harvest (USFWS 2006, p. 477). Although the Service determined that ongoing forest practices on privates lands "may affect, and are likely to adversely affect" murrelets, we concluded that these effects are not likely to jeopardize the continued existence of murrelets (USFWS 2006, p. 482). This conclusion was based on the protection of the occupied murrelet sites provided by the Forest Practices Rules, which is consistent with the murrelet recovery plan, which calls for the protection of occupied habitat on private lands (USFWS 1997, p. 133).

State lands in the action area are managed under the Washington Department of Natural Resources Habitat Conservation Plan (HCP), which includes provisions for the protection of marbled murrelet occupied sites and murrelet nesting habitat within designated marbled murrelet Special Habitat Areas (WDNR 2019). The murrelet provisions of the HCP are expected to mitigate for the effects of ongoing habitat loss and degradation associated with forest management activities on State lands in Washington, and contribute to the recovery of murrelets in Washington through the protection of existing habitat, and increased recruitment of habitat in strategic locations for murrelet conservation.

Oregon

Cumulative effects from non-federal timber harvest can substantially affect murrelets by eliminating breeding sites, increasing forest fragmentation, creating edge effects to breeding sites, and creating gaps in distribution where federal lands are lacking. To date, the Oregon Forest Practice Rules have not adopted regulations that specifically provide protection to murrelets. The level of this impact is difficult to estimate because Oregon Department of Forestry only tracks total acres permitted each year for harvest, and does not distinguish when the same permit area is repeated in subsequent years or whether the permit area actually is treated. Additionally, the impact to murrelet habitat is not tracked. It is likely that annual harvest will continue into the foreseeable future as long as harvestable timber remains. Occupied murrelet habitat located on State lands is not likely to be harvested, as the State is surveying that habitat and protecting all occupied habitat.

We have no additional knowledge or expectation of a change in future State, Tribal, local or private actions that are reasonably certain to occur. Cumulative effects to murrelets are an ongoing concern and will likely continue in the future within the action area and the State of Oregon. Habitat conditions on non-federal lands are expected to decline within the foreseeable future.

Summary of Cumulative Effects

In summary, the cumulative loss of potential nesting habitat ultimately curtails the opportunities for improving habitat distribution and supporting the long-term recovery of murrelets on state and private lands. Without a federal nexus, there is little opportunity for the Service to intervene in the management of murrelet habitat on state and private lands. At the range-wide scale, federal lands managed under the Northwest Forest Plan are expected to provide for the majority of habitat to support the long-term recovery potential for marbled murrelets.

Summary and Synthesis- Murrelet

The proposed action, HIP4, is a restoration program to improve fish and wildlife habitats in the Columbia River Basin. Generally, HIP4 will result in long-term benefits to listed species and their habitats, but short-term impacts from construction activities will also occur, specifically, construction impacts may disturb or disrupt murrelets.

It is likely that the rate of development and timber harvest from private and state actions will continue to degrade habitats and cause negative effects to murrelets. Climate change may further exacerbate negative impacts to forest ecosystems. Restoration actions other than the proposed HIP4 action are also expected continue into the future throughout the Columbia River Basin.

The negative impacts from the proposed HIP4 are anticipated to be limited to individual murrelets, and relatively short-term in nature, and not rise to the level of local population effects. The potential impacts to individual and habitats are minimized by the implementation of the proposed conservation measures that are included in the proposed action. No restoration project is anticipated to occur at such a large scale that it will have effects beyond local nest sites, or at larger population scales.

Conclusion- Murrelet

After reviewing the status of the marbled murrelet, the environmental baseline for the action area, and the effects of the proposed action, including all measures proposed to avoid and minimize adverse effects, and the cumulative effects, it is the Service's Biological Opinion that the proposed HIP4 is not likely to jeopardize the continued existence of the marbled murrelet. This "no jeopardy" finding for the marbled murrelet is supported by the following:

1. The proposed action does not include the removal of suitable or critical murrelet habitats, and thus adverse effects to murrelets via habitat changes will not occur.
2. The conservation measures proposed by BPA will ensure that the effects from most projects within the range of murrelets will be minimized and not result in negative effects

to murrelets.

3. Most restoration projects within the range of murrelets will be implemented outside of nesting period windows and/or outside of disturbance distances from murrelet nests and unsurveyed suitable habitat.
4. Effects to the murrelet from the proposed action will be through exposure to noise and visual disturbance associated with restoration actions, and those projects are limited to no more than 4 projects per year within the disruption distances of murrelets during the breeding season. This disruption will result in an increased likelihood of injury to murrelets nesting within the affected acres, but it is not reasonably certain to result in direct nest failures.

Therefore, the Service believes the proposed project will not result in jeopardy for the marbled murrelet at the scale of the Conservation Zones or range-wide.

[End of Section]

STREAKED HORNED LARK

The HIP4 BA was developed jointly by the Service and BPA. Thus, the Service will reference and summarize information presented in the HIP4 BA instead of repeating the same information in this Opinion. All HIP4 BA pages referenced throughout the following sections on streaked horned lark are hereby incorporated by reference.

Status of the Species- Streaked Horned Lark

The streaked horned lark was listed as a threatened species on October 3, 2013 (78 FR 61452), under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). The range-wide population of streaked horned larks is probably around 2,000 individuals; local populations are found at scattered sites in the south Puget Lowlands, the Washington coast, the lower Columbia River, the northern Oregon coast and the Willamette Valley. A special rule promulgated under section 4(d) of the Act was published as part of the listing determination; the special rule exempts certain activities associated with hazardous wildlife management at non-federal airports, agricultural activities in the Willamette Valley, and control of noxious weeds on non-federal lands.

Critical habitat was designated for the streaked horned lark on October 3, 2013 (78 FR 61506), under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). Critical habitat units were designated at four sites on the outer coast of Washington, nine islands in the lower Columbia River, and on three units of the Service's Willamette Valley National Wildlife Refuge Complex.

For a detailed account of the status of the streaked horned lark, refer to Appendix F of the HIP4 BA (*Status of the Species and Critical Habitat: Streaked Horned Lark*). A summary of that information is provided below.

Environmental Baseline - Streaked Horned Lark

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline 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 or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Current Condition of the Species and Critical Habitat in the Action Area

The action area for this consultation includes the lower Columbia River and the Willamette Valley. In the lower Columbia River, streaked horned larks are found mainly on dredge material deposition sites; most of these sites are on islands, though some are on the shores on the Oregon

or Washington sides of the river (Slater and Treadwell 2018, p. 14). The most recent population estimate for larks in the lower Columbia River is 59 breeding pairs (Slater and Treadwell 2018, p. 27).

Much of the potential habitat for larks in the Willamette Valley is on private agricultural land, which has not been surveyed for streaked horned larks, except along public road margins (Altman 1999, p. 2; Myers and Kreager 2010, pp. 2-3). There are numerous locations on private agricultural lands on which streaked horned larks have been observed in the Willamette Valley, particularly in the southern valley on grass seed fields. Lark habitat on agricultural lands is dynamic, and the location and quantity of habitat varies as crops mature and sites becomes less suitable for larks. This is likely a common pattern, as breeding streaked horned larks opportunistically shift sites as habitat becomes available among private agricultural lands in the Willamette Valley (Moore 2008, pp. 9-11). Agricultural lands may contain a large proportion of the regional population of streaked horned larks in Oregon, but no comprehensive survey has been conducted to date. The most recent estimate of the streaked horned lark population in the Willamette Valley region is about 900 to 1,300 breeding streaked horned larks (Altman 2011, p. 213). See pp. 3-122 to 3-124 for a complete description of status of the streaked horned lark in the action area.

Designated critical habitat for the streaked horned lark occurs within the action area on islands in the lower Columbia River and at the U.S. Fish and Wildlife Service's Willamette Valley National Wildlife Refuge Complex; however, none of the projects likely to be implemented under the HIP4 program will occur at these sites, either because the sites are active dredge material disposal sites used by the U.S. Army Corps of Engineers (in the lower Columbia River) or are on National Wildlife Refuges (in the Willamette Valley). Therefore, the projects associated with HIP4 will have no effect to designated critical habitat for the streaked horned lark. Additional information on the Environmental Baseline for streaked horned lark and its critical habitat is provided in the HIP4 BA (pp. 3-122 to 3-125).

Conservation Role of the Action Area - Streaked Horned Lark

The lower Columbia River and the Willamette Valley form a substantial portion of the range of the streaked horned lark. Activities that affect lark populations in these areas may change the trend of the species. The single largest need for the recovery of the lark is acquisition and management of suitable habitat in the Willamette Valley. The proposed project, which includes possible future acquisitions of conservation lands in the Willamette Valley, could make meaningful contributions to the recovery of the streaked horned lark.

Climate Change - Streaked Horned Lark

The effects of climate change have already been observed in the Pacific Northwest. Temperatures have risen 1.5°F to 2°F over the past century, and the past three decades have been warmer than any other historical period (Frankson et al. 2017a, p.1; Frankson et al. 2017b, p. 1). Climate change is widely expected to threaten wildlife and their habitats in the Pacific Northwest by increasing summer temperatures, reducing soil moisture, increasing wildfires, reducing mountain snow pack, and causing more extreme weather events (Bachelet et al. 2011, p. 414).

