



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
West Coast Region  
1201 NE Lloyd Boulevard, Suite 1100  
PORTLAND, OREGON 97232

May 21, 2019

Dear Recipient:

In accordance with provisions of the National Environmental Policy Act (NEPA), we announce the availability for review of the Draft Environmental Assessment (DEA) for Snake River Basin Hatcheries.

The proposed action is to make Endangered Species Act (ESA) section 4(d) determinations for the 15 hatchery programs for spring and summer Chinook salmon, summer steelhead, and coho salmon to operate in the Snake River Basin.

These programs are operated by the Idaho Department of Fish and Game, the Nez Perce Tribe, and the Shoshone-Bannock Tribes and are funded by the Columbia River Inter-Tribal Fish Commission, the Lower Snake River Compensation Plan, the Idaho Power Company, and the Bonneville Power Administration.

The document is accessible electronically through the National Marine Fisheries Service (NMFS) West Coast Region website at:

[http://www.westcoast.fisheries.noaa.gov/hatcheries/SRHatcheries/snake16\\_hatch\\_rvw.html](http://www.westcoast.fisheries.noaa.gov/hatcheries/SRHatcheries/snake16_hatch_rvw.html).

Hard copies or CD copies of the document may be obtained from the NMFS Comment Coordinator for this action, Emi Kondo, at the contact information provided below.

Written comments may be submitted to NMFS via electronic mail, physical mail, or fax to the Comment Coordinator during the public comment period (the closing date for the public comment period is noted at the above website). When submitting comments, please include the identifier "Snake River Hatcheries DEA comments" in the subject line or fax cover page.

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Thank you in advance for your input and assistance in finalizing the Environmental Assessment.

Sincerely,

A handwritten signature in blue ink that reads "Barry A. Thom".

Barry A. Thom  
Regional Administrator





# Environmental Assessment

Snake River Basin Hatcheries

*Snake River Basin*

**June 2019**



**Snake River Basin Hatcheries  
Draft Environmental Assessment**

**June 2019**

Lead Agency: National Marine Fisheries Service, West Coast Region  
National Oceanic and Atmospheric Administration

Responsible Official: Regional Administrator, West Coast Region  
National Marine Fisheries Service

Cooperating Agency: Bonneville Power Administration

DOE document number: DOE/EA-2083

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Appendix A. Population Viability of Salmon and Steelhead in the Study Area.....A-1



### Acronym List

BKD	Bacterial kidney disease
BMP	Best Management Practice
BOD	Biochemical oxygen demand
BPA	Bonneville Power Administration
cfs	Cubic feet per second
CRITFC	Columbia River Inter-Tribal Fish Commission
CWT	Coded-wire tag
DPS	Distinct Population Segment
EA	Environmental Assessment
ESA	Endangered Species Act
ESPA	Eastern Snake Plain Aquifer
ESU	Evolutionarily Significant Unit
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FONSI	Finding of No Significant Impact
FH	Fish hatchery
HCSA	Hells Canyon Settlement Agreement
HGMP	Hatchery Genetics Management Plan
HOR	Hatchery-origin fish
HSRG	Hatchery Scientific Review Group
ICTRT	Interior Columbia Technical Recovery Team
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
IHN	Infectious hematopoietic necrosis
IHNV	Infectious hematopoietic necrosis virus
IPAC	Information, Planning, and Consultation System
IPC	Idaho Power Company
ISAB	Independent Scientific Advisory Board
JCAPE	Johnson Creek Artificial Propagation Enhancement
LSRCP	Lower Snake River Compensation Plan
MPG	Major population group
NEPA	National Environmental Policy Act

NFH	National fish hatchery
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
ODFW	Oregon Department of Fish and Wildlife
OHWM	Ordinary high water mark
PBF	Physical and biological feature
PBT	Parentage-based tagging
pHOS	Proportion of hatchery-origin fish on spawning grounds
PIT	Passive Integrated Transponder
PNI	proportionate natural influence
PNOS	proportion of natural-origin spawners
ppm	Parts per million
RM&E	Research, monitoring, and evaluation
SFCEP	South Fork Chinook Salmon Eggbox Project
SOP	Standard operating procedure
SSI	Steelhead Streamside Incubator
TMDL	Total Maximum Daily Load
USBR	U.S. Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WDE	Washington Department of Ecology
WDFW	Washington Department of Fish and Wildlife
WLA	Wasteload Allocation

# 1 Introduction

The National Marine Fisheries Service (NMFS) is the lead agency responsible for administering the Endangered Species Act (ESA) as it relates to listed salmon and steelhead. Actions that may affect listed species are reviewed by NMFS under section 7, section 10, or section 4(d) of the ESA. Under section 4(d), the Secretary of the Interior issues regulations that are “necessary and advisable to provide for the conservation of such species.” NMFS is considering making determinations under ESA section 4(d) for the continued operation and maintenance of 15 hatchery programs in the Snake River Basin in Idaho. Each program includes the collection and spawning of adult salmon or steelhead, incubation of eggs, and rearing and release of juveniles (or eggs for two programs) as described in Hatchery and Genetic Management Plans (HGMPs). The 4(d) determination would affirm that the programs do not jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Determinations under Section 4(d) have no expiration date. These programs are designed to enhance the propagation and survival of Clearwater River coho salmon (*Oncorhynchus kisutch*), Snake River spring/summer Chinook salmon (*O. tshawytscha*) and Snake River steelhead (*O. mykiss*). The 15 hatchery programs, including facility operations specific to these programs, under consideration and their operators are:

- Clearwater River Coho Salmon (at Dworshak and Kooskia National Fish Hatcheries), Nez Perce Tribe
- South Fork Clearwater (at Clearwater Hatchery) B-run Steelhead, Idaho Department of Fish and Game (IDFG)
- Hells Canyon Snake River A-run Summer Steelhead, IDFG
- Hells Canyon Snake River Spring Chinook Salmon, IDFG
- Little Salmon River A-run Summer Steelhead, IDFG
- Little Salmon River Basin Spring Chinook Salmon (at Rapid River Fish Hatchery), IDFG
- South Fork Salmon River Summer Chinook Salmon, IDFG
- Johnson Creek Artificial Propagation Enhancement (JCAPE) Project (Chinook Salmon), Nez Perce Tribe
- South Fork Chinook Salmon Eggbox Project, Shoshone-Bannock Tribes
- Pahsimeroi A-run Summer Steelhead, IDFG
- Pahsimeroi Summer Chinook Salmon, IDFG
- East Fork Salmon River Natural A-run Steelhead, IDFG
- Salmon River B-run Steelhead, IDFG
- Upper Salmon River Spring Chinook Salmon (at Sawtooth Hatchery), IDFG
- Steelhead Streamside Incubator Project A-run and B-run, Shoshone-Bannock Tribes

The ESA applications submitted to NMFS by IDFG, the Nez Perce Tribe, and the Shoshone-Bannock Tribes include HGMPs that outline the rearing and release of Clearwater River coho salmon, Snake River spring/summer Chinook salmon, and Snake River steelhead using existing facilities. NMFS’s section 4(d) determinations of the HGMPs constitute a Federal action that is subject to analysis as required by the National Environmental Policy Act (NEPA) and is the topic of this environmental assessment (EA) review.

1 NMFS is choosing to evaluate these programs as the Proposed Action in one NEPA analysis because  
2 many overlaps and links exist among the programs. All of the programs would be implemented in the  
3 Snake River Basin during the same time and include the same or similar activities that lead to the release  
4 of coho salmon, spring/summer Chinook salmon, or steelhead.

5 The following activities are included in the HGMPs, and are described in more detail in Section 2,  
6 Description of Alternatives, of this EA:

- 7 • Broodstock collection, including methods and facility operations
- 8 • Identification, holding, and spawning of adult fish
- 9 • Egg incubation and rearing
- 10 • Marking of hatchery-origin juveniles
- 11 • Juvenile releases
- 12 • Adult management
- 13 • Research, monitoring, and evaluation (RM&E) to assess program performance

14 Bonneville Power Administration (BPA), as a cooperating agency for the development of this EA, has a  
15 decision for their portion of the Proposed Action, as described in Chapter 2, as to whether BPA will  
16 provide funding to the Nez Perce Tribe for the JCAPE program and the quantity of fish production that  
17 would occur with that funding. Prior to making this decision, BPA is required under NEPA to assess the  
18 potential environmental effects related to BPA's funding of the program. If, based on the analysis in this  
19 EA, BPA determines that these impacts are not significant and adopts the EA, BPA would issue a Finding  
20 of No Significant Impact (FONSI). If, however, BPA determines that any of these potential impacts are  
21 significant, BPA would proceed with preparation of an Environmental Impact Statement (EIS) for the  
22 proposal. At the conclusion of the NEPA process – either issuance of a FONSI or completion of the EIS  
23 process – BPA would make its decision on whether to provide the requested funding and at what level.

24 BPA's funding activities may include the continued operation and maintenance of a temporary adult  
25 Chinook salmon trap and weir; adult holding and spawning at the South Fork Salmon River Satellite; egg  
26 incubation and juvenile rearing of JCAPE fish at McCall Fish Hatchery; transportation of broodstock,  
27 eggs, and smolts between facilities; and the direct release of smolts into Johnson Creek.

28 To inform these hatchery actions, BPA may fund RM&E activities, such as fish tagging and marking;  
29 spawning ground surveys; fish capture, including rotary screw trap collection; and habitat quality, such as  
30 water temperature data collection in the South Fork Salmon basin. The hatchery program helps  
31 supplement the Johnson Creek summer Chinook salmon population which has low natural abundance  
32 and productivity.

## 33 **1.1 Purpose and Need**

34 NMFS's purpose and need for the Proposed Action is to:

- 35 • Evaluate the proposed hatchery programs to make a determination under ESA section 4(d) to  
36 ensure the sustainability of Snake River salmon and steelhead by conserving the productivity,  
37 abundance, diversity, and distribution of listed species of salmon and steelhead in the Snake  
38 River.