Projections specific to prairie ecosystems, however, suggest that these habitats and their resident wildlife will be relatively resilient to climate change impacts. The grasslands and prairies of Washington and Oregon span a wide geographic and climatic range, encompassing a rich variety of soil types, vegetation cover, elevations, and weather patterns. This heterogeneity will likely provide substantial buffering from the effects of changing weather and climate (Bachelet et al. 2011, p. 412). It is even possible that increased summer drought may affect less drought-tolerant trees and other forest species adjacent to prairies, possibly resulting in prairie expansion (Bachelet et al. 2011, p. 417). An analysis conducted for the update of the State Wildlife Conservation Strategy in Washington concluded that prairie and grassland ecosystems are well-adapted to warm and dry conditions and periodic soil drought, and projected future increases in temperature and drought for the region, "are unlikely to disadvantage (and may benefit) these systems" (Washington Department of Fish and Wildlife 2015, p. 5-31).

The effects of climate change on the streaked horned lark were evaluated in both Washington and Oregon's State Wildlife Conservation Strategies. In Washington, the streaked horned lark was ranked as a species at moderate vulnerability to the effects of climate change (Washington Department of Fish and Wildlife 2015, p. 5-10). Oregon's assessment ranked the streaked horned lark in the Willamette Valley as a species at low to lowest vulnerability (Steel et al. 2011, p. 26).

Effects of the Action- Streaked Horned Lark

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

The aspects of the action that may affect streaked horned larks are those that focus on restoration of native vegetation in upland habitats. These activities are described in the following HIP4 project elements:

- Category 3: Invasive Plant Control
    - 3a) Manage Vegetation Using Physical Control
    - 3b) Manage Vegetation Using Herbicides
    - 3e) Prescribed Burning
- Category 9: Special Actions for Terrestrial Species
    - 9e) Willamette Valley Prairie Restoration Conservation Measures

Restoration projects implemented under HIP4 will focus largely on aquatic habitats, however, some projects will be implemented at upland restoration sites under BPA's Willamette Wildlife Mitigation Project. BPA estimated the acreage of current and likely future projects that could affect streaked horned larks in a supplement to the HIP4 BA; there are currently 3,102 acres out of 8,500 acres (about 37 percent of all projects) of upland restoration sites in the Willamette Valley for which BPA requires section 7 coverage. Of those acres, 562 are identified as potential streaked horned lark habitat. BPA expects to double the amount of habitat restoration sites by

2025, so we can assume that BPA would need section 7 coverage for approximately 1,100 acres of potential lark habitat. Of the focus areas identified by BPA, larks are most likely to occur in areas near Sauvie Island, Adair Village, and Fern Ridge Reservoir.

Category 3a) Manage Vegetation Using Physical Control

Manual and mechanical removal of invasive plants may be implemented year-round using hand tools and power tools. These methods are focused on the invasive plants. Targeted removal of invasive plants will have minimal adverse effects to streaked horned larks. The adverse effects will be mainly temporary disturbance of adults and juveniles associated with crews entering the site and noise; there is a negligible chance of death of eggs or nestlings due to inadvertent crushing, and a very small chance of prolonged abandonment of nests by the parent birds. Ultimately, the effects will be beneficial, as it will result in the removal of invasive plants and improved habitat quality at the site.

Under the HIP4 program, up to 1,100 acres of potential lark habitat could be treated with manual and mechanical removal of invasive plants each year; most of the habitat treated is unlikely to have any larks present due to the degraded condition of the restoration sites. Given the lack of information regarding the actual number of streaked horned larks that may be present on the restoration sites in any year, we use a habitat surrogate (acres) for quantifying the effects of removal of invasive plants to this species. We expect temporary disturbance of all individual streaked horned larks at restoration sites, and a small number (likely fewer than 1% of all nests) abandoned at up to 1,100 acres of restoration sites each year.

Mowing. Mowing is one of the most commonly used techniques to restore prairie habitat. Sites may be mowed using tractor mowers or hand-held mowers (e.g., rotary line trimmers). Conservation measures specified in the HIP4 BA will minimize the adverse effects of mowing to streaked horned larks. These measures include mowing outside of the April 1- August 31 nesting season, or if mowing must occur during the nesting season, individual mowing treatments during the nesting season will be limited to 50% of a project site in any given treatment period. Cumulative mowing during the nesting season may equal 100% of a project site. Another key conservation measure is setting mower deck height to the highest level possible to achieve the desired biological outcomes.

The beneficial effects of mowing are substantial; without periodic mowing, prairie restoration sites would be invaded by non-native vegetation, likely changing the structure and function of the habitat. Several studies have documented the positive and negative effects of mowing in occupied streaked horned lark habitat (Pearson and Hopey 2004, pp. 23-24; Moore 2011, p. 15). Moore (2011, p. 15) notes that mowing during the breeding season is a valuable tool to maintain habitat quality, and the equipment appears to have negative effects only when tires pass directly over the nests.

The negative effects of mowing have been demonstrated to be crushing of eggs, nestlings and fledglings, and disturbance of adults and juveniles. The tires of the mowing vehicles appear to be the largest threat to streaked horned lark nests and fledglings (Moore 2011, p. 15). Mowing has resulted in direct mortality of nestlings and eggs and nest failures of streaked horned larks at

sites monitored in Washington (Pearson and Hopey 2004, pp. 23-24; Pearson and Hopey 2005, p. 19). Recent monitoring at Joint Base Lewis-McChord in Washington found that some streaked horned larks successfully fledged young from nests in mowed fields, although the risk of crushing and the subsequent exposure of nests to predators were documented hazards associated with mowing within the breeding season (Wolf and Anderson 2014, p. 46).

Under the HIP4 program, up to 1,100 acres of potential lark habitat could be mowed each year; most of the habitat treated is unlikely to have any larks present due to the degraded condition of the restoration sites. Due to lack of information regarding the actual number of streaked horned larks that may be present on the restoration sites in any year, we use a habitat surrogate (acres) for quantifying the effects of the action to this species. We expect that a small number of nests containing eggs or nestlings could be crushed (less than 20%) and all individuals (adults, juveniles, fledglings, nestlings) will be disturbed by mowing at up to 1,100 acres of restoration sites each year.

Tilling/Disking/Plowing. A tractor with a tiller/disk attachment will be used to turn up the soil to a depth of no more than 30 cm (12 inches). Tilling and disking will not be used within 10 m (30 feet) of known populations of listed plant and animal species, unless species specific measures state otherwise.

Given the restriction on distance from individuals of listed species, tilling and disking are unlikely to have more than negligible adverse effects to streaked horned larks. Tilling and disking will have clear beneficial effects, as these practices will result in the creation of bare ground, which will provide suitable habitat for larks, at least in the short-term.

Grazing as a Management Tool. The HIP4 BA states that livestock grazing will not be used at sites with known populations of streaked horned larks, unless it occurs outside of the breeding season (April 1 to August 31). Thus, grazing will be allowed from September 1 to March 31. Since this practice will not be implemented at sites with breeding streaked horned larks, there will be no effects of grazing to lark eggs or juveniles. There is a small chance that grazing animals could disturb foraging larks during the non-breeding season, but these effects would likely be small. We expect that all individuals may be subject to minor and temporary disturbance effects from livestock grazing at up to 1,100 acres of restoration sites each year.

Category 3b) Manage Vegetation Using Herbicides

The HIP4 BA includes specific conservation measures for streaked horned larks. See Table 15 (p. 2-98 of the HIP4 BA) provides the specific limitations that apply to herbicide use in occupied streaked horned lark habitat during the nesting season.

Herbicides will be used to control woody plants and invasive vegetation and are an important tool for controlling non-native vegetation. We have limited information on the effects of herbicides on streaked horned larks. Available information on herbicide effects to organisms was summarized in the BA's Appendix B (Detailed Environmental Fate and Risk Assessment for Herbicide Use). Using this information and other relevant information from our files, the proposed herbicides range from "moderately toxic" to "practically non-toxic" to avian species.

While this information is not specific to streaked horned larks, this information suggests that herbicides will have relatively small effects to larks. The lark-specific conservation measures specified in the BA will further reduce the potential for adverse effects by requiring that herbicides will only be applied outside of the breeding season at any sites at which larks are present. Restricting herbicide use to the non-breeding season will avoid the potential for sub-lethal effects to larks during the most sensitive life stages.

The effect of herbicide application outside of the breeding season would likely be limited to disturbance of larks due to the presence of humans and machinery. The use of narrow tire equipment and large booms will minimize the number of times a piece of equipment will need to cross a field, thereby reducing the chance individuals would be killed or injured by equipment strikes.

The effects of the application methods during the breeding season would be the disturbance of adult or juvenile larks and the destruction of nest, eggs or nestlings. The effect of herbicide application outside of the breeding season would likely be limited to disturbance of larks due to the presence of humans and machinery. The use of narrow tire equipment and large booms will minimize the number of times a piece of equipment will need to cross a field, thereby reducing the chance individuals would be killed or injured by equipment strikes.

Under the HIP4 program, up to 1,100 acres of potential lark habitat could be treated with herbicides each year; most of the habitat treated is unlikely to have any larks present due to the degraded condition of the restoration sites. Implementation of conservation measures specified in the BA will help ensure that herbicide applications will target the woody and invasive plants, and will have limited effects to non-target wildlife. Due to lack of information regarding the actual number of streaked horned larks that may be present on the restoration sites in any year, we use a habitat surrogate (acres) for quantifying the effects of the action to this species. We expect that all individuals will be disturbed by herbicide application at up to 1,100 acres of restoration sites each year.

Category 3e) Prescribed Burning

At restoration sites with larks, burning will be restricted to outside of the nesting season on suitable habitat (i.e., burning will be allowed from September 1 to March 31). This conservation measure will ensure that the adverse effects of burning will be limited to disturbance of adults and juveniles, with a negligible likelihood of causing death or injury to individuals. The beneficial effects of burning are well documented. Prescribed burns in grasslands reduce thatch buildup, and expose bare ground. Evidence shows that late summer burning creates habitat conditions selected by post-breeding adult and hatch-year larks (Pearson and Hopey 2005, p. 25). Burning at Joint Base Lewis-McChord has increased the amount of high quality habitat for larks and the number of lark nests in a treated area (Wolf and Anderson 2014, p. 12).

Under the HIP4 program, up to 1,100 acres of potential lark habitat could be burned each year; most of the habitat treated is unlikely to have any larks present due to the degraded condition of the restoration sites. A restriction on burning to the period outside of the lark's breeding season will ensure that the effects of burning are mainly beneficial. Due to lack of information

regarding the actual number of streaked horned larks that may be present on the restoration sites in any year, we use a habitat surrogate (acres) for quantifying the effects of the action to this species. We expect that all individuals will be disturbed by burning at up to 1,100 acres of restoration sites each year.

Surveys and Monitoring

Surveys and monitoring associated with restoration activities will require trained observers stationed in or adjacent to restoration areas. Transect counts may require surveyors to walk through suitable, occupied habitat of the streaked horned lark; observers traversing a site may cause temporary disturbance of individual adult and juvenile streaked horned larks at the site. Point counts generally are less likely to disturb larks due to the stationary nature of the observers, although some disturbance is possible. Despite the low levels of temporary disturbance, surveys and monitoring are essential to implementing restoration activities. Assessing the level of lark use of a site will ensure that site-specific information guides restoration actions and the appropriate implementation of conservation measures to protect streaked horned larks. Due to lack of information regarding the actual number of streaked horned larks that may be present on the restoration sites in any year, we use a habitat surrogate (acres) for quantifying the effects of the action to this species. We expect that all individuals may be subject to minor and temporary disturbance effects from surveys and monitoring at up to 1,100 acres of restoration sites each year.

Cumulative Effects- Streaked Horned Lark

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). Future federal actions that are unrelated to the proposed action are not considered in this section because they will require separate consultation pursuant to section 7 of the Act.

The most common activities reasonably certain to occur in the action area are agricultural activities, operation of hydropower and flood-control facilities, urban and suburban development, recreational activities, logging, road construction and maintenance, and hard rock and gravel mining; of these activities, agriculture, urban and suburban development and recreation in the Willamette Valley are the non-federal activities that are likely to affect the streaked horned lark. Between 2000 and 2010, the combined population of Oregon, Washington, and Idaho grew from 10.6 to 12.14 million, an increase of approximately 14.4%. Each of the three states is projected to grow at a similar rate for the next 5 years. We assume that future non-federal actions will continue within the action areas, increasing as population rises. When considered together, the effects of non-federal activities are likely to continue to reduce the extent of native prairie habitat, and the availability of suitable grassland habitat currently in agriculture, which will reduce the habitat available to the streaked horned lark. These effects could continue to erode the status of the streaked horned lark by reducing population abundance and productivity.

Summary and Synthesis- Streaked Horned Lark

In summary, some of the habitat restoration activities that will be implemented under the HIP4 program have the potential to adversely affect streaked horned larks, but most of the projects will have mainly or entirely beneficial effects to the species. For those projects that have adverse effects to larks on the treatment site, the conservation measures that will be implemented will limit the adverse effects to larks, and will ensure that populations are maintained. Most of the prairie restoration projects will likely be implemented in habitat that is not suitable for streaked horned larks, or is highly degraded (i.e., dense vegetation, deep thatch, etc.). Therefore, most projects that affect larks will be at sites that have few, if any, larks, and the effects will be largely beneficial through creation or restoration of suitable habitat for the species (Table SHL1).

Table SHL1. Summary of effects to streaked horned larks from proposed activities included in the HIP4 BA.

Activity	Anticipated adverse effects	Anticipated beneficial effects
Prairie Restoration and Management		
Manual and mechanical removal of vegetation	Small likelihood of death to eggs or juveniles by crushing or abandonment (<1%) if conducted before August 31, disturbance of all juveniles and adults	Creation of suitable habitat structure for nesting and foraging
Mowing	During the breeding season: death of eggs or juveniles due to crushing (<20% of nests at site), disturbance of all juveniles and adults at site. Outside of the breeding season: disturbance of all individuals at the site.	Creation of suitable habitat structure for nesting and foraging
Tilling/Disking/Plowing	None	Creation of suitable habitat structure for nesting and foraging
Livestock grazing	Minor and temporary disturbance of all individuals at the site.	Creation of suitable habitat structure for nesting and foraging
Prescribed burning	During the breeding season: none. Outside of breeding season, disturbance of all individuals (juveniles and adults)	Thatch removal and creation of bare ground, creation of suitable habitat structure for nesting and foraging
Herbicide treatments	Small likelihood of death of eggs or juveniles due to crushing by equipment if conducted during the breeding season. Outside of the breeding season: disturbance of all individuals (juveniles and adults)	Creation of suitable habitat structure for nesting and foraging
Surveys and Monitoring		
Surveys and monitoring	Small likelihood of disturbance of juveniles and adults	Improved management of the species

Conclusion- Streaked Horned Lark

After reviewing the status of the streaked horned lark, the environmental baseline for the action area, and the effects of the proposed action, including all measures proposed to avoid and minimize adverse effects, and the cumulative effects, it is the Service's Biological Opinion that

the HIP4 is not likely to jeopardize the continued existence of the streaked horned lark.

This “no jeopardy” finding for the streaked horned lark is supported by the following:

1. The proposed action may temporarily disturb up to 1,100 acres of potentially suitable habitat for the streaked horned lark each year. The restoration activities may have short-term adverse effects, but will provide restored high-quality habitat for the species.
2. Effects to the streaked horned lark from the proposed project will be mainly through temporary disturbance associated with restoration activities.
3. While all streaked horned larks on a project site may be affected due to disturbance, the actual killing of eggs, juveniles or adults is expected to be low due to the conservation measures that will be implemented.

[End of Section]

WILLAMETTE VALLEY PRAIRIE PLANT SPECIES

The HIP4 BA was developed jointly by the Service and BPA. Thus, the Service will reference and summarize information presented in the HIP4 BA instead of repeating the same information in this Opinion. All HIP4 BA pages referenced throughout the following sections on Willamette Valley prairie plant species are hereby incorporated by reference.

Status of the Species- Willamette Valley Plant Species

Within the Willamette Valley and into southwest Washington, there are five listed plant species associated with prairies (Table WV1). Prairies are open native grasslands with little tree cover or the grassland understories of savanna habitats (USFWS 2010). The native prairies of western Oregon and southwestern Washington are among the most endangered ecosystems in the United States (Noss et al. 1995). USFWS (2010) found that the major factors contributing to the decline of these species have been:

1. Alteration of natural and human-mediated disturbance processes (e.g. flooding and fires) that maintained the early seral stage of the plant communities;
2. Habitat conversion to agricultural landscapes through livestock grazing and croplands;
3. Urbanization resulting in the permanent loss of native prairies;
4. Invasion by non-native plants (Altman et al. 2001; Wilson et al. 2003).

The above factors have resulted in the loss, degradation, and fragmentation of prairie habitats, which have affected these prairie-dependent plants, and resulted in smaller population sizes, loss of genetic diversity, reduced gene flow among populations, destruction of population structure and increased susceptibility to local population extirpation caused by environmental catastrophes. For a description of the status of these plants, refer to Appendix G of the HIP4 BA (Status of the Species: Willamette Valley Plant Species) and the USFWS's Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington (USFWS 2010).

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline 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 or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Table WV1. Listed plant species addressed in the Willamette Valley.

Species	Federal Status	Federal Listing Date	Critical Habitat Designation
Bradshaw's lomatium, *Lomatium bradshawii*	Endangered	September 30, 1988; 53 FR 38448	--

Golden paintbrush, *Castilleja levisecta*	Threatened	June 11, 1997; 62 FR 31740	--
Kincaid's lupine, *Lupinus sulphureus* ssp. *Kincaidii*	Threatened	January 25, 2000; 65 FR 3875	October 31, 2006; 71 FR 63862
Nelson's checker-mallow, *Sidalcea nelsoniana*	Threatened	February 12, 1993; 58 FR 8235	--
Willamette daisy, *Erigeron decumbens* var. *decumbens*	Endangered	January 25, 2000; 65 FR 3875	October 31, 2006; 71 FR 63862

Environmental Baseline – Willamette Valley Plant Species

Current Condition in the Action Area –

Bradshaw's Lomatium. Sites of Bradshaw's lomatium, which are typically delineated by ownership or management unit, are distributed across a highly fragmented landscape (U.S. Fish & Wildlife Service, 2018, p. 26). Increased survey efforts have also led to the discovery of previously unknown wild populations of Bradshaw's lomatium. There are currently approximately 11,277,596 Bradshaw's lomatium individuals across 24 known populations, made up of 71 known sites with multiple different ownerships (U.S. Fish and Wildlife Service, 2018, p. i). The vast majority of known Bradshaw's lomatium individuals (10,790,000 plants) occur at a single site, Camas Meadows in Southwest Washington. Outside of this site, there are approximately 487,596 Bradshaw's lomatium plants at the most recent count, distributed across 70 sites in Washington and Oregon (U.S. Fish and Wildlife Service, 2018, p. 36). For further information on Bradshaw's lomatium, see Appendix G, Status of the Species for Willamette Valley Plant Species, pp. G-3 to G-8.