39 BPA needs to respond to the Nez Perce Tribe's request for continued funding for the JCAPE Program  
40 and associated operation and maintenance (O&M), monitoring and evaluation (M&E), which includes a  
41 requested increase in the annual production and release of summer Chinook salmon juveniles from

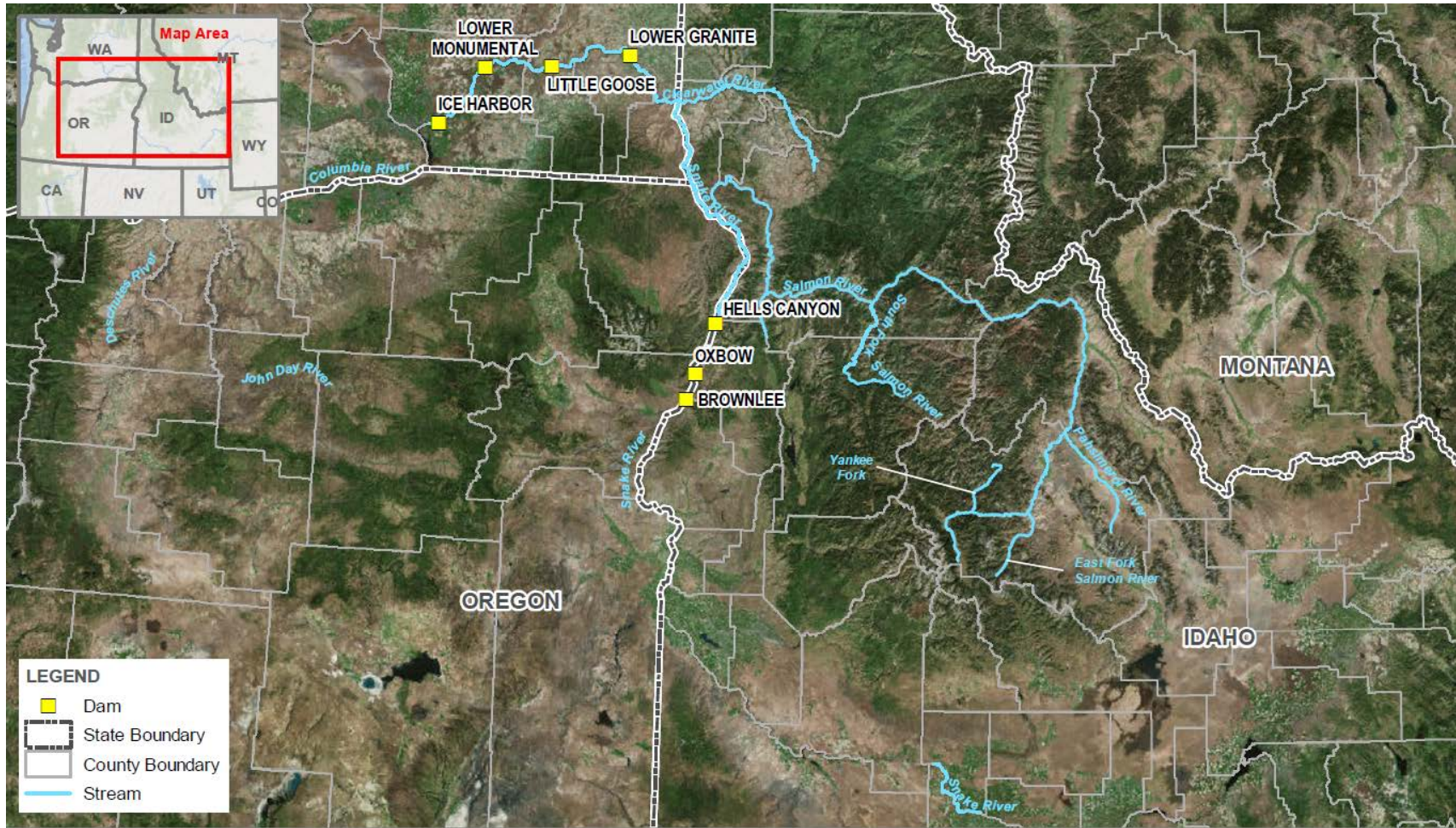
1 100,000 up to 150,000. In meeting BPA's need to take funding action, the alternatives considered should  
2 achieve BPA's purposes listed below.

- 3 • Support efforts to mitigate for effects of the development and operation of the Federal Columbia  
4 River Power System on fish and wildlife in the Columbia River and its tributaries, including the  
5 Snake River, under the Pacific Northwest Electric Power Planning and Conservation Act of 1980  
6 (Northwest Power Act) (16 U.S.C. 839 et seq.);
- 7 • Implement BPA's Fish and Wildlife Implementation Plan EIS and Record of Decision policy  
8 direction, which calls for protecting weak stocks—like the Snake River spring/summer run  
9 Chinook salmon—while sustaining overall populations of fish for their economic and cultural  
10 values (BPA 2003);
- 11 • Minimize harm to natural and human resources, including species listed under the ESA (16  
12 U.S.C. 1531 et seq.).

## 13 **1.2 Project Area and Study Area**

14 The project area is the geographic area where the Proposed Action would take place. It includes the fish  
15 traps and collection sites, hatchery facilities, and release locations as described in the HGMPs (Section  
16 2.1, Alternative 1, No Action). It also includes the broader area where direct and indirect impacts of the  
17 program operations could affect environmental and human resources. As such, the project area includes  
18 the three subbasins of the Proposed Action: Clearwater River Subbasin, the Hells Canyon reach of the  
19 Snake River Basin from the Lower Granite Dam up to Hells Canyon Dam, and the Salmon River  
20 Subbasin (Figure 1-1). It also includes the mainstem Snake River downstream from the Hells Canyon  
21 reach to Ice Harbor Dam, and areas upstream from Hells Canyon Dam near Oxbow, Hagerman National,  
22 Niagara Springs and Magic Valley fish hatcheries (Section 2.1, Alternative 1, No Action).

23 The study area is the geographic extent that is being evaluated for a particular resource. Although the  
24 project area encompasses the full extent of project influence, the study area is specific to the resource  
25 being analyzed. For some resources, such as wildlife and human health, the study area is limited to the  
26 area immediately surrounding the project facilities where operations could have a direct affect. For other  
27 resources, such as salmon and steelhead, project operations could have wider reaching effects. The  
28 study area for each resource is described in Section 3, Affected Environment. In addition, a larger study  
29 area was defined to consider past, present, and reasonably foreseeable future actions, which with the  
30 Proposed Action, could result in cumulative impacts on the human or natural environment. The evaluation  
31 of this larger study area for cumulative impacts is described in Section 5, Cumulative Impacts.



DATA SOURCE: USGS (2017)



- 1
- 2 Figure 1-1. Map of Project Area, highlighting the river reaches that are specifically included in this EA.

1 **1.3 Relationship to Other Plans, Regulations, Agreements, Laws, Secretarial**  
2 **Orders, and Executive Orders**

3 **1.3.1 Tribal Trust Responsibility under the Endangered Species Act**

4 The United States government has a trust or special relationship with tribes. The unique and distinctive  
5 political relationship between the United States and tribes is defined by statutes, executive orders, judicial  
6 decisions, and agreements, and differentiates tribes from other entities that deal with, or are affected by  
7 the Federal government.

8 Secretarial Order, *American Indian Tribal Rights, Federal-Tribal Trust Responsibilities and the ESA*  
9 (Secretarial Order) clarifies the responsibilities of the agencies when actions are taken under the ESA  
10 (USFWS and NMFS 1997). Specifically, USFWS and NMFS shall, among other things:

- 11 • Work directly with tribes on a government-to-government basis to promote healthy ecosystems
- 12 • Recognize that tribal lands are not subject to the same controls as Federal public lands
- 13 • Assist tribes in developing and expanding tribal programs so that healthy ecosystems are
- 14 promoted and conservation restrictions are unnecessary
- 15 • Be sensitive to tribal culture, religion, and spirituality

16 NMFS considers the responsibilities described above when taking ESA actions such as making section  
17 4(d) determinations associated with this EA. Furthermore, NMFS has specified that the statutory goals of  
18 the ESA and the federal trust responsibility to Indian tribes are complementary (Terry Garcia, U.S.  
19 Department of Commerce, letter sent to Ted Strong, Executive Director, Columbia River Inter-Tribal Fish  
20 Commission, July 21, 1998, regarding federal trust responsibility). The federal trust obligation is  
21 independent of the statutory duties and informs the way that statutory duties are implemented.

22 **1.3.2 U.S. v. Oregon**

23 The court in *U.S. v. Oregon*, 302 F.Supp. 899 (D. Or. 1968), ruled that state regulatory power over Indian  
24 fishing is limited because the 1855 treaties between the United States and the Nez Perce, Umatilla,  
25 Warm Springs, and Yakama Tribes preserved the tribes' right to fish at all usual and accustomed places,  
26 whether on or off reservation. Because of this decision, fisheries in the Columbia River Basin, including  
27 the Snake River Basin, are governed through the Columbia River Fish Management Agreement  
28 (Management Agreement; *U.S. v. Oregon* 2018), which was carefully negotiated by the Federal and state  
29 governments and the involved treaty Indian tribes. The most recent Management Agreement, entered as  
30 a court order in 2018 and set to expire on December 31, 2027, provides the current framework for  
31 managing fisheries and hatchery programs in much of the Columbia River Basin. The agreement includes  
32 a list of hatchery programs with stipulated production levels, and a list of tribal and non-tribal salmonid  
33 fisheries in the Columbia River Basin, including designated off-channel sites that are intended to: (1)  
34 ensure fair sharing of harvestable fish between tribal and non-tribal fisheries in accordance with Treaty  
35 fishing rights standards and *U.S. v. Oregon*, and (2) be responsive to the needs of ESA-listed species.  
36 For more details about the history of the Management Agreement, see the Mitchell Act Final  
37 Environmental Impact Statement (FEIS) Subsection 1.7.4, *U.S. v. Oregon* (NMFS 2014a) and the *U.S. v.*  
38 *Oregon* FEIS Subsection 1.61.1, *U.S. v. Oregon* (NMFS 2017e).

1 **1.3.3 Northwest Power Act/Council’s Fish and Wildlife Program**

2 The Northwest Power Act directs BPA to protect, mitigate, and enhance fish and wildlife affected by the  
3 development and operation of federal hydroelectric facilities on the Columbia River and its tributaries. To  
4 assist in accomplishing this, the Council makes recommendations to BPA concerning which fish and  
5 wildlife projects to fund. The Council gives deference to project proposals developed by state and Tribal  
6 fishery managers.

7 As part of its Fish and Wildlife Program, the Council has a three-step process for review of artificial  
8 propagation projects (i.e., hatcheries) proposed for BPA funding (Council 2006). Step 1 is conceptual  
9 planning, represented primarily by master plan development and approval. The master plan provides the  
10 scientific rationale for the activities proposed as part of a fish production program, and presents initial  
11 designs for proposed new facilities. Step 2 provides preliminary designs and cost estimates and  
12 environmental review. Step 3 is the final design review. The Council’s Independent Scientific Review  
13 Panel (ISRP) reviews the proposed projects as they move from one stage of the process to the next. The  
14 production of the JCAPE Program was reviewed by the Council and approved through the three-step  
15 process in 2005.



## 2 Description of Alternatives

Four alternatives are considered in this EA: (1) No Action, NMFS would not make ESA section 4(d) determinations and BPA would not fund the JCAPE Program, but the programs would be operated as proposed in the HGMPs; (2) Proposed Action, NMFS would make section 4(d) determinations consistent with the HGMPs and the programs would be operated as proposed in the HGMPs. BPA would either fund the JCAPE Program or not fund the JCAPE Program; (3) NMFS would make section 4(d) determinations consistent with the HGMPs, but juvenile releases from all programs would be reduced by 50 percent, and BPA would either (1) fund JCAPE at a level to produce juvenile releases that are reduced by 50 percent of the number outlined in the HGMP or (2) not fund JCAPE; and (4) NMFS would not make ESA section 4(d) determinations, BPA would not fund the JCAPE Program, and the programs would terminate.

### 2.1 Alternative 1, No Action

Under this alternative, NMFS would not make a 4(d) determination, and BPA would not fund the JCAPE Program. For analysis purposes, NMFS has defined the No Action Alternative as the choice by the applicants to operate the programs as described in the HGMPs because the applicants have been voluntarily improving their programs over the years to include the changes to historic operations that are now found in the HGMPs. Therefore, the No Action Alternative would reflect the HGMP production for the hatchery programs (Table 2-1), as well as for RM&E, and operations and maintenance (Section 2.1.3, Research Monitoring, and Evaluation; Section 2.1.4, Operation and Maintenance).