Golden Paintbrush. Golden paintbrush historically occurred in the grasslands and prairies of the Willamette Valley of the action area; however, the species has been extirpated from all of these sites as the habitat has been modified by agriculture (USFWS 2010). The last sighting of golden paintbrush in the wild in the Willamette Valley was during 1938 in Linn County; recent surveys have failed to re-locate wild populations of golden paintbrush in Oregon (Sheehan and Sprague 1984, Kaye 2009). The distribution of plants range-wide and the number of plants in the majority of populations has increased due to out-planting seeds and plugs, and other on-the-ground conservation efforts, including areas within the action area. As of 2018, there were 26 sites in the Willamette Valley in Oregon (USFWS 2019b, p. 11). For further information on golden paintbrush, see Appendix G, Status of the Species for Willamette Valley Plant Species, pp. 9-16.

Kincaid's Lupine. Range-wide, Kincaid's lupine is known at about 164 sites, comprising about 608 acres of total coverage (USFWS 2010). In Oregon, the ONHIC (2014) reported Kincaid's lupine over 100 sites. In Washington, a total of 5 populations across 9 sites were reported by Arnett in 2014. Between 2014 - 2016, 84 populations of Kincaid's lupine (including 5 in southwest Washington) were inventoried and the associated plant community analyzed. Kincaid's lupine population sizes ranged from 4560.8 m^2 (Powell/Kuhl, Eugene West) to 0.21 m^2 (Fender's Prairie, Corvallis West) (Ottombrino-Haworth et al 2016, p. 29). For further

information on Kincaid's lupine, see Appendix G, Status of the Species for Willamette Valley Plant Species, pp. G-16 to G-22.

Nelson's checkermallow. Nelson's checkermallow populations all occur within the action area, with the majority of populations found within the Willamette Valley. A 2016 range-wide inventory report indicated that more than 350,000 plants were extant across 71 sites (Silvernail et al. 2016, pp. 17-24). Only 14 sites of 59 sites (24 percent) met recovery plan criteria for prairie quality and species diversity. Silvernail et al. (2016, p. 32) also noted that the long term stability of these populations depended on continued site management, especially to meet recovery needs. For more information on Nelson's checkermallow, see Appendix G, pp. G-23 to G-29.

Willamette Daisy. The action area encompasses the entire range of the Willamette Daisy. In 2010, Willamette daisy was believed to be extant at 37 sites that comprise 17 populations (USFWS 2010b). A 2018 range-wide survey of Willamette daisy (Ottombrino-Haworth et al. 2019, entire) found a total of 81,303 (+/- 25,826) plants across 46 extant sites. Surveyors were unable to relocate plants at 25 sites known to previously contain Willamette daisy. Plants and populations are unevenly distributed across the range, with the majority occurring in the Salem East recovery zone (51,820 plants), and the second most in the Eugene West recovery zone (26,043 plants). Trend data is not available for most sites, and many sites are not formally protected. For additional information on Willamette daisy, see Appendix G, pp. G-29 to G-35.

Conservation Role of the Action Area - Willamette Valley Plant Species

The action area includes Southwest Washington and the Willamette Valley, which encompass the entire range of Bradshaw's lomatium, Nelson's checker-mallow and Willamette daisy, and the majority of Kincaid's lupine, which has several populations further south into Douglas County and outside of the action area. Southwest Washington and the Willamette Valley also form a fair portion of the range of Golden paintbrush, which extends north of the Columbia River Basin into Puget Sound area of Washington, where most golden paintbrush populations exist. Activities that affect prairie habitats in the action area may change the trend of the species. Protection and maintenance of prairie habitats for native species in the Willamette Valley and southwest Washington is essential for the conservation of each of these five listed plant species. The proposed project, which includes possible future acquisitions of conservation lands in the Willamette Valley and maintenance of prairie habitats, could make meaningful contributions to the conservation of these prairie species.

Climate Change - Willamette Valley Plant Species

The effects of climate change have already been observed in the Pacific Northwest. Temperatures have risen 1.5°F to 2°F over the past century, and the past three decades have been warmer than any other historical period (Frankson et al. 2017a, p.1; Frankson et al. 2017b, p. 1). Climate change is widely expected to threaten wildlife and their habitats in the Pacific Northwest by increasing summer temperatures, reducing soil moisture, increasing wildfires, reducing mountain snow pack, and causing more extreme weather events (Bachelet et al. 2011, p. 414).

Projections specific to prairie ecosystems, however, suggest that these habitats will be relatively resilient to climate change impacts. The grasslands and prairies of Washington and Oregon span a wide geographic and climatic range, encompassing a rich variety of soil types, vegetation cover, elevations, and weather patterns. This heterogeneity will likely provide substantial buffering from the effects of changing weather and climate (Bachelet et al. 2011, p. 412). Winter precipitation is predicted to increase, though increased summer temperatures are expected to cause increased evapotranspiration, thus causing reduced growing season soil moisture (Bachelet *et al.* 2011, p. 414). It is even possible that increased summer drought may affect less drought-tolerant trees and other forest species adjacent to prairies, possibly resulting in prairie expansion (Bachelet et al. 2011, p. 417). An analysis conducted for the update of the State Wildlife Conservation Strategy in Washington concluded that prairie and grassland ecosystems are well-adapted to warm and dry conditions and periodic soil drought, and projected future increases in temperature and drought for the region, "are unlikely to disadvantage (and may benefit) these systems" (Washington Department of Fish and Wildlife 2015, p. 5-31). However, given each species has its own particular niche requirements, it is difficult to predict how each of the listed Willamette Valley species will be affected by climate change.

Effects of the Action- Willamette Valley Plant Species

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

BPA provided an effects analysis for the Willamette Valley listed plant species in the HIP4 BA (pp. 3-189 to 3-196). The following information provides a summary of that information. The HIP4 proposes several categories of restoration actions, some of which will occur in the Willamette Valley or southwest Washington in or near prairie habitats that may support listed plants.

Restoration activities include the use of heavy equipment and herbicides, and alter existing and typically degraded habitats to achieve restoration goals, and thus may negatively affect federally-listed plant species (directly or indirectly) due the nature of the activity. These effects are generally the same for all 5 listed Willamette Valley plant species, and thus, such effects are presented only once in this Opinion. The use of heavy equipment and other vehicles can crush plants or compact soil conditions such that plants are harmed or killed; similarly, the humans involved in the restoration actions or surveys may also inadvertently trample and crush plants or alter soils conditions such that plants are harmed or killed. Ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non-native vegetation can adversely affect all life stages of listed plants (*i.e.,* seeds, seedlings, and reproductive plants). Listed plant species can be trampled, broken, buried, dug up, and killed; and soils compacted, displaced, or removed from the project site. Herbicides can harm or kill listed plants.

In terms of effects to plants in the Willamette Valley, there are 3 groupings of restoration:

- Aquatic habitat restoration activities (e.g. Categories 1, 2, 4, 6, 7d-e, 7g, and 8) that wholly target benefits to fish and other aquatic organisms, such as fish passage, channel reconstruction, addition of gravels;
- Restoration activities that could include both aquatic and terrestrial habitats (e.g. Categories 3, 5, 7a-c, 7f, 8, 9a-d), such as use of herbicides, vegetation planting, road decommissioning; and
- Prairie restoration activities (e.g. Categories 2 (wetland restoration actions), 3b, and 9e) that target improving prairie conditions, such as mowing, grazing, and burning, or use of herbicides to control non-native invasive species.

Activities implemented near or within occupied habitats will have the greatest effects to these species. Of the 3 categories above, aquatic habitat restoration activities are the least likely to cause negative effects to Willamette Valley plant species, as much of the work is completed within the active channel where plants are not likely to be present. The remaining 2 categories, especially prairie restoration activities, have a greater potential to encounter listed plants: in some instances activities will occur in occupied areas in order to improve the conditions and specifically benefit the listed plant species present. Thus, it is not always possible to avoid impacts to listed plants within the restoration footprint. However, these actions are often necessary to maintain habitats; without such actions, habitat may become unsuitable for the species over time.

BPA assumes a total of approximately 6,800 acres in the Willamette Valley may require ESA coverage for the management and restoration of grasslands and prairies where one or more listed plant species may be present (pp. 3-193 of the HIP4 BA). For each species, BPA estimates no more than 1,700 acres[2] of potentially occupied habitats for each species would be treated or managed in any one year (See Table WV2):

A serious long-term threat to many early seral plant species in the Willamette Valley is the change in community structure due to plant succession, and many of Willamette Valley prairies would likely be forested if left undisturbed. Thus, restoration actions that re-set plant succession and mimic historical disturbance regimes that maintained early plant succession are necessary to create and maintain habitats that support listed plants and other native species they support. The proposed conservation measures (Category 9e), such as pre-project surveys to locate listed plants, designation of buffers around listed plants, and identification of appropriate access points for vehicles and staff, will minimize the potential and extent of these negative effects from restoration activities. The anticipated long-term beneficial effects to listed species are expected to negate any short-term effects by improving habitat conditions for listed species and by addressing threats to listed species (e.g. unrestricted livestock access, soil erosion, degraded ecosystem processes, and plant competition with non-native and invasive plant species).

[2] There are 5 listed plant species that could be present over the 6,800 total acres. Since some areas could have more than one species of listed plants, BPA divided 6,800 by 4 (not 5) to estimate the number of affected acres for each plant to account for overlap in species distribution.

Table WV2. Estimated number of treatment acres that may by occupied by each listed Willamette Valley plant each year.

Plant Species	Total potential affected acres /year
Bradshaw's lomatium (*Lomatium bradshawii*)	1,700
Golden paintbrush (*Castilleja levisecta*)	1,700
Kincaid's lupine (*Lupinus sulphureus ssp. kincaidii*)	1,700
Nelson's checker-mallow (*Sidalcea nelsoniana*)	1,700
Willamette daisy (*Erigeron decumbens var. decumbens*)	1,700

In summary, some listed Willamette Valley plants and populations may be harmed during the implementation of restoration actions. Several of the restoration/recovery activities, especially ground-disturbing activities and the control or removal of invasive and non-native vegetation, can result in adverse effects to federally listed plant species in the Willamette Valley. However, these actions are often necessary to maintain habitats; without such actions, habitat may become unsuitable for the species over time. It is also possible that some listed plant species could be harmed or killed by aquatic restoration actions, if it is not possible to achieve the restoration goals without avoiding the listed plants. By implementing the Willamette Valley Prairie Restoration Conservation Measures (Category 9e), as well as any species-specific conservation measures, there is a substantial reduction in the severity of the potential adverse effects to these species. Given the importance of prairie restoration actions to creating and maintaining habitats for these species, the projected annual number and size of projects relative to the amount of occupied habitat for any one species, the greatest risk to a listed plant species is at the individual level and not at the population level. Areal restrictions and timing windows for mowing and burning and herbicide use minimize impacts to listed plant species. Individual plants may be injured or destroyed while implementing some activities, but populations should not be affected to a degree where they would be placed in significant harm: where continued survival, growth, and reproduction of that population would be impacted in the future.

Effects Analysis and Summary for Bradshaw's Lomatium

Bradshaw's lomatium is a wet prairie species that may be affected by some aquatic restoration projects, but is most likely to be affected by techniques for prairie restoration (mowing, herbicide use, burning, grazing, and plant propagation) and wetland restoration (re-grading, etc). The general effects of aquatic and prairie restoration projects are described in Effects to Willamette Valley Listed Plants (pp. 3-190 to 3-201 of the HIP4 BA), and these adequately describe the potential effects to Bradshaw's lomatium. No additional effects are anticipated for any of the proposed activities.

Effects Analysis and Summary for Golden Paintbrush
Golden paintbrush is an upland prairie species that may be affected by some aquatic restoration projects, but is most likely to be affected by techniques for prairie restoration (mowing, herbicide use, burning, grazing, and plant propagation). The general effects of aquatic and prairie restoration projects are described in Effects to Willamette Valley Listed Plants (pp. 3-190 to 3-201 of the HIP4 BA), and these adequately describe the potential effects to golden paintbrush. No additional effects are anticipated for any of the proposed activities.

Effects Analysis and Summary for Kincaid's Lupine
Kincaid's lupine is an upland prairie species, which is most likely to be affected by techniques for prairie restoration (mowing, herbicide use, burning, grazing, and plant propagation), but could also be present in some wetland or aquatic restoration sites. The general effects of aquatic and prairie restoration projects are described in Effects to Willamette Valley Listed Plants (pp. 3-190 to 3-201 of the HIP4 BA), and these adequately describe the potential effects to Kincaid's lupine. No additional effects (direct or indirect) are anticipated based on the life history or habitat characteristics of Kincaid's lupine.

Effects Analysis and Summary for Nelson's Checkermallow
Nelson's checkermallow is typically found in wet prairies or along stream channels. Thus, this species may be affected by some aquatic restoration projects, as well as techniques for prairie restoration (mowing, herbicide use, burning, grazing, and plant propagation) and wetland restoration (re-grading, etc). The general effects of aquatic and prairie restoration projects are described in Effects to Willamette Valley Listed Plants (pp. 3-190 to 3-201 of the HIP4 BA), and these adequately describe the potential effects to Nelson's checkermallow. No additional effects are anticipated for any of the proposed activities.

Effects Analysis and Summary for Willamette Daisy
Willamette daisy is a wet prairie species that may be affected by some aquatic or wetland restoration projects, but is most likely to be affected by techniques for prairie restoration (mowing, herbicide use, burning, grazing, and plant propagation). The general effects of aquatic and prairie restoration projects are described in Effects to Willamette Valley Listed Plants (pp. 3-190 to 3-201 of the HIP4 BA), and these adequately describe the potential effects to Willamette daisy. No additional effects are anticipated for any of the proposed activities.

Cumulative Effects- Willamette Valley Plant Species

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). Future federal actions that are unrelated to the proposed action are not considered in this section because they will require separate consultation pursuant to section 7 of the Act.

The most common activities reasonably certain to occur in the action area are agricultural

activities, operation of hydropower and flood-control facilities, urban and suburban development, recreational activities, logging, road construction and maintenance, and hard rock and gravel mining; of these activities, agriculture, urban and suburban development and recreation in the Willamette Valley are the non-federal activities that are likely to affect the Willamette Valley listed plant species. Many of these activities would not be federal actions and would not be subject to ESA consultation and would likely result in some adverse effects to ESA-listed species and their habitats. Some of the activities, such as development, are subject to regulation under federal or state programs, and the effects to Willamette Valley listed plant species and their habitats would be reduced to some degree under these programs. Between 2000 and 2010, the combined population of Oregon, Washington, and Idaho grew from 10.6 to 12.14 million, an increase of approximately 14.4%. The population is likely to be at least that in the Willamette Valley, if not greater for the next several years. We assume that future non-federal actions will continue within the action areas, increasing as population rises. When considered together, the effects of non-federal activities are likely to continue to reduce the extent of native prairie habitat, which will reduce the habitat available for the Willamette Valley listed plant species. These effects could continue to impact Willamette Valley listed plant species by degrading or destroying habitat, reducing population abundance and productivity.

Summary and Synthesis- Willamette Valley Plant Species

In summary, some of the prairie habitat restoration activities that will be implemented under the HIP4 program have the potential to adversely affect Willamette Valley listed plant species, but most will have mainly or entirely beneficial effects to the species. Other projects implemented under HIP4 will have no effect, as many projects will occur outside of the range of this species. For those projects that have adverse effects to Willamette Valley listed plant species at occupied treatment sites, the proposed conservation measures will limit the short-term adverse effects to these species and ensure that populations are maintained into the future. Most of the projects targeting aquatic habitat restoration will have few, if any listed plant species, and are not expected to affect population abundance or productivity. Most of the prairie restoration projects will likely be implemented in habitat that are degraded for Willamette Valley listed plant species, or in habitats that without maintenance, will no longer support the listed plant species (e.g. woody plant encroachment, non-native species invasion). Thus, prairie restoration projects will improve habitat conditions and benefit these species in the long term through maintenance or restoration of prairie habitats.

Conclusion- Willamette Valley Plant Species

After reviewing the status of the Bradshaw's lomatium, Golden paintbrush, Kincaid’s lupine, Nelson's checker-mallow, and Willamette daisy, the environmental baseline for the action area, and the effects of the proposed action, including all measures proposed to avoid and minimize adverse effects, and the cumulative effects, it is the Service’s Biological Opinion that the HIP4 is not likely to jeopardize the continued existence of the Bradshaw's lomatium, Golden paintbrush, Kincaid’s lupine, Nelson's checker-mallow, and Willamette daisy.

This “no jeopardy” finding for the Bradshaw's lomatium, Golden paintbrush, Kincaid’s lupine, Nelson's checker-mallow, and Willamette daisy is supported by the following:

1. Restoration actions that re-set plant succession and mimic historical disturbance regimes are necessary to create and maintain habitats that support listed plants and other native species they support.
2. The proposed conservation measures (Category 9e) and species-specific conservation measures are anticipated to minimize the potential and extent of short-term negative effects from restoration activities.
3. Individual plants may be injured or destroyed while implementing some activities, but populations should not be affected to such a degree that continued survival, growth, and reproduction of that population would be impacted in the future.
4. The anticipated long-term beneficial effects to listed species are expected to negate any short-term effects by improving habitat conditions for listed species and by addressing threats to listed species

[End of Section]

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened animal species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. *Harm* is defined by the Service as an act, which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). *Harass* is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the BPA so that they become binding conditions of any grant or permit issued to its partners, as appropriate, for the exemption in section 7(o)(2) to apply. The BPA has a continuing duty to regulate the activity covered by this incidental take statement. If the BPA: (1) fails to assume and implement the terms and conditions, or (2) fails to require its partners to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the BPA or its partners must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

AMOUNT OR EXTENT OF TAKE

Bull Trout

Any of the nine proposed restoration activity categories may result in short-term adverse impacts to bull trout from:

- water quality changes from instream construction (e.g. suspended sediment, temperature, dissolved oxygen, contaminants),
- short-term impacts to physical habitat features (e.g. floodplain connectivity, natural cover, riparian vegetation, instream flow, passage conditions)
- water quality impacts from use of chemical herbicides in riparian areas, and

- fish handling during dewatering and work area isolation.

Depending on the project location and timing, there is a varying likelihood of species presence, and thus exposure to these impacts.

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within the action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional and operate across far broader temporal and spatial scales than will be affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be predicted precisely based on existing habitat conditions, nor can we precisely predict the number of fish that are reasonably certain to be harmed or harassed if their habitat is modified or degraded by the proposed action. In such circumstances we use the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

Short-term impacts to water quality (suspended sediment, temperature, etc.) and physical habitat features. The best available indicators for the extent of incidental take associated with short-term impacts to water quality and physical habitat features are as follows:

1. The total length of stream reach that will be modified by construction each year.
2. The visible increase in suspended sediment associated with construction activities.