The hatchery programs, as named in pertinent biological opinions (NMFS 2017a, 2017b, 2017c, 2017d), are described in detail in the following subsections, with some official program names assigned a shorter name (in parentheses) for simplicity:

- Two in the Clearwater River Subbasin (Figure 2-1) and two in the Hells Canyon reach of the Snake River (Figure 2-2):
  - Clearwater River Coho Salmon (at Dworshak and Kooskia National Fish Hatcheries) (Clearwater Coho Salmon)
  - South Fork Clearwater (at Clearwater Hatchery) B-run Steelhead (South Fork Clearwater Steelhead)
  - Hells Canyon Snake River A-run Summer Steelhead
  - Hells Canyon Snake River Spring Chinook Salmon
- Eleven in the Salmon River Subbasin (Figure 2-3):
  - Little Salmon River A-run Summer Steelhead
  - Little Salmon River Basin Spring Chinook Salmon (Little Salmon/Rapid River Spring Chinook Salmon)
  - South Fork Salmon River Summer Chinook Salmon
  - Johnson Creek Artificial Propagation Enhancement (JCAPE) - Summer Chinook Salmon
  - South Fork Chinook Salmon Eggbox Project (SFCEP)
  - Pahsimeroi A-run Summer Steelhead
  - Pahsimeroi Summer Chinook Salmon
  - East Fork Salmon River Natural A-run Steelhead

- 1           o Steelhead Streamside Incubator Project A-run and B-run (SSI)
- 2           o Salmon River B-run Steelhead,
- 3           o Upper Salmon River Spring Chinook Salmon (at Sawtooth Hatchery) (Upper Salmon Spring
- 4           Chinook Salmon)

5 The HGMPs collectively describe the management of Clearwater River coho salmon, Snake River  
6 spring/summer Chinook salmon, and Snake River steelhead under the 15 described programs  
7 (Shoshone-Bannock Tribes and IDFG 2010a, 2010b; IDFG 2011a, 2011b, 2011c, 2011d, 2011e, 2011f,  
8 2015a, 2015b, 2016a, 2016b, 2016c; Nez Perce Tribe 2016, 2017; Shoshone-Bannock Tribes 2016);  
9 these programs include several rearing facilities and satellite facilities.

10 Eleven of the 15 programs included in this EA are currently operated as part of either the Lower Snake  
11 River Compensation Plan (LSRCP) or the Hells Canyon Settlement Agreement. (HCSA) (Table 2-1). The  
12 LSRCP was authorized by the Water Resources Development Act of 1976 (Public Law 94-587) to  
13 mitigate salmon and steelhead losses caused by the construction and operation of the four Lower Snake  
14 River dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) (Figure 1-1). The HCSA is  
15 an agreement approved by the Federal Energy Regulatory Commission (FERC) defining mitigation  
16 requirements for the Idaho Power Company (IPC) associated with construction and operation of the Hells  
17 Canyon Dam Complex (Hells Canyon, Oxbow, and Brownlee dams) (Figure 1-1).

18 In 2014, NMFS completed the Mitchell Act FEIS to assess Columbia River Basin hatchery operations and  
19 funding of the Mitchell Act hatchery programs (NMFS 2014a). The Mitchell Act FEIS analyzed a wide  
20 range of hatchery programs throughout the Columbia River Basin, including the programs included in this  
21 EA, across a suite of alternatives<sup>1</sup>. These alternatives were related to how hatcheries might be operated

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<sup>1</sup> The alternatives in the Mitchell Act FEIS were designed to give consideration to distributing funds in a manner which would have the effect of reducing or minimizing the adverse effects or increasing the benefits of hatchery operations on natural-origin salmon and steelhead populations. The alternatives are varying application of two hatchery performance goals that are either intermediate or stronger than the baseline conditions:

- Alternative 1 – No action; under this alternative, the Columbia River Basin hatchery production would continue as baseline conditions.
- Alternative 2 – No Mitchell Act funding; under this alternative, all Mitchell Act-funded hatchery programs and facilities would be closed. Other programs would operate to intermediate performance goals, and production levels would be reduced for those programs designed to meet mitigation requirements only when those production levels conflicted with the ability of a hatchery program to meet performance goals.
- Alternative 3 – All Hatchery Programs Meet Intermediate Performance Goal; under this alternative, all hatchery programs in the Columbia River Basin affecting primary and contributing salmon and steelhead populations would meet the intermediate performance goal.
- Alternative 4 – Willamette/Lower Columbia River Hatchery Programs Meet Stronger Performance Goal; under this alternative, all hatchery programs in the Columbia River Basin affecting primary and contributing salmon and steelhead populations in the Interior Columbia Recovery Domain would meet the intermediate performance goal, and all hatchery programs in the Columbia River Basin affecting primary and contributing salmon and steelhead populations in the Willamette/Lower Columbia Recovery Domain would meet the stronger performance goal.
- Alternative 5 – Interior Columbia River Hatchery Programs Meet Stronger Performance Goal; under this alternative, all hatchery programs in the Columbia River Basin affecting primary and contributing salmon and steelhead populations in the Willamette/Lower Columbia Recovery Domain would meet the intermediate performance goal, and all hatchery programs in the

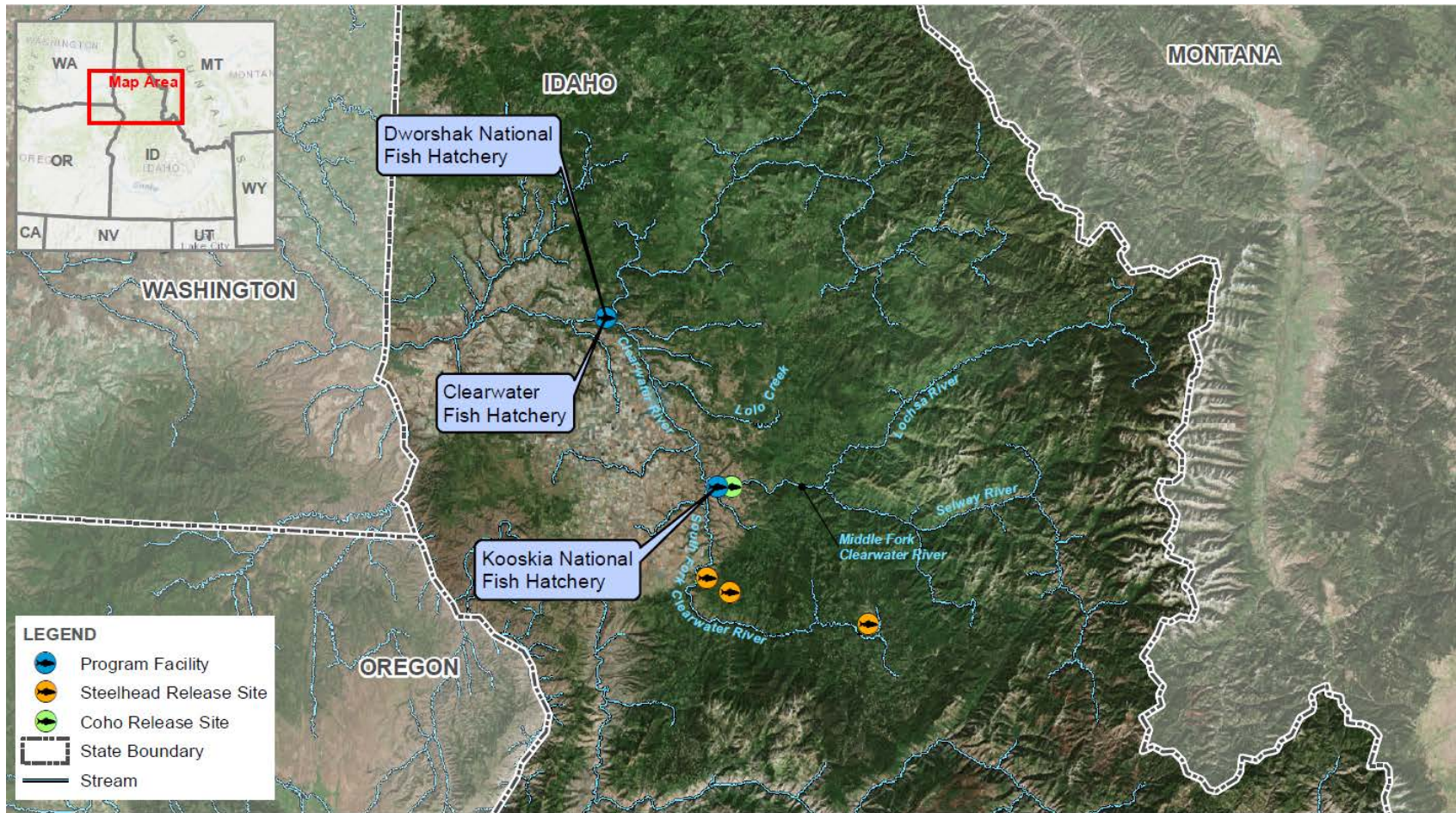
1 to manage effects (negative and positive) on natural salmon and steelhead populations, both ESA-listed  
2 and non-listed. Although the Mitchell Act FEIS analyzed the likely comprehensive effects of hatchery  
3 production on broad scales, it did not contain site-specific analyses for the programs included in this EA.  
4 Where relevant, this EA compares production levels from the 15 included programs to the alternatives  
5 analyzed in the Mitchell Act FEIS to inform the analysis of program effects relative to the range of  
6 alternatives analyzed in the Mitchell Act FEIS (Table 2-1).

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Columbia River Basin affecting primary and contributing salmon and steelhead populations in the Interior Columbia Recovery Domain would meet the stronger performance goal.

- Alternative 6 – All Hatchery Programs Meet Stronger Performance Goal; under this alternative, all hatchery programs in the Columbia River Basin affecting primary and contributing salmon and steelhead populations would meet the stronger performance goal

1



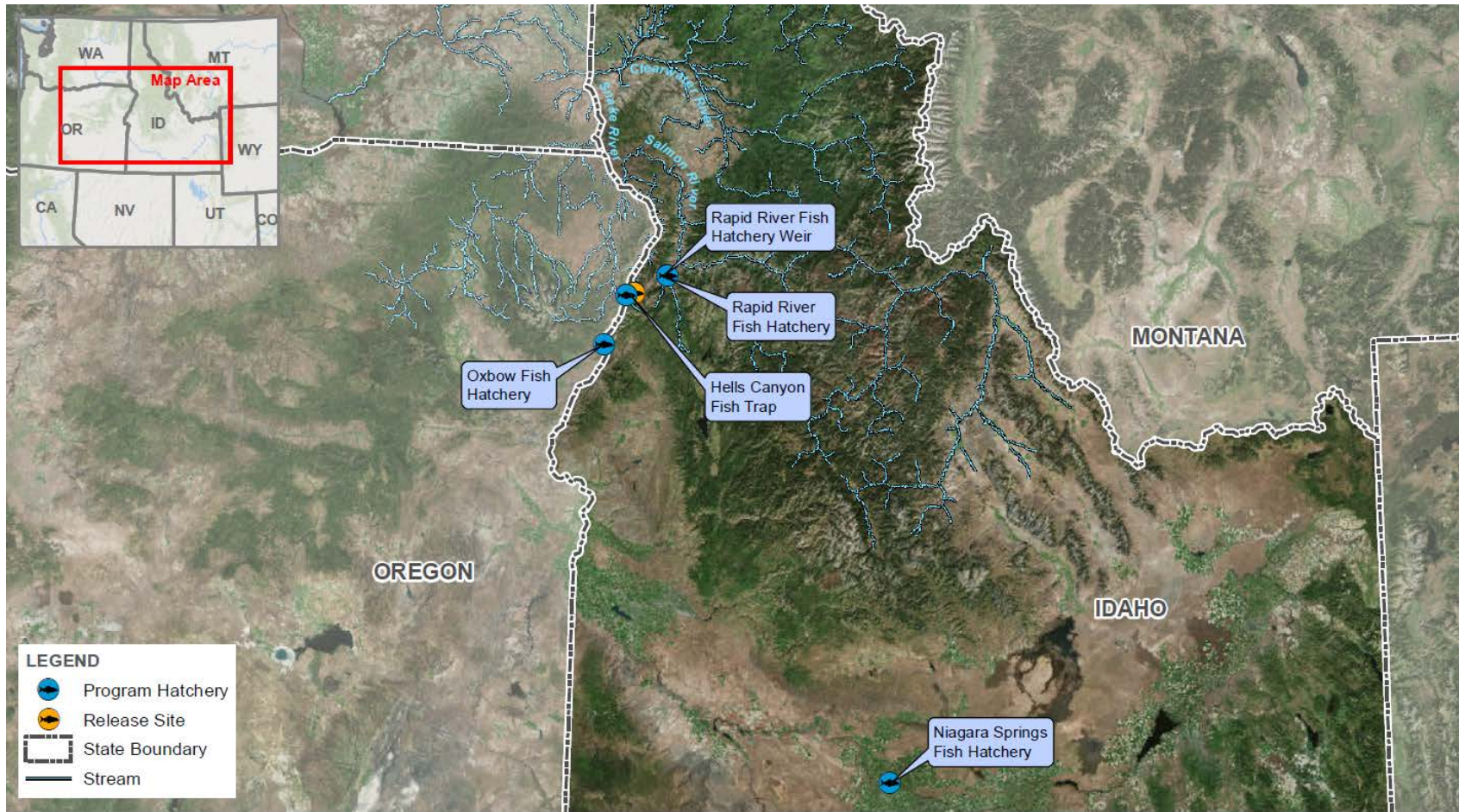
DATA SOURCE: IDFG (2016) and USGS (2017)