These variables are proportional to the amounts of harm and harassment that the proposed action is likely to cause through degradation of water quality or physical habitat. Suspended sediment is proportional to the water quality impairment that the proposed action will cause, including increased sediment, temperature, and contaminants, and reduced dissolved oxygen. Stream length is proportional to the amount of habitat that will be physically altered, including natural cover, floodplain connectivity, riparian vegetation, forage and safe passage conditions. The proposed action may be localized (e.g., culvert replacement) or much larger in scope (e.g., channel reconstruction). The extent of take is most practicably identified by the maximum number of projects requiring near and in-water construction in any given year.

The Service anticipated that an increase in suspended sediments and turbidity will be visible in the immediate vicinity of, and for some distance downstream, of each project requiring near- or in-water construction. The distance that sediment will be visible downstream is proportional both to the size of the disturbance and to the width of the wetted stream. As part of the proposed action in the HIP4 BA, BPA has proposed a modified "Turbidity Monitoring Protocol" (p. 2-34 of the HIP4 BA), which will limit the exposure to fish in terms of both the duration and magnitude of turbidity. The extent of take will be exceeded if the turbidity plume generated by construction activities is visible above background levels (about a 10 percent increase in natural stream turbidity) downstream from the project area source as follows: A visible increase in suspended sediment, as follows: 50 feet from the project area in streams that are 30 feet wide or

less, 100 feet from the discharge point or nonpoint sources of runoff for streams between 30 and 100 feet wide, 200 feet from the discharge point or nonpoint source for streams greater than 100 feet wide, or 300 feet from the discharge point or nonpoint source for areas subject to tidal or coastal scour. The compliance point shall be measured/observed every four hours, and take is exceeded when activities continue to result in visible suspended sediment beyond two consecutive monitoring intervals.

When defined exceedances occur, corrective measures must be taken to address the excessive turbidity. If exceedances occur for two consecutive monitoring intervals (8 hours), all activity must be stopped, until turbidity returns to background levels. This protocol will minimize exposure of bull trout to potential harm from excessive turbidity, while still allowing the restoration work to proceed in the most expedient manner and limited timeframe possible.

Under the HIPIII BO, the Service authorized the implementation of up to 90 near- and in-water work projects per year, based on project implementation under NMFS HIP I and HIP II biological opinions. In its 2018 Annual Monitoring Report for HIPIII, BPA (2019b, p.17) indicated an average of 42 projects that required in-water work. Further, BPA (2019b, p. 23) reported zero "non-compliance" cases for the entire program for the past 2 years, attributing that to the experience and thorough training of BPA's restoration partners and their familiarity with the regulations. Because the Service does not want to limit the scope of large, beneficial restoration projects that BPA has been shown to fund and implement successfully, the Service maintains BPA's take threshold from our HIPIII BO. BPA may implement up to 90 projects per year that include near- or in-water construction within the range of the bull trout (spawning/rearing, or foraging, migration and overwintering (FMO) habitats). Implementation of more than 90 such projects in one year is a threshold for reinitiating consultation.

Short-term water quality impacts from chemical herbicide application. Application of chemical herbicides will result in short-term degradation of water quality, which will cause injury to fish in the form of adverse, sublethal, physiological effects. This is particularly true for herbicide applications in riparian areas or in ditches that may deliver herbicides to stream occupied by listed salmonids, including bull trout. These sublethal effects will include increased respiration, reduced feeding success, and subtle behavioral changes that can result in increased susceptibility to predation. As with HIPIII, the future abundance and distribution of listed fish in relation to the effects of herbicide applications within HIP4 is indeterminate and so a specific number of individuals taken cannot be predicted.

Direct measurement of herbicide transport using the most commonly accepted method of residue analysis (e.g., mass spectrometry) is impracticable for the type and scale of herbicide applications proposed. Thus, use of those measurements in this take statement as an extent of take indicator is likely to outweigh any benefits of using herbicides as a simple and economical vegetation management tool, and act as an insurmountable disincentive to their use for plant control under this programmatic Opinion. Further, the use of simpler, indirect methods, such as olfactory tests, do not correlate well with measured levels of the airborne pesticides. Therefore, the best available indicator for the extent of take due to the proposed invasive plant control is the annual limitation on the extent of treated riparian acres. To limit the potential negative effects

from herbicide use while still allowing use of herbicides in this restoration program, the Service will limit BPA's herbicide treatments of riparian acres each year.

In its 2018 Annual Monitoring Report for HIPIII, BPA (2019b, p.26) indicated an average of 628 acres of riparian habitats were treated with herbicides, with a maximum of 836 acres/year reported. Further, BPA (2019b, p. 23) reported zero "non-compliance" cases for the entire program for the past 2 years, attributing that to the experience and thorough training of BPA's restoration partners and their familiarity with the regulations. In BPA's correspondence with the Service regarding herbicide applications under HIP4, BPA indicated that additional acreage would be treated with herbicides under the estuarine component of the proposed action. Thus, the Service limits herbicide applications for restoration under HIP4 to 1,500 acres per year or less. If more than 1,500 riparian acres are treated in a calendar year under HIP 4, BPA shall reinitiate consultation.

Fish Capture. The capture and handling of bull trout for salvage purposes will result in direct take (e.g. capture, holding, injury, kill). However, the direct take resulting from salvage operations will minimize the incidental take of individual bull trout from isolating in-water work areas for restoration activities. The Service authorized BPA to implement up to 90 projects requiring near or inwater work within the range of the bull trout (spawning/rearing, or foraging, migration and overwintering (FMO) habitats). Of those 90 projects, the Service anticipates up to 70 projects will require fish salvage. While we expect the majority of ESA-listed fish captured as part of these projects would be salmon and steelhead, a small portion of these fish are likely to be bull trout.

For programmatic assessments where there is uncertainty as to where projects will be implemented across the action area, we often rely on professional judgment to develop formulas that help predict the likelihood of a listed species occurrence and rate of occurrence within a project area. Given that bull trout are an apex predator and generally persist in much lower abundance than other sympatric salmonids such as salmon, steelhead and other species of trout, we believe bull trout would comprise a relatively low percentage of the overall catch of salmonids within a given project area; probably somewhere between three and four percent for migratory populations, although there will be wide variation between project locations.

Areas where resident bull trout populations exist may comprise a slightly higher proportion of the overall number of salmonids, somewhere near ten percent or possibly higher in some cases. While the overall percentage of bull trout to other salmonids may increase in spawning/rearing habitats during summer and fall, the converse is true for FMO habitats during this time period because of warmer water temperatures and generally poorer water quality. Because the ratio of bull trout to other salmonids varies considerably across their range, and to err conservatively, we estimate a ratio of bull trout to salmon and steelhead of .05 to 1 (i.e., bull trout are estimated to comprise on average five percent of all salmonids captured during isolation and capture efforts).

NMFS' anticipated capture of 100 salmonids per in-stream project, based on fish capture data for site isolation under HIP III (NMFS HIP4 BO, p. 68). Thus, the Service estimates an average capture of five bull trout for each project within the range of bull trout where isolation and dewatering could be required. We also anticipate injury or mortality to five percent of the fish

that are captured and released, with the remainder (95 percent) likely to survive with no long-term adverse effects. Data presented in the Effects section suggests that the injury/mortality number is more likely around two percent for fish captured and handled. Nonetheless, we are choosing to err on the side of caution and use the more conservative five percent figure.

Overall, the effects of work area isolation on the abundance of bull trout in the Columbia River Basin are likely to be small. In its 2018 Annual Monitoring Report for HIPIII, BPA (2019b, p.18) indicated 0 to 29 bull trout were captured annually, and none of those fish died. This is far less than the anticipated capture of 250 bull trout with a resulting 13 mortalities[3] in the Service's HIP III BO. For HIP4 implementation, the Service anticipates up to 70 projects requiring fish salvage may occur. Assuming 5 bull trout are captured per project, the Service estimates 350 bull trout may be captured, and up to 5% of those fish (18 fish) may die from handling. While this number exceeds what has been reported under HIPIII, the number of bull trout encountered will vary widely between project locations and the Service does not want to limit the scope of large, beneficial restoration projects that BPA has been shown to fund and implement successfully. Thus, the Service authorizes BPA to capture and handle up to 350 individual bull trout each year, and as a result of that capture, an estimated 18 individuals (.05 percent x 350 fish) will be injured or killed per year. Almost all of these fish are anticipated to be juveniles, but a small number of adults could be captured. For utility of operation we will not distinguish between take of juveniles and take of adults but will assume that most (95-99%) of the capture would be juveniles.

Marbled Murrelet

The Service anticipates incidental take of murrelet nests associated with implementation of two projects per year in Washington (Conservation Zone 2), and two projects per year in Oregon (Conservation Zone 3). The maximum area of nesting habitat exposed to adverse disturbance effects would be 300 acres in Oregon, and 828 acres in Washington, annually. We anticipate no more than 4 active murrelet nests per year would be incidentally taken as result of project implementation (2 nests in Oregon and 2 nests in Washington). The take is in the form of harassment from active nests exposed to noise and visual disturbance during the murrelet nesting season. Noise and visual disturbance is likely to significantly disrupt murrelet normal nesting behaviors. Anticipated murrelet responses to disturbance include flushing from a nest or branch within nesting habitat and aborted or delayed feeding of juveniles. These behavioral disruptions create a likelihood of injury by increasing the risk of failed nesting attempts due to increased predation risk of eggs or chicks and/or through reduced fitness of nestlings.

Murrelets are cryptic, nest locations are rarely located, and available data suggest a patchy and inconsistent distribution in the action area. For these reasons, the Service has used the number of

[3] In its HIP III BO, the Service anticipated up to 250 individual bull trout will be captured on average per year (estimated 50 in-stream projects within the range of bull trout x 5 bull trout per project on average) of which an estimated 13 individuals (.05 percent x 250 fish) will be injured or killed per year as a result of fish capture necessary to isolate in-water construction areas.

projects implemented and the amount of suitable murrelet nesting habitat exposed to disturbance effects as a surrogate measure of take.

The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-711), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

Streaked Horned Lark

The Service anticipates that the habitat restoration activities implemented under the HIP4 program will result in the following forms of take of streaked horned larks:

- Virtually all streaked horned larks present on suitable habitat at restoration sites will be non-lethally harassed by the habitat restoration activities.
- A small but unquantifiable number of streaked horned larks will be harmed through the temporary loss of suitable habitat caused by the habitat restoration activities.
- A small but unquantifiable number of streaked horned larks will be harassed by surveys and monitoring before, during and after habitat restoration activities are implemented.
- A small number of streaked horned lark eggs and nestlings may die as a result of crushing or temporary abandonment by adults that are harassed due to habitat restoration activities. We estimate this number to be no more than 20% of nests at each restoration site; each nest may contain up to 3 to 5 eggs or nestlings.

The take described above will be difficult to detect or quantify; the sub-lethal effects of harassment and harm may take years to manifest, and nests destroyed or individuals killed by habitat restoration activities may be missed, even with pre-project surveys. Instead the amount of take authorized by this Opinion will be tracked through the amount of habitat treated. We estimate that an average of 1,100 acres of potential lark habitat will be treated each year under the HIP4 habitat restoration program. The amount of take authorized by this Biological Opinion will have been exceeded if the amount of habitat treated at sites that may have streaked horned larks exceeds 1,100 acres.

The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-711), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

EFFECT OF THE TAKE

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). "Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These terms and conditions must be implemented for the exemption in section 7(o)(2) to apply.

BPA and its contractors shall:

1. Minimize incidental take by ensuring that all applicable project design criteria (PDC) and conservation measures (CMs) are fully implemented for all actions funded or carried out under HIP4.

2. Ensure completion of a comprehensive monitoring and reporting program for all actions funded or carried out under HIP4, and this program.

3. Minimize incidental take associated with invasive and non-native plant control activities.

4. In order to limit potential effects to marbled murrelets, BPA must limit the number of projects implemented each year that are likely to adversely affect marbled murrelets.

5. In order to use the most up-to-date definitions to assess project impacts, BPA must update definitions for murrelet habitat used in the HIP4 BA (see Term and Condition # 3 below).

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of Act, the BPA and its contractors must comply with the following terms and conditions, which implement the Reasonable and Prudent Measures described above and outline required reporting and monitoring requirements. The measures described below are non-discretionary, and must be undertaken by BPA or, if an applicant is involved, must become binding conditions of any funding provided to the applicant, for the exemption in section 7(o)(2) to apply. BPA has a continuing duty to regulate the activity covered by this incidental take statement. If BPA (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant to adhere to the terms and conditions of the incidental take statement through funding conditions, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, BPA must report the progress of the action and its impact on the species considered in this Opinion to USFWS as specified in the incidental take statement.

1. To implement reasonable and prudent measure #1 (PDC and CMs), BPA shall:
    a. Administer every action funded or carried out under this Opinion in a manner consistent with General Conservation Measures for all activity categories.
    b. Administer every action funded or carried out under this Opinion in a manner consistent with Activity Specific Conservation Measures.

2. To implement reasonable and prudent measure #2 (monitoring and reporting), BPA shall:

   a. Submit a monitoring report to USFWS by June 15 each year that describes BPA's efforts to carry out the proposed action covered by this programmatic Opinion. The report will include an assessment of overall program activity, a map showing the location and type of each action funded or carried out under this Opinion, compliance with the Opinion, and any other data or analyses BPA deems necessary or helpful to assess habitat trends as a result of actions completed under this Opinion.
   b. BPA will host an annual coordination meeting with USFWS and NMFS by April 15 each year to discuss the annual monitoring report, compliance with the Service's biological Opinion, and any actions that will improve conservation under this Opinion, or make the program more efficient or accountable.

3. To implement reasonable and prudent measure #3 (herbicide restrictions), BPA shall:
   a. BPA shall not allow the use of the adjuvants R-11 or Entry II for any project funded or authorized under HIP4.
   b. BPA shall not allow any broadcast application of dicamba (because of issues associated with drift) for any project funded or authorized under HIP4.

4. To implement RPM #4 for marbled murrelet, BPA must ensure the following (new, clarifying text is underlined):
   a. Individual projects with an effect determination of "*likely to adversely affect"* for the murrelet will not exceed 2 projects per year in Washington and 2 projects per year in Oregon, for a maximum of up to 4 "*likely to adversely affect"* projects per year. Projects will not occur within the applicable disruption and disturbance distances from occupied murrelet nest trees or suitable nest trees in unsurveyed nesting habitat for murrelets (during the critical nesting period), unless a protocol survey determines murrelets are not present. Otherwise:
      i. In Oregon, the project would be *likely to adversely affect* and either delayed until August 6 (with 2-hour <u>daily dawn/dusk</u> timing restrictions) at which point it would be considered *not likely to adversely affect* or until it is determined that young are not present; or it may be counted toward the limited number of *likely to adversely affect* projects covered under this programmatic consultation (with 2-hour timing restrictions). <u>Projects within the applicable disruption and disturbance distances for murrelets implemented between April 1 and September 15 would not begin until 2 hours after official sunrise and would end 2 hours before official sunset.</u>

      ii. In Washington, the project would be *likely to adversely affect* and either delayed until September 4 (with 2-hour <u>daily dawn/dusk</u> timing restrictions); or counted toward the limited number of *likely to adversely affect* projects covered under this programmatic. Projects within the applicable disruption and disturbance distances for murrelets implemented between April 1 and <u>September 23 would not begin until 2 hours after official sunrise and would end 2 hours before official sunset.</u>

2) To implement RPM #5 for marbled murrelet, BPA must use the following definitions (new, clarifying text is underlined) to assess any individual project's impacts"
    a. "Potential nesting structure" will be defined as follows: Consists of an individual tree (or trees) with the following characteristics:
        i. Occurs within 50 miles (81 km) of the coast <u>in Oregon, and up to 55 miles inland in Washington as defined under the Northwest Forest Plan (Raphael et al. 2016, p.72)</u>;
        ii. A conifer tree (USFWS 1997);
        iii. ≥ 19.1 inches (49 cm) in diameter (dbh), > 107 feet (33 m) in height, has at least one platform ≥ 4 inches (10 cm) in diameter, nesting substrate (e.g., moss, epiphytes, duff) on that platform, and an access route through the canopy that a murrelet could use to approach and land on the platform (Burger 2002, Nelson & Wilson 2002);
        iv. Has a platform ≥ 32.5 feet (9.9 m) above the ground (Nelson & Wilson 2002); and
        v. Has a tree branch or foliage, either on the tree with nesting structure or on an adjacent tree, which provides protective cover over the platform (Nelson & Wilson 2002).
    b. "Unsurveyed habitat" will be defined as follows: Consists of suitable habitat or potential structure within younger stands that has not been surveyed by the established survey protocol (Evans et al. 2003). In cases of uncertainty such as stand occupancy, it is USFWS policy to give the benefit of the doubt to the listed species. On that basis, the USFWS considers unsurveyed habitat as occupied when analyzing effects to murrelets, <u>including suitable habitat that occurs outside of designated critical habitat</u>.

In summary, the Service believes that no more take than described below will be incidentally taken as a result of HIP4:

- Bull trout
    - No more than 90 projects requiring near or in-water work will be implemented in a single year,
    - No more than 1,500 riparian acres will be treated using herbicides in a single year,
    - No more than 350 bull trout will be captured in a single year, and no more than 5 percent of the total number captured will be killed (up to 18 in a single year).
- Murrelet
    - no more than 4 active murrelet nests per year (2 nests in Oregon and 2 nests in Washington).
- Streaked Horned Lark
    - No more than 1,100 acres of potential lark habitat may be treated in a single year.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed

action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

The Service is to be notified within three working days upon locating a dead, injured or sick endangered or threatened species specimen. Initial notification must be made to the nearest U.S. Fish and Wildlife Service Law Enforcement Office. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care should be taken in handling sick or injured specimens to preserve biological materials in the best possible state for later analysis of cause of death, if that occurs. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Contact the U.S. Fish and Wildlife Service Law Enforcement Office at (503) 682-6131, or the Service's Oregon Fish and Wildlife Office at (503) 231-6179.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any of the following conservation recommendations.

Pacific Lamprey

The Service recommends that the Action Agencies require considerations for the biological needs of lamprey species for all permits requiring instream or near-stream projects, or projects that affect passage. The following recommendations are for Pacific lamprey, but may also benefit other species of lamprey (e.g. river lamprey, western brook lamprey). Consideration of Pacific lamprey is important for many reasons:

- They are a Tribal Trust species, because they have a high cultural significance to Native American tribes from California to Alaska and;
- They may have served as a primary food source for aquatic, mammal, and avian predators that also prey on ESA-listed salmonids and other recreational and commercially important fish species.
- Their abundance and distribution has significantly declined throughout its range over the past three decades, and efforts to reverse this decline are needed (USFWS 2019c).