2

3 Figure 2-1. Hatchery facilities and release sites for programs in the Clearwater River Subbasin included in this EA.

1



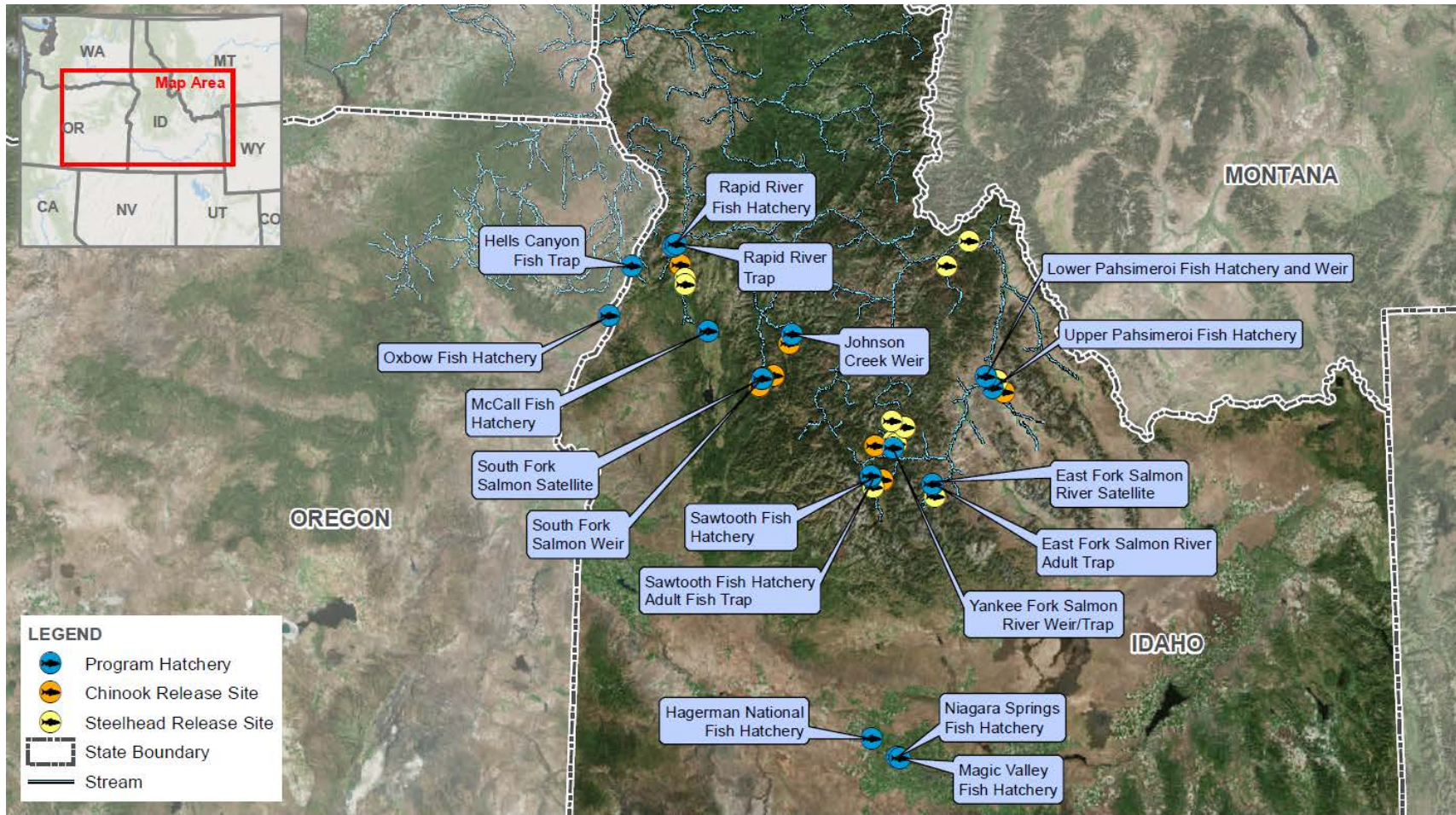
DATA SOURCE: IDFG (2016) and USGS (2017)



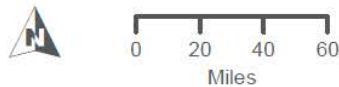
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3 Figure 2-2. Hatchery facilities and release sites for programs in the Hells Canyon Reach of the Snake River included in this EA.

1



DATA SOURCE: IDFG (2016) and USGS (2017)



2

3 Figure 2-3. Hatchery facilities and release sites for programs in the Salmon River Subbasin included in this EA.

1 Table 2-1. Smolt and egg releases for the (identical) No Action / Proposed Action alternatives versus releases defined for alternatives in the  
2 Mitchell Act FEIS (NMFS 2014a).

Program	Operator	Funding Source <sup>1</sup>	No Action/Proposed Production Level	Life Stage at Release	Relation of Release Numbers under the Proposed Action to those under the Six Mitchell Act FEIS Alternatives
<b>Clearwater River Subbasin</b>					
Clearwater Coho Salmon	Nez Perce Tribe	CRITFC	500,000	Smolts	Between Alternative 2 (0 smolts) and Alternative 1, Alternative 3, Alternative 4, Alternative 5, and Alternative 6 (843,480 smolts)
South Fork Clearwater Steelhead	IDFG	LSRCP	843,000	Smolts	Lower than all alternatives (1,050,344 smolts)
<b>Hells Canyon Reach</b>					
Hells Canyon Snake River A-run Summer Steelhead	IDFG	IPC	550,000	Smolts	Slightly greater than, but similar to all alternatives (525,388 smolts)
Hells Canyon Snake River Spring Chinook Salmon	IDFG	IPC	350,000	Smolts	Greater than all alternatives (299,536 smolts)
<b>Salmon River Subbasin</b>					
Little Salmon River A-run Summer Steelhead	IDFG	LSRCP and IPC	636,000	Smolts	Slightly lower than, but similar to all alternatives (645,044 smolts)
Little Salmon/Rapid River Spring Chinook Salmon	IDFG	IPC	2,650,000	Smolts	Slightly greater than, but similar to all alternatives (2,600,160 smolts)
South Fork Salmon River Summer Chinook Salmon	IDFG	LSRCP	1,000,000	Smolts	Greater than Alternative 2, Alternative 3, and Alternative-4 (223,344 smolts), and similar to Alternative 1, Alternative 5, and Alternative 6 (999,464 smolts)
Johnson Creek Artificial Propagation Enhancement	Nez Perce Tribe	BPA	150,000	Smolts	Greater than all alternatives (101,165 smolts)
South Fork Chinook Salmon Eggbox	Shoshone-Bannock Tribes	Various	300,000	Eyed-eggs	Not applicable
Pahsimeroi A-run Summer Steelhead	IDFG	IPC	800,000	Smolts	Lower than Alternative 1, Alternative 2, Alternative 3, Alternative 4, Alternative 5 (1,009,515 smolts), and Alternative 6 (1,009,720 smolts)
Pahsimeroi Summer Chinook Salmon	IDFG	IPC	1,000,000	Smolts	Greater than Alternative 5 (799,900 smolts) and similar to Alternative 1, Alternative 2, Alternative 3, Alternative 4, and Alternative 6 (999,400 smolts)

Program	Operator	Funding Source <sup>1</sup>	No Action/Proposed Production Level	Life Stage at Release	Relation of Release Numbers under the Proposed Action to those under the Six Mitchell Act FEIS Alternatives
East Fork Salmon River Natural A-run Steelhead	IDFG Shoshone-Bannock Tribes	LSRCP	60,000	Smolts	Between Alternative 2, Alternative 3, and Alternative 4 (0 smolts) and Alternative 1, Alternative 5, and Alternative 6 (180,172 smolts)
Steelhead Streamside Incubator Project A-run and B-run	Shoshone-Bannock Tribes	Various	1,000,000	Eyed-eggs	Not applicable
Salmon River B-run Steelhead	IDFG and Shoshone-Bannock Tribes	LSRCP	1,085,000	Smolts	Between Alternative 6 (1,042,767 smolts) and Alternative 5 (1,339,000 smolts)
Upper Salmon Spring Chinook Salmon	IDFG	LSRCP	1,700,000 <sup>3</sup>	Smolts	Between Alternative 5 (1,200,461 smolts) and Alternative 6 (2,099,866 smolts)

1 CRITFC = Columbia River Inter-Tribal Fish Commission, LSRCP = Lower Snake River Compensation Plan, IPC = Idaho Power Company (through the Hells Canyon Settlement Agreement, BPA = Bonneville Power Administration.

2  
3 <sup>2</sup>Hatchery managers have agreed to target the release number as specified in the Proposed Action; however, because of the variability in within-hatchery survival, some flexibility is needed. Therefore, the Proposed Action includes juvenile release targets that include a cushion, not to exceed an additional 10 percent of each program's release target, by the hatchery annually, which must be approved by the managers (NMFS 2017a).

4  
5  
6 <sup>3</sup>An additional 300,000 smolts reared at Sawtooth Fish Hatchery for release into the Yankee Fork Salmon River are included in a separate EA currently being drafted, as Yankee Fork  
7 Salmon River releases are part of a different program.



## 2.1.1 Clearwater Subbasin and Hells Canyon Programs

### 2.1.1.1 Clearwater Subbasin

#### Clearwater Coho Salmon

The Nez Perce Tribe initiated a Clearwater River Coho Restoration Project in 1994 to reintroduce coho salmon to the Clearwater River Subbasin<sup>2</sup>. An agreement under U.S. v. Oregon allowed the Nez Perce Tribe to use surplus coho salmon eggs from the Lower Columbia River to reintroduce the species in the Clearwater River Subbasin for supplementation purposes. The release of 500,000 coho salmon smolts at Kooskia National Fish Hatchery on Clear Creek in the Middle Fork Clearwater River watershed is included as part of this action.

Adult collection and spawning occurs at Dworshak National Fish Hatchery (adults may also be collected in Clear Creek, at Kooskia National Fish Hatchery, and at a weir on Lapwai Creek), and incubation and rearing occur at both Dworshak and Kooskia national fish hatcheries (Table 2-2; Figure 2-1). Juvenile fish are acclimated at Kooskia National Fish Hatchery and released as smolts directly into Clear Creek.

#### South Fork Clearwater Steelhead

The segregated<sup>3</sup> South Fork Clearwater Steelhead program is intended to mitigate for fish losses caused by the construction and operation of the four Lower Snake River Federal dams. In addition to harvest mitigation, approximately 40 percent of the steelhead production at Clearwater Fish Hatchery is dedicated to producing steelhead intended to supplement natural spawners in the Upper South Fork Clearwater River. The total production target is 843,000 localized steelhead smolts released into the South Fork Clearwater River watershed.

Broodstock for this program were historically trapped at Dworshak National Fish Hatchery. As part of the transition to becoming locally adapted, broodstock are now collected by anglers in the South Fork Clearwater River and transported to Dworshak National Fish Hatchery for spawning (Table 2-2). If needed, broodstock are collected at Dworshak National Fish Hatchery. Eyed eggs are transported to Clearwater Fish Hatchery for incubation and rearing. All juvenile fish are transported as smolts to release sites in the South Fork Clearwater River watershed (Table 2-2; Figure 2-1).

### 2.1.1.2 Hells Canyon

#### Hells Canyon Snake River A-run Summer Steelhead

The segregated Hells Canyon Snake River A-run Summer Steelhead Program was established to mitigate for anadromous fish losses caused by the construction and continued operation of the Hells Canyon Complex. The release target for the HCSA includes 550,000 smolts released downstream from

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<sup>2</sup> While the long-term goal of the program is to include natural-origin broodstock when the natural populations are restored, this program is analyzed as a segregated program at this time because hatchery-origin broodstock will primarily be used for production until the natural populations are restored.

<sup>3</sup> Segregated programs use hatchery-origin fish for broodstock and intend to minimize interbreeding between hatchery stock and the natural population, maintaining high genetic divergence. Integrated programs intend to minimize genetic divergence between the hatchery stock and the natural population with which it is expected to exchange spawners.

1 Hells Canyon Dam in the mainstem Snake River in March and April. Release levels are slightly higher  
2 than those described for all Mitchell Act FEIS alternatives.

3 Broodstock for the program are collected at the Hells Canyon Fish Trap and transported to Oxbow Fish  
4 Hatchery for spawning and incubation (Table 2-2; Figure 2-2). Final egg incubation and juvenile rearing  
5 occurs at Niagara Springs Fish Hatchery. Smolts are released within the Hells Canyon reach of the  
6 Snake River, downstream of Hells Canyon Dam.

### 7 **Hells Canyon Snake River Spring Chinook Salmon**

8 The segregated Hells Canyon Snake River Spring Chinook Salmon program was established to mitigate  
9 for anadromous fish losses caused by the construction and continued operation of the Hells Canyon  
10 Complex. Operations, rearing, smolt releases, and broodstock collection are managed in conjunction with  
11 the Little Salmon/Rapid River Spring Chinook Salmon Program at Rapid River Fish Hatchery (Section  
12 2.1.2.1, Little Salmon River). The total production target for the combined program includes 3 million  
13 yearling smolts. The portion of the release considered herein is 350,000 smolts released below Hells  
14 Canyon Dam in March or April. Release levels are slightly higher than those described for all Mitchell Act  
15 FEIS alternatives.

16 Broodstock for the program are collected at the Rapid River Fish Trap located approximately 1.5 miles  
17 downstream from Rapid River Fish Hatchery and at the Hells Canyon Fish Trap (Table 2-2; Figure 2-2).  
18 Approximately 88 to 90 percent of the annual broodstock is collected at the Rapid River Fish Trap, and  
19 the remaining 10 to 12 percent of the annual broodstock is collected at the Hells Canyon fish trap. The  
20 Rapid River Fish Hatchery is located on the Rapid River, a tributary to the Little Salmon River. Adults  
21 collected from both sites are managed as a single broodstock. In the rare event that brood needs for  
22 Rapid River and Hells Canyon facilities cannot be met, Rapid River and Hells Canyon programs can  
23 include excess Clearwater Subbasin fish.

24 Holding, spawning, and rearing occur at Rapid River Fish Hatchery. However, 1.8 million green eggs  
25 between this program and the Little Salmon/Rapid River Spring Chinook Salmon Program are transferred  
26 to Oxbow Fish Hatchery for early incubation. These eggs are returned back to Rapid River Fish Hatchery  
27 for incubation. Smolts are released from the Rapid River Fish Hatchery holding ponds and directly into  
28 the Snake River downstream of Hells Canyon Dam.

## 29 **2.1.2 Salmon River Programs**

### 30 **2.1.2.1 Little Salmon River**

#### 31 **Little Salmon River A-run Summer Steelhead**

32 The segregated Little Salmon River A-run Summer Steelhead program was established to mitigate for  
33 fish losses caused by the construction and continued operation of the Hells Canyon Complex and the four  
34 Lower Snake River Federal dams. Under that portion of the program considered in this EA, 636,000  
35 smolts are released in the Little Salmon River.

36 Broodstock for the program are collected at the Hells Canyon Fish Trap, Lower Pahsimeroi Fish  
37 Hatchery, and Dworshak National Fish Hatchery (Table 2-3; Figure 2-3). Early incubation occurs at  
38 Clearwater, Oxbow, Sawtooth or Lower Pahsimeroi fish hatcheries. Final egg incubation and juvenile  
39 rearing occurs at Niagara Springs and Magic Valley fish hatcheries. Smolts are released into the Little  
40 Salmon River in April.

## 1 Little Salmon/Rapid River Spring Chinook Salmon

2 The segregated Little Salmon/Rapid River Spring Chinook Salmon program was established to mitigate  
3 for anadromous fish losses caused by the construction and operation of the Hells Canyon Complex. The  
4 production goal included in this EA is 2.65 million smolts.

5 Broodstock for the program are collected at the adult trap located on the Rapid River, downstream of  
6 Rapid River Fish Hatchery, and at the Hells Canyon Fish Trap (Table 2-4; Figure 2-2; Figure 2-3).  
7 Holding, spawning, and rearing occur at Rapid River Fish Hatchery. However, 1.8 million green eggs  
8 between this program and the Hells Canyon program are transferred to Oxbow Fish Hatchery for early  
9 incubation. These eggs are returned back to Rapid River Fish Hatchery for incubation. Smolts are  
10 released from the Rapid River Fish Hatchery holding ponds and into the Rapid River, Little Salmon River,  
11 and Hells Canyon. Of the 2.65 million smolts, the first 2.5 million smolts are released into the Rapid River  
12 and release of the remaining 150,000 smolts alternates between Hells Canyon and the Little Salmon  
13 River in 100,000 and 50,000 intervals, respectively.

### 14 2.1.2.2 South Fork Salmon River

#### 15 South Fork Salmon River Summer Chinook Salmon

16 The South Fork Salmon River Summer Chinook Salmon program was established to mitigate for fish  
17 losses caused by the construction and operation of the four Lower Snake River Federal dams. The  
18 program includes both segregated harvest and integrated conservation components which, combined,  
19 release 1 million hatchery-origin yearlings into the South Fork Salmon River. The program is designed to  
20 move towards being fully integrated depending on natural origin returns (NORs). However, at low natural-  
21 origin escapement levels, these releases include 850,000 fish from the segregated component and  
22 150,000 fish from the integrated component.

23 The segregated and integrated components of the program are related genetically because a percentage  
24 of returning fish from the integrated component are used as broodstock for the segregated component.  
25 The number of hatchery and natural-origin adults that are either retained for broodstock (for integrated  
26 components) or released to spawn naturally is based on a sliding scale. Under the sliding scale approach,  
27 fully implemented in 2014, the size of the integrated smolt program increases with a corresponding  
28 increase in the number of NORs to the collection weir (Table 2-5). Therefore, the abundance of NOR  
29 Chinook salmon determines the proportion of natural-origin fish retained for broodstock (pNOB) and the  
30 numbers of hatchery-origin adults released to spawn naturally (pHOS).

31 Broodstock for the program are collected at the South Fork Salmon River Satellite, a facility located on  
32 the South Fork Salmon River, approximately 71 river miles upstream from the mouth (Table 2-4;  
33 Figure 2-3). If the natural-origin returns in a given year are forecasted to be fewer than 50 adults to the  
34 satellite, managers contact NMFS prior to initiating broodstock collection.

35 Fish are held at the South Fork Salmon River Satellite for spawning. Eggs are transferred to McCall Fish  
36 Hatchery for incubation and rearing<sup>4</sup>. Smolts are released in the South Fork Salmon River at Knox Bridge,  
37 approximately 1 mile upstream from the satellite facility.

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<sup>4</sup> Broodstock collection at the South Fork Salmon River Weir and the productions at the McCall Fish Hatchery also include the South Fork Salmon River Chinook Salmon Eggbox Program, as discussed below.

### 1 **Johnson Creek Artificial Propagation Enhancement**

2 The primary goal of the JCAPE program is to use indigenous stock only to provide for the restoration of  
3 summer Chinook salmon in Johnson Creek and to mitigate for fish losses occurring as a result of the  
4 construction and operation of the four Lower Snake River dams. The program is an integrated recovery  
5 program for mitigation and is managed to recover and sustain the population and to provide harvest  
6 opportunities in years of abundant returns.

7 The production target is up to 150,000 smolts (current and historical production targets are, and have  
8 been, 100,000 smolts) using natural-origin broodstock collected at a temporary picket weir and trap  
9 placed in Johnson Creek, approximately 5.1 miles above the confluence of Johnson Creek and the East  
10 Fork of the South Fork of the Salmon River (Table 2-4; Figure 2-3). If natural-origin returns are under 100,  
11 then managers consult with NMFS to determine broodstock numbers. Upon collection, adults are  
12 transported to and held at the South Fork Salmon Satellite for spawning. Eggs are transferred to McCall  
13 Fish Hatchery for incubation and rearing and smolts are released in Johnson Creek at Moose Creek. No  
14 additional water or rearing facilities at McCall Fish Hatchery would be required for the increase in JCAPE  
15 production. Eggs or fish in excess of hatchery capacity may at times require early release into Upper  
16 Johnson Creek.

### 17 **South Fork Chinook Salmon Eggbox**

18 The SFCEP began in 1997 and uses Chinook salmon production from McCall Fish Hatchery to help  
19 maintain, rehabilitate, and enhance Chinook salmon in tributary habitat of the South Fork Salmon River.  
20 The program currently uses 300,000 eyed-eggs from the South Fork Salmon River segregated program  
21 (see above, South Fork Salmon River Summer Chinook Salmon), but returns permitting, the South Fork  
22 Salmon River integrated program may be able to provide eggs to the SFCEP.

23 The production target includes the release of 300,000 eggs into egg boxes. Eggs are currently placed in  
24 six egg boxes in Lower Cabin Creek and six egg boxes in Lower Curtis Creek, with 150,000 eggs per  
25 creek; both creeks are tributaries to the South Fork Salmon River, upstream of the South Fork Salmon  
26 Satellite and Trap (Table 2-6; Figure 2-3). Adult broodstock are collected at the South Fork Salmon  
27 Satellite, and spawning and incubation occur at McCall Fish Hatchery. After hatching, fry volitionally  
28 migrate from egg boxes to the stream. Release sites are accessed the following spring to remove the  
29 boxes and estimate hatch success.