While Pacific lamprey are anadromous like salmon, their life history has some unique aspects that are typically not considered during implementation of instream activities, even when using

design considerations and best management practices for salmonids. Adjustments to minimize adverse effects to Pacific lamprey should be made at the project design phase to accommodate lamprey passage, lamprey spawning periods, existence of nests, upstream and downstream movement, and avoid direct mortality to larval lamprey burrowed in the substrate.
For context, an abbreviated description of Pacific lamprey life history and habitat use in freshwater is provided as follows: As adults, Pacific lamprey return from the ocean to fresh water primarily during spring and summer months, primarily moving at night. They often spend about 1 year in freshwater habitat before spawning, usually holding under large substrate (e.g., large boulders, bedrock crevices) associated with low water velocities until the following spring, when they move to spawning areas. Adult lampreys spawn generally between March and July in gravel bottom stream, usually at the upstream end of riffle habitat near suitable habitat for larval lamprey (sometimes called ammocoetes), and die after spawning (Beamish 1980).

After hatching, the larval lamprey drift downstream to areas of low stream velocity and burrow into depositional areas with sand or silt substrate, and filter feed on algae, diatoms, and detritus for 3 to 7 years. Larvae can be difficult to detect since they range in size from about .08 to 6 inches long; the smaller ones are easy to overlook. Larvae will move downstream during flow events, mostly at night. Many age classes of larvae will congregate together, often occurring in large clusters in depositional sites with fine sediments where habitats are optimal, making lamprey larvae populations particularly susceptible to activities that involve dredging/excavating, stranding and use of toxic chemicals. Metamorphosis of larval lamprey into the juvenile out-migrant form or "macrophthalmia" occurs generally from July through November but is variable depending on distance from salt water. Out-migration to the ocean occurs during or shortly after transformation (Beamish 1980). Out-migration generally peaks with rising stream and river flows in late winter or early spring (Kostow 2002).

Threats to Pacific Lampreys Residing in Upper Portions of Stream/River Habitats
Larval lamprey spend most of their time burrowed in stream substrates, moving during flow events and mostly at night. Many age classes can concentrate together in the same areas because of habitat preference, making larval lamprey populations particularly susceptible to activities that involve dredging/excavating, stranding and use of toxic chemicals. Adults also prefer to move at night, hiding in large rock and boulder substrate during the day. Threats to lampreys include:

Poor passage conditions and entrainment. Culverts, water diversions, hydroelectric dams and other passage barriers can impede upstream migrations by adult lampreys and downstream movement of larval lamprey and juvenile out-migrants. Culverts that have a drop at the outlet, high velocities, inadequate attachment surfaces or insufficient resting areas, will block upstream passage, but those that simulate streams provide passage for all life stages. Fish ladders designed for salmonids can be impediments to lamprey passage as they do not have adequate surfaces for attachment, velocities are often too high and there are inadequate places for resting. Rounding corners, providing resting areas or providing a natural stream channel or wetted ramp for passage over the impediment have been effective in facilitating lamprey passage. Larval lamprey and juvenile out-migrants may also become entrained at un-screened water diversions due to their size and weak swimming ability and adults can be blocked from moving upstream. All life stages can be impinged on screens resulting in injury or death. At present, there are no criteria

for lamprey when designing fish screens; however, perforated plate, vertical bar or interlocking bar screens reduce entrainment of larvae relative to woven wire cloth (Rose and Mesa 2012).

De-watering and streamflow management from water diversions, instream projects and hydropower peaking can cause rapid fluctuations in stream water levels and strand larval lamprey in the substrates. A single event can have a significant effect on a local lamprey population. Upstream passage can also be impacted, and nests can be dewatered, killing eggs and larvae.

Dredging from construction, channel maintenance and mining activities can impact all age classes of larval lamprey. Removal of substrate with a backhoe or trackhoe could remove several hundred lamprey per bucket load.

Chemical poisoning from accidental spills or chemical treatments can harm or kill larval lamprey burrowed in streams. As larval lamprey spend 3 – 7 years filter feeding, they may have a higher propensity for accumulating toxins such as PCBs, mercury, and other heavy metals (Bettaso and Goodman, 2010).

Poor water quality. Water temperatures of 22º C (72 º F) or higher may cause significant mortality or deformation of eggs or larval lamprey (Meeuwig et al 2005). Accumulated toxins in the lower reaches of streams and rivers may affect larval lamprey because they are often found in these areas.

Stream and floodplain degradation (channelization, loss of side channels, scouring) can result in the loss of riffle, suitable stream edge and side channel habitats, reducing areas for spawning and larval lamprey rearing.

Lamprey Recommendations: The biological considerations of lamprey should be incorporated into project design, objectives, salvage and best management practices for the protection and conservation of this species. Currently there are several guidance documents available to assist in such actions:

1. *Best management guidelines for native lampreys during in-water work (Lamprey Technical Workgroup 2020),* which covers a broad spectrum of actions including biology, salvage during dewatering actions, habitat restoration, screening, and passage. *(*https://www.fws.gov/pacificlamprey/Documents/2020%20Lamprey%20BMG%20Final.pdf)
2. *Practical guidelines for incorporating adult Pacific lamprey passage at fishways* (Lamprey Technical Workgroup 2017, entire) (https://www.fws.gov/pacificlamprey/Documents/2017.06.20%20LampreyPsgFINAL.pdf), which includes specific guidance on providing upstream passage within existing fishways and in new fishway designs.
3. *Design Guidelines for Pacific Lamprey Passage Structures* (Zobott et al. 2015, entire), which provides specific guidance for designing and installing lamprey ramps for upstream passage: http://www.uidaho.edu/~/media/UIdaho-Responsive/Files/cnr/FERL/technical-reports/2015/2015-5-LPS-Design.ashx

4. *Pacific Lamprey Habitat Restoration Guide* (Crandall and Wittenbach 2015): (http://www.methowsalmon.org/Documents/PacificLampreyRestorationGuide_web.pdf), which provides a detailed description of the biology, ecology, and cultural significance of lamprey, as well as threats to their population and best management practices to protect and restore populations.
5. Additional documents, updates, information, and materials may be found on the website for the Pacific Lamprey Conservation Initiative: https://www.fws.gov/pacificlamprey/mainpage.cfm

Lamprey Reporting

In order for the Service to be kept informed of actions that minimize or avoid adverse effects or that benefit Pacific lamprey, other lamprey species, and their habitats, the Service requests notification of the implementation of any of the above conservation recommendations, and copies of any relevant publications for conserving lamprey species and their habitats. Please send documents to:

State Supervisor
U.S. Fish and Wildlife Service - Oregon Fish and Wildlife Office
Attn: Ann Gray
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266

Native Freshwater Mussels

While no species of freshwater mussels are federally listed in the Pacific Northwest, they are of high value (culturally, ecologically, and environmentally) to many entities. The Service recommends that the Action Agencies require considerations for the biological needs of all native freshwater mussel species for all permits requiring instream or near-stream projects. There are six species of western freshwater mussels: the western pearlshell, the western ridged mussel, the winged floater, the Oregon floater, the Yukon floater, and woebegone floater. The Xerces Society for Invertebrate Conservation (Xerces Society) maintains a great resource for western freshwater mussels at https://xerces.org/endangered-species/freshwater-mussels. To paraphrase from the Xerces Society's website:

> "Freshwater mussels are experiencing a dramatic decline; 72% percent of North American freshwater mussels are considered extinct or imperiled, representing one of the most at-risk groups of animals in the United States. The decline of freshwater mussels has been well studied in eastern North America but has received very little attention in states west of the Rocky Mountains….
>
> "Native freshwater mussels have immense ecological and cultural significance. As filter-feeders, they can substantially improve water quality by filtering out harmful pollutants, which benefits both humans and aquatic ecosystems…. These animals can be highly sensitive to environmental changes and thus have great potential to be used as indicators of water quality. Freshwater mussels have been historically important sources of food, tools, and other implements for many Native American tribes. Native Americans in the interior Columbia Basin have

harvested these animals for at least 10,000 years, and they remain an important cultural heritage for tribes today."

Mussel Recommendations: The biological considerations of native freshwater mussel species should be incorporated into project design, objectives, salvage and relocation, and best management practices for the protection and conservation of this species. The Xerces Society has developed a publication "Conservation the Gems of Our Waters: Best Management Practices for Protecting Native Western Freshwater Mussels during Aquatic and Riparian Restoration, Construction, and Land Management Projects and Activities (Blevins et al. 2017), and a companion handbook, Mussel Friendly Restoration (Blevins et al. 2019)- both available online at https://xerces.org/publications/guidelines/mussel-friendly-restoration. These documents include information on determining if mussels are present at your site, project development and review, salvage and relocation, monitoring and practices for minimizing project impacts for several different activities (i.e. construction, vegetation management, flow management, restoration). The Xerces Society website also has a field identification guide developed by the Xerces Society and Confederation Tribes of the Umatilla Indian Reservation at https://pnwmussels.org/wp-content/uploads/2016/07/QuickMusselGuide_CTUIR.pdf

Freshwater Mussels Reporting

In order for the Service to be kept informed of actions that minimize or avoid adverse effects or that benefit freshwater mussels, and their habitats, the Service requests notification of the implementation of any of the above conservation recommendations, and copies of any relevant publications for conserving mussel species and their habitats. Please send documents to:

State Supervisor
U.S. Fish and Wildlife Service - Oregon Fish and Wildlife Office
Attn: Courtney Newlon
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266

REINITIATION NOTICE

This concludes formal programmatic consultation on the BPA's HIP4. As provided in 50 CFR 402.16, reinitiation of consultation is required and shall be requested by the federal agency or by the Service, where discretionary federal involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the Biological Opinion; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action.

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