### 30 **2.1.2.3 Pahsimeroi River**

#### 31 **Pahsimeroi A-run Summer Steelhead**

32 The purpose of the segregated Pahsimeroi A-run Summer Steelhead Program is to mitigate for fish  
33 losses caused by the construction and continued operation of the Hells Canyon Complex. Of the smolts  
34 produced from broodstock collected at the Lower Pahsimeroi Fish Hatchery, approximately 800,000 are  
35 targeted for release in the Pahsimeroi River immediately downstream of the weir and are included in this  
36 alternative and Alternative 2.

37 Broodstock for the program are collected at the Lower Pahsimeroi Fish Hatchery through use of a weir  
38 that spans the Pahsimeroi River, and diverts adults through an attraction canal and a fish ladder  
39 (Table 2-3; Figure 2-3). If needed, broodstock for this program may also be collected at the Hells Canyon  
40 Trap or Sawtooth Fish Hatchery. Egg incubation is conducted at Upper Pahsimeroi Fish Hatchery, and  
41 final incubation and rearing are conducted at Niagara Springs Fish Hatchery. Smolts for the program are  
42 released directly into the Pahsimeroi River, below the weir. Some production may be used for the  
43 Steelhead Streamside Incubator A-run program in Panther Creek (Table 2-6).

## **Pahsimeroi Summer Chinook Salmon**

The purpose of the Pahsimeroi Summer Chinook Salmon Program is to mitigate for anadromous fish losses caused by the construction and operation of the Hells Canyon Dam Complex. The majority of the program is operated as a segregated harvest program; however, a component of the hatchery program includes an integrated conservation program intended to supplement natural spawning above the hatchery weir. Of the 1.0 million smolts released under the program, 65,000 comprise the integrated program and 935,000 smolts are part of the segregated component of the program.

The numbers of integrated hatchery-origin and natural-origin adults that are either retained for broodstock or released to spawn naturally are based on sliding scales. If returns of integrated adults are in excess of integrated broodstock and natural escapement needs, some may be included in the segregated component of the program, based on a sliding scale (Table 2-7).

The abundance of natural-origin returns (NORs) determines the proportion of natural-origin fish retained for broodstock (pNOB) and the number of hatchery-origin adults released to spawn naturally above the weir (pHOS) in both program components. Broodstock for the program are collected at the Lower Pahsimeroi Fish Hatchery through use of the adult weir (Table 2-4; Figure 2-3). Adults are also held and spawned at the Lower Pahsimeroi Fish Hatchery. Incubation and rearing are conducted at the Upper Pahsimeroi Fish Hatchery. Hatchery-origin yearling smolts are volitionally released from two holding ponds at Upper Pahsimeroi Fish Hatchery in late March to mid-April.

### **2.1.2.4 East Fork Salmon River**

#### **East Fork Salmon River Natural A-run Steelhead**

The purpose of the integrated East Fork Salmon River Natural A-run Summer Steelhead Program is to increase the abundance of the natural population. It is part of the LSRCP to mitigate for fish losses caused by the construction and operation of the four Lower Snake River Federal dams. This program is operated as an integrated conservation program and releases 60,000 smolts into the East Fork Salmon River.

Broodstock are collected at an adult trapping facility on the East Fork Salmon River, located 18 miles upstream of the river's mouth (Table 2-3; Figure 2-3). The facility includes a velocity barrier, an associated adult trap and raceways for temporary adult holding. Fish are spawned at the East Fork Salmon River Satellite. Green eggs collected at the satellite facility are transported to Sawtooth Fish Hatchery, located near the headwaters of the Salmon River, approximately 400 miles upstream from the mouth of the Salmon River. At Sawtooth Fish Hatchery, the eggs are incubated to the eyed stage of development. Eyed eggs are then transported to Hagerman National Fish Hatchery, where the remaining incubation and rearing to smolts occurs. Smolts are transported back to the East Fork Salmon River Satellite and released near the adult trap.

### **2.1.2.5 Upper Salmon River**

#### **Salmon River B-run Steelhead**

The segregated Salmon River B-run Steelhead Program provides harvest mitigation for fish losses caused by the construction and operation of the four Lower Snake River Federal dams. The management goal for the program is to provide fishing opportunities in the Upper Salmon River for larger B-run type steelhead that return predominantly as age 2 ocean adults. The production goal for the entire Salmon River B-run Steelhead Program is to release approximately 1.085 million smolts annually, which includes

1 217,000 into the Little Salmon River, 248,000 into the Pahsimeroi River, and 620,000 into the Yankee  
2 Fork Salmon River.

3 Broodstock for the program would eventually be collected from only the Yankee Fork Salmon River,  
4 through a combination of angling by Shoshone-Bannock Tribes staff and collection at a temporary or  
5 permanent weir. If the permanent weir is built, it will be constructed in conjunction with the Shoshone-  
6 Bannock Tribes' Crystal Springs Hatchery Facility (construction of the hatchery or the weir are not part of  
7 the proposed action). Presently this is uncertain to occur, so until a consistent number of broodstock can  
8 be collected in Yankee Fork to achieve program goals, broodstock are collected in the Yankee Fork  
9 Salmon River via angling or at temporary weirs, the Lower Pahsimeroi weir, or sourced at Dworshak  
10 National Fish Hatchery (Table 2-3; Figure 2-2; Figure 2-3). Dworshak-origin fish are released in the  
11 Pahsimeroi River. Adults are held and spawned at the Lower Pahsimeroi Fish Hatchery, Yankee Fork  
12 Trap/Sawtooth Fish Hatchery or Dworshak. Eggs may be incubated to the eyed stage at Clearwater Fish  
13 Hatchery or at Sawtooth Fish Hatchery and then transferred to Magic Valley Fish Hatchery for final  
14 incubation and rearing. All other incubation and rearing occurs at Magic Valley Fish Hatchery. Release of  
15 yearling smolts from Magic Valley Fish Hatchery occurs in the Yankee Fork Salmon River, the Pahsimeroi  
16 River immediately downstream of the adult weir, and in the Little Salmon River.

### 17 **Steelhead Streamside Incubator A-run and B-run**

18 This program consists of eggs from both the Pahsimeroi A-run Summer Steelhead Program (subsection  
19 above, Pahsimeroi A-run Summer Steelhead) and the Salmon River B-run Steelhead Program  
20 (subsection above, Salmon River B-run Steelhead). The 2018-2027 *U.S. v. Oregon* Management  
21 Agreement includes a provision that parties agree on three locations for planting steelhead eyed-eggs in  
22 the Salmon River Subbasin, including Indian Creek, Panther Creek, and the Yankee Fork. The resulting  
23 SSI program is a conservation program designed as a supplementation program whereby returning  
24 hatchery-origin steelhead are collected at Sawtooth and Pahsimeroi fish hatcheries to produce up to  
25 1.0 million eyed-eggs, with 500,000 coming from each hatchery.

26 Eggs for Indian and Panther creeks are sourced from the Pahsimeroi A-run Summer Steelhead Program.  
27 In Indian Creek, two streamside incubators are located approximately 0.6 mile upstream from the  
28 confluence with the Salmon River. Four streamside incubators are located at the confluence of Beaver  
29 Creek and Panther Creek.

30 Eggs from the Salmon River B-run Steelhead Program are distributed among streamside incubators in  
31 tributaries of the Yankee Fork Salmon River (Table 2-6; Figure 2-3). Eggs incubated in Yankee Fork are  
32 sourced from the Lower Pahsimeroi Fish Hatchery (Pahsimeroi A-run) and Dworshak National Fish  
33 Hatchery (Salmon River B-run). Two incubators are placed in Yankee Fork Salmon River tributaries. For  
34 both components, fry volitionally migrate from egg boxes to the stream after hatching.

### 35 **Upper Salmon River Spring Chinook Salmon**

36 The purpose of the Upper Salmon River Spring Chinook Salmon Program is to mitigate for fish losses  
37 caused by the construction and operation of the four Lower Snake River Federal dams. The program has  
38 two components (segregated and integrated) with a genetic linkage between them. A percentage of  
39 returning fish from the integrated component is released upstream of the Sawtooth Fish Hatchery to  
40 spawn naturally or used as broodstock, based on a sliding scale (Table 2-8). This program is operated as  
41 an integrated stepping-stone program, maintaining a large segregated group that continues to address  
42 harvest objectives, and an integrated group that is used to supplement spawners upstream of the adult  
43 weir.

1 Four abundance-based production levels are associated with increasing the size of the integrated  
2 component of the program (Table 2-9). As the number of smolts produced for the integrated component  
3 increases, the number of segregated smolts produced decreases an equivalent amount so that the total  
4 production of the program remains the same. The intent is to transition, over the long term as part of the  
5 proposed action, into a fully-integrated program, which can be completed once natural production is  
6 sufficient to provide the required number of natural-origin brood fish. This transition is likely to take  
7 multiple generations (more than 10 years) because it is unlikely that natural populations would improve to  
8 such levels quickly.

9 All broodstock collection, spawning, incubation, and rearing occur at the Sawtooth Fish Hatchery  
10 (Table 2-4; Figure 2-3). The program target is to release approximately 1.7 million yearling spring Chinook  
11 salmon each year into the Upper Salmon River at the Sawtooth Fish Hatchery. This target includes  
12 approximately 1.45 million smolts from the segregated harvest component and 250,000 smolts from the  
13 integrated conservation component. Smolts are released into the Salmon River immediately upstream of  
14 the hatchery weir. An additional 300,000 smolts reared at Sawtooth Fish Hatchery for release into the  
15 Yankee Fork Salmon River are included in a separate EA being drafted, as Yankee Fork Salmon River  
16 releases are part of a different program.

### 17 **2.1.3 Research, Monitoring, and Evaluation**

18 Surveying and sampling to assess program objectives and goals may increase the risk of injury and  
19 mortality to salmon and steelhead that are the focus of the actions, or that may be incidentally  
20 encountered. RM&E activities discussed in this EA are related directly to the hatchery programs  
21 described in this EA (Table 2-10; Table 2-11; Table 2-12). RM&E may include monitoring survival and  
22 growth within hatcheries and sampling outside of hatcheries, to assess the effects of hatchery fish on  
23 population, productivity, genetic diversity, run and spawn timing, spawning distribution, and age and size  
24 at maturity. This information may be collected from:

- 25 • Spawning ground surveys to assess abundance, distribution, and origin (hatchery or natural) of  
26 spawners through marking (i.e., passive integrated transponder (PIT) tags, coded-wire tags  
27 [CWT,] and adipose fin-clips)
- 28 • Stock composition sampling (genetics, disease) to determine population age, sex, and size  
29 distribution
- 30 • Juvenile sampling in the hatchery to determine smoltification status, size distribution, and  
31 precocial maturation
- 32 • Juvenile trapping using screw traps to determine abundance, survival, emigration timing, and  
33 size of juveniles
- 34 • PIT tagging to track downstream migration of juveniles and provide information on residualism  
35 rates of hatchery fish, and to determine emigration timing, population abundance, overwinter  
36 survival, and emigration survival of natural-origin fish

### 37 **2.1.4 Operation and Maintenance**

38 Most hatcheries used for operation of programs included in this EA divert surface water and return it to  
39 the diverted waterbody (minus any leakage and evaporation). Magic Valley, Niagara Springs, and  
40 Hagerman National fish hatcheries utilize springs or groundwater. Both surface and groundwater used at  
41 all facilities are withdrawn in accordance with state-issued water rights. All facilities are being evaluated  
42 against the NMFS (2011a) screening and passage criteria. The proposed strategy to determine  
43 compliance and prioritize needs is based on entrainment risks and specific compliance concerns.

1 Modifications and upgrades are based on the prioritized list and acted upon as funding becomes  
2 available.

3 For additional information regarding facility water sources for each program, refer to Section 3.1, Water  
4 Quantity, and Section 3.2, Water Quality, of this EA, and to the Biological Opinions recently issued for  
5 each program (NMFS 2017a, 2017b, 2017c, 2017d). Programs that rear over 20,000 pounds of fish  
6 annually operate under applicable National Pollutant Discharge Elimination System (NPDES) general  
7 permits.

8 Several routine (and semi-routine) maintenance activities occur in or near water that could impact fish in  
9 the area including sediment/gravel removal/relocation from intake and/or outfall structures, pond cleaning,  
10 pump maintenance, debris removal from intake and outfall structures, and maintenance and stabilization  
11 of existing bank protection. All in-water maintenance activities considered “routine” (occurring on an  
12 annual basis) or “semi-routine” (occurring with regularity, but not necessarily on an annual basis) occur  
13 within existing structures or the footprint of areas that have already been impacted. When maintenance  
14 activities occur within water, they are implemented under the following conditions:

- 15 • In-water work:
  - 16 ○ Is done during the allowable freshwater work times established for each location, or  
17 complies with an approved variance of the allowable freshwater work times with IDFG,  
18 NMFS, and USFWS
  - 19 ○ Follows a pollution and erosion control plan that addresses equipment and materials  
20 storage sites, fueling operations, staging areas, cement mortars and bonding agents,  
21 hazardous materials, spill containment and notification, and debris management
  - 22 ○ Ceases if fish are observed in distress at any time as a result of the activities
  - 23 ○ Includes notification of NMFS staff
  - 24 ○ Is conducted using equipment retrofitted with vegetable-based synthetic fuel oil
- 25 • Equipment:
  - 26 ○ Is inspected daily, and is free of leaks before leaving the vehicle staging area
  - 27 ○ Works above OHWM or in the dry whenever possible
  - 28 ○ Is sized correctly for the work to be performed and has approved oils/lubricants when  
29 working below the OHWM
  - 30 ○ Is staged and fueled in appropriate areas 150 feet from any waterbody
  - 31 ○ Is cleaned and free of vegetation before it is brought to the site and prior to removal from  
32 the project area



1 Table 2-2. Overview of operations for the Clearwater River Subbasin and the Hells Canyon Reach of the Snake River.

Parameter	Clearwater River Subbasin		Hells Canyon Reach	
	Clearwater Coho Salmon	South Fork Clearwater Steelhead	Hells Canyon Snake River A-run Summer Steelhead	Hells Canyon Snake River Spring Chinook Salmon
<b>Adults</b>				
Component and Purpose	Reintroduction and supplementation	Segregated harvest <sup>1</sup>	Segregated harvest	Segregated harvest
Broodstock number and type (HOR vs. NOR) <sup>2</sup>	1,200 HORs	386 HORs	750 HORs	400 HORs
Collection location <sup>3</sup>	Dworshak NFH; Kooskia NFH; Clear Creek Weir Lapwai Creek Weir	SF Clearwater River angling; Dworshak NFH	Hells Canyon Trap	Hells Canyon Trap; Rapid River Trap
Collection timing	Oct-Dec	Feb-Mar	Oct-Nov; Mar-Apr	Apr-Aug
Adult holding location	Dworshak NFH; Kooskia NFH	Dworshak NFH	Oxbow FH	Rapid River FH
Adult spawning location	Dworshak NFH	Dworshak NFH	Oxbow FH	Rapid River FH
<b>Incubation, Rearing, and Release</b>				
Incubation location	Dworshak NFH; Kooskia NFH	Dworshak NFH; Clearwater FH	Oxbow FH Niagara Springs FH	Rapid River FH (early incubation may occur at Oxbow FH)
Rearing location	Dworshak NFH; Kooskia NFH	Clearwater FH	Niagara Springs FH	Rapid River FH
Acclimation location	Kooskia NFH	None	None	None
Release locations	Clear Creek	SF Clearwater River (Red House Hole) Meadow Creek Newsome Creek	Snake River at Hells Canyon	Snake River at Hells Canyon
Release timing	April-May	April	March-April	March or April
Release number	500,000	843,000	550,000	350,000
Marks <sup>4</sup>	CWT = 16%-50% (range depends on funding) PBT = 100%	Adipose fin clip=60% CWT=40% PBT=100% PIT=17,000	Adipose fin clip=100% PBT=100% PIT=8,600	Adipose fin clip=100% PBT=100%

Parameter	Clearwater River Subbasin		Hells Canyon Reach	
	Clearwater Coho Salmon	South Fork Clearwater Steelhead	Hells Canyon Snake River A-run Summer Steelhead	Hells Canyon Snake River Spring Chinook Salmon
<b>Other</b>				
Maximum surface water (or ground/spring water if noted) use by facility (cfs)	Dworshak NFH = 182 <sup>5</sup> Kooskia NFH = 16	Dworshak National FH = 120 Clearwater FH = 89	Oxbow FH = 15.5 Niagara Springs FH = 120 <sup>6</sup>	Rapid River FH = 34 avg, 46.6 maximum Rapid River trap = 18 max
Adult management goal <sup>7</sup>	pNOB = 0	Hatchery-origin straying of known program origin to be no more than 5% of returns to a non-target population targeted for viability or high viability <sup>8</sup>		pHOS = 0 pNOB = 0
Method of adult management	--	Segregated, all fish marked; Excess released for harvest, provided to Tribes or food banks, or disposed	Segregated, all fish marked; Excess provided to Tribes or food banks, transported to non-anadromous waters for fisheries, or used for nutrient enhancement	Segregated, all fish marked; Continue PBT monitoring to better understand population level pHOS; Excess transported for fisheries, given to Tribes, or used for nutrient enhancement
Within basin targeted fisheries	Yes	Yes	Yes	Yes

1 <sup>1</sup>The South Fork Clearwater Steelhead program could also have some conservation benefit to natural populations because propagated fish contain what is remaining of the genetic  
2 material from the North Fork Clearwater population, which has been extirpated (Lance Hebdon, IDFG, pers. Comm.).  
3 <sup>2</sup>HOR = hatchery-origin returns, NOR = natural-origin returns;  
4 <sup>3</sup>NFH = National fish hatchery, FH = fish hatchery,  
5 <sup>4</sup>CWT = coded-wire tag, PBT = parentage-based tagging, PIT = passive integrated transponders  
6 <sup>5</sup>Up to 154 cfs is from the North Fork Clearwater River. The remainder of up to 28 cfs is sourced from Dworshak Reservoir.  
7 <sup>6</sup>Niagara Springs Fish Hatchery utilizes ground/spring water  
8 <sup>7</sup>pHOS = Percent hatchery-origin fish on the spawning grounds, pNOB = percent natural-origin fish in broodstock. Information on the proportion of hatchery- and natural-origin  
9 spawners on natural spawning grounds for steelhead is limited; applicants remove hatchery-origin fish from the wild to the extent possible.  
10 <sup>8</sup>These goals work in conjunction with the goals of steelhead programs described in Table 2-3.

1 Table 2-3. Overview of operations for Salmon River steelhead programs.

Parameter	Little Salmon River A-run Summer Steelhead	Pahsimeroi A-run Summer Steelhead	Salmon River B-run Steelhead <sup>1</sup>	East Fork Salmon River Natural A-run Steelhead
<b>Adults</b>				
Component and Purpose	Segregated harvest	Segregated harvest	Segregated harvest	Integrated recovery
Broodstock number and type (HOR vs. NOR) <sup>2</sup>	Not Applicable	912 HORs	694 HORs	28 NORs (managed on sliding scale)
Collection location <sup>3</sup>	Hells Canyon Trap; Lower Pahsimeroi FH; Dworshak NFH (receives juveniles from Pahsimeroi and Hells Canyon – no additional brood collected)	Primary: Lower Pahsimeroi FH Secondary: Hells Canyon and Sawtooth FH	Lower Pahsimeroi FH; Yankee Fork Weir; Dworshak NFH	EF Salmon Satellite
Collection timing	Hells Canyon = Oct-Nov; Mar-Apr Lower Pahsimeroi = Feb-May Dworshak = Oct-Apr	Feb-May	Lower Pahsimeroi and Dworshak =Feb-Apr; Yankee Fork = Apr-May	Mar-May
Adult holding location	Oxbow FH; Lower Pahsimeroi FH Dworshak NFH	Lower Pahsimeroi FH	Lower Pahsimeroi FH; Yankee Fork Trap/Sawtooth FH <sup>4</sup> ; Dworshak NFH	EF Salmon Satellite
Adult spawning location	Oxbow FH; Lower Pahsimeroi FH Dworshak NFH	Lower Pahsimeroi FH	Lower Pahsimeroi FH; Sawtooth FH; Dworshak NFH	EF Salmon Satellite
<b>Incubation, Rearing, and Release</b>				
Incubation location	Clearwater FH Oxbow FH; Sawtooth FH; Lower Pahsimeroi FH	Upper Pahsimeroi FH; Niagara Springs FH	Clearwater FH; Magic Valley FH; Sawtooth FH	Sawtooth FH; Hagerman NFH
Rearing location	Niagara Springs FH; Magic Valley FH	Niagara Springs FH	Magic Valley FH	Hagerman NFH
Acclimation location	None	None	None	None
Release locations	Little Salmon River	Lower Pahsimeroi FH	Little Salmon River Lower Pahsimeroi FH; Yankee Fork	EF Salmon Satellite

Parameter	Little Salmon River A-run Summer Steelhead	Pahsimeroi A-run Summer Steelhead	Salmon River B-run Steelhead <sup>1</sup>	East Fork Salmon River Natural A-run Steelhead
Release timing	April	April	April-May	Early May
Release number	636,000	800,000	1,085,000	60,000
Marks <sup>5</sup>	Adipose fin clip = 100% PBT=100% PIT = 7,300	Adipose fin clip = 100% PBT=100% PIT = 9,000	CWT=468,000 Adipose fin clip = 617,000 PBT = 100% PIT = 26,900	CWT=100% PBT=100% PIT = 8,600
<b>Other</b>				
Maximum surface water (or ground/spring water if noted) use by facility (cfs)	Lower Pahsimeroi FH = 40 Magic Valley = 87.2 <sup>6</sup> Hells Canyon = 130 Dworshak = 182 <sup>7</sup> Clearwater = 89	Lower Pahsimeroi FH = 40 Upper Pahsimeroi FH = 20 Sawtooth FH = 60	Lower Pahsimeroi FH = 40 Sawtooth FH = 60 Magic Valley FH = 87.2 <sup>6</sup>	EF Salmon Satellite = 15 Sawtooth FH = 60 Hagerman NFH = 84.6 <sup>6</sup>
Adult management goal <sup>8</sup>	Hatchery-origin straying of known program origin to be no more than 5% of returns to a non-target population targeted for viability or high viability <sup>9</sup>			Average PNI ≥ 0.4 (until 2021); ≥ 0.5 (after 2021)
Method of Adult Management	Segregated – 100% marked; Excess provided to Tribes or food banks, transported to non-anadromous waters for fisheries, or used for nutrient enhancement	Segregated – 100% marked; Excess provided to Tribes or food banks, transported to non-anadromous waters for fisheries, or used for nutrient enhancement	Segregated – some marked; Excess provided to Tribes or food banks, transported to Yankee Fork for tribal fishery, or used for nutrient enhancement	None warranted due to low estimated population abundance; Excess released upstream for natural production; strays used for nutrient enhancement
Within basin targeted fisheries	Yes	Yes	Yes	No

1 <sup>1</sup>The Salmon River B-run Steelhead program could also have some conservation benefit to natural populations because propagated fish contain what is remaining of the genetic material from the North Fork Clearwater population, which has been extirpated, and because it may also be re-introducing the B-run life history type into the Upper Salmon Basin (Lance Hebdon, IDFG, pers. Comm.).

2

3

4 <sup>2</sup>HOR = hatchery-origin returns, NOR = natural-origin returns

5 <sup>3</sup>FH = fish hatchery, NFH = National fish hatchery

6 <sup>4</sup>Adults collected at the Yankee Fork Trap are currently transported to Sawtooth FH for holding and spawning.

7 <sup>5</sup>CWT = coded-wire tag, PBT = parentage-based tagging, and PIT = passive integrated transponder; some Salmon River B-run steelhead receive both CWT and an adipose fin clip.

8 <sup>6</sup>Magic Valley and Hagerman National fish hatcheries utilize ground/spring water.

9 <sup>7</sup> Up to 154 cfs is from the North Fork Clearwater River. The remainder of up to 28 cfs is sourced from the Dworshak Reservoir.

10 <sup>8</sup>PNI = proportionate natural influence. Information on the proportion of hatchery- and natural-origin spawners on natural spawning grounds for steelhead is limited; applicants remove hatchery-origin fish from the wild to the extent possible.

11 <sup>9</sup>These goals work in conjunction with the goals of steelhead programs described in Table 2-2.

12

1 Table 2-4. Overview of operations for Salmon River Chinook salmon programs.

Parameter	Little Salmon/Rapid River Spring Chinook Salmon	South Fork Salmon River Summer Chinook Salmon	Johnson Creek Artificial Propagation Enhancement	Pahsimeroi Summer Chinook Salmon	Upper Salmon Spring Chinook Salmon
<b>Adults</b>					
Component and Purpose	Segregated harvest	Segregated – harvest, Integrated conservation	Integrated recovery	Segregated – harvest, Integrated conservation	Segregated – harvest, Integrated conservation
Broodstock number and type (HOR vs. NOR) <sup>1</sup>	2,096 HORs	Segregated: 678 HORs Integrated: up to 104 NORs (total brood), with balance HORs, number managed on sliding scale	Up to 104 NORs (total brood), with balance HORs, (number managed on sliding scale)	Segregated: 704 HORs Integrated: up to 42 NORs (total brood), with balance HORs, number managed on sliding scale	Segregated: 1,018 HORs Integrated: up to 80 NORs (total brood), with balance HORs, number managed on sliding scale
Collection location <sup>2</sup>	Rapid River FH and Hells Canyon Dam traps	South Fork Salmon Weir	Johnson Creek Weir	Lower Pahsimeroi Weir	Sawtooth Hatchery Weir
Collection timing	Late-April – August	Jun-Sep	Jun-Sep	Jun-Sep	Jun-Sep
Adult holding location	Rapid River FH	South Fork Salmon Satellite	South Fork Salmon Satellite	Lower Pahsimeroi FH	Sawtooth Hatchery
Adult spawning location	Rapid River FH	South Fork Salmon Satellite	South Fork Salmon Satellite	Lower Pahsimeroi FH	Sawtooth Hatchery
<b>Incubation, Rearing, and Release</b>					
Incubation location	Rapid River and Oxbow FH	McCall FH	McCall FH	Upper Pahsimeroi FH	Sawtooth Hatchery
Rearing location	Rapid River FH	McCall FH	McCall FH	Upper Pahsimeroi FH	Sawtooth Hatchery
Acclimation location	Yes for Rapid River, none for Little Salmon River	None	None	Upper Pahsimeroi FH	Sawtooth Hatchery
Release locations	Rapid River and Little Salmon River	South Fork Salmon River at Knox Bridge	Johnson Creek at Moose Creek	Upper Pahsimeroi FH	Sawtooth Hatchery
Release timing	Mid-March	March-April	Late March-early April	March-April	March-April
Release number <sup>3</sup>	Up to 2.5 million into Rapid River and 150,000 in Hells Canyon and Little Salmon River	Segregated = 850,000 Integrated = 150,000	Up to 150,000	Segregated = 935,000 Integrated = 65,000	Segregated = 1,450,000 Integrated = 250,000

Parameter	Little Salmon/Rapid River Spring Chinook Salmon	South Fork Salmon River Summer Chinook Salmon	Johnson Creek Artificial Propagation Enhancement	Pahsimeroi Summer Chinook Salmon	Upper Salmon Spring Chinook Salmon
Marks <sup>4, 5</sup>	Adipose fin clip =100% PBT = 100% CWT = 120,000	Segregated: Adipose fin clip = 100% PBT = 100% CWT/PIT = some Integrated: CWT = 100% PIT = some	PBT = 100% CWT = 100% PIT = some	Segregated: Adipose fin clip =100% Integrated: CWT =100%	PBT = 100%; Segregated: Adipose fin clip = 100% CWT/PIT = some Integrated: CWT = 100% PIT = some
<b>Other</b>					
Maximum surface water use by facility (cfs)	Rapid River FH = 34 avg, 46.6 max (hatchery); trap = 18 max	South Fork Salmon Satellite = 9.2 avg, 20 max; McCall FH = 20	McCall FH = 20	Lower Pahsimeroi FH = 40 Upper Pahsimeroi FH = 20	Sawtooth FH = 60
Adult management goal <sup>6</sup>	pHOS = 0	pHOS value can range from 0 to 1.0 depending on NORs and according to the sliding scale management scheme  Integrated pNOB = up to 90%	pHOS: Five year average (2011 to 2015) = 0.45 Future estimates = 0.45  pNOB goal = 100%	pHOS varies by natural-origin abundance (sliding scale management) with recent (2014-2016) values less than 0.41  Segregated pHOS and pNOB = 0 Integrated pNOB = up to 100%	pHOS varies by natural-origin abundance (sliding scale management) with recent (2014-2016) values less than 0.71  Segregated pHOS and pNOB = 0 Integrated pNOB = up to 100%

Parameter	Little Salmon/Rapid River Spring Chinook Salmon	South Fork Salmon River Summer Chinook Salmon	Johnson Creek Artificial Propagation Enhancement	Pahsimeroi Summer Chinook Salmon	Upper Salmon Spring Chinook Salmon
Method of adult management	Segregated, marked; Excess are recycled through fishery, given to tribes or charities, or used for nutrient enhancement	Continue sliding scale management of broodstock collection and passage above satellite (no immediate need to reduce pHOS)  Segregated = all smolts adipose fin clipped Integrated = no external marking; Excess integrated and segregated are recycled through fishery, given to tribes or charities, transported to create fisheries, used to supplement natural spawning, or used for nutrient enhancement	PNI values are over 0.67; continue program operations (no immediate need to reduce pHOS)	Use of adult weir to implement sliding scale management of pHOS  Segregated = all smolts adipose fin clipped Integrated = CWT; Excess segregated are recycled through fishery, given to tribes or charities, or used for nutrient enhancement	Use of adult weir to implement sliding scale management of pHOS  Segregated = all smolts adipose fin clipped Integrated = CWT; Excess integrated and segregated are used to supplement natural production in the Yankee Fork, recycled through fishery, given to tribes or charities, or used for nutrient enhancement
Within basin targeted fisheries	Yes	Segregated = yes; Mainstem and South Fork Salmon marked-selective fisheries	No	Segregated = yes Mainstem and Upper Salmon marked-selective fisheries	Segregated = yes; Mainstem and Upper Salmon marked-selective non-tribal fisheries; Non-selective tribal fisheries

1 <sup>1</sup>HOR = hatchery-origin returns, NOR = natural-origin returns;

2 <sup>2</sup>FH = fish hatchery

3 <sup>3</sup>The size of each program component (integrated vs. segregated) varies based on the number of NORs from limited to full integration as presented in Table 2-5, and Table 2-9.

4 <sup>4</sup>CWT = coded-wire tag, PBT = parentage-based tagging, PIT = passive integrated transponder

5 <sup>5</sup>The number of smolts to be marked via adipose fin clip or CWT varies annually for each program that has both segregated and integrated components, based upon sliding scale and resulting size of integrated vs. segregated smolt program. All integrated smolts will be CWT; fish may be given adipose fin clips as integrated programs increase in size. All segregated smolts will be adipose fin clipped, but some may also be CWT when the size of the integrated program is low.

6 <sup>6</sup>pHOS = % hatchery-origin fish on the spawning grounds, pNOB = % natural-origin fish in broodstock; PNI = proportionate natural influence.

1 Table 2-5. Sliding scale of natural origin abundance for South Fork Salmon River summer Chinook  
2 salmon used to determine size of integrated program.

Project NOR <sup>1</sup> to Satellite	Size of Integrated Program
<700	150,000
700-999	250,000
1,000-1,299	500,000
>1,300	1,000,000

3 Source: NMFS 2017a

4 <sup>1</sup>NOR = Natural-origin returns

5 Table 2-6. Overview of operations for South Fork Chinook Eggbox and Steelhead Streamside  
6 Incubator A-run and B-run projects.

Parameter	South Fork Chinook Salmon Eggbox	Steelhead Streamside Incubator A-run and B-run		
		Indian Creek	Panther Creek	Yankee Fork
<b>Adults</b>				
Component and purpose	Segregated recovery	Conservation and supplementation		
Broodstock number <sup>1</sup>	NA – eggs sourced from McCall FH; (use of NOR dependent on sliding scale for South Fork Salmon Summer Chinook salmon program)	NA – eggs for Indian and Panther creeks sourced from other programs		
Collection location <sup>2</sup>	South Fork Salmon Satellite	Lower Pahsimeroi FH (Pahsimeroi A-run)		Lower Pahsimeroi FH; Dworshak NFH (Salmon River B-run)
Collection timing	Jun-Sep	Feb-May	Feb-May	Feb-May
Adult holding location	South Fork Salmon Satellite	Lower Pahsimeroi FH		Sawtooth FH; Pahsimeroi FH; Dworshak NFH
Adult spawning location	South Fork Salmon Satellite	Lower Pahsimeroi FH		
<b>Incubation, Rearing, and Release</b>				
Incubation location	McCall FH; Cabin Creek; Curtis Creek	Upper Pahsimeroi FH; Indian Creek	Upper Pahsimeroi FH; Panther Creek	Sawtooth FH; Yankee Fork Salmon River
Rearing location	Cabin Creek; Curtis Creek	Indian Creek	Panther Creek	Yankee Fork Salmon River
Acclimation location	Cabin Creek; Curtis Creek	Indian Creek	Panther Creek	Yankee Fork Salmon River
Release locations	Cabin Creek; Curtis Creek	Indian Creek	Panther Creek	Yankee Fork Salmon River
Release timing	September-October	May-July	May-July	May-July
Release number (eggs)	300,000	100,000	400,000	500,000
Marks <sup>3</sup>	100% PBT	100% PBT	100% PBT	100% PBT
<b>Other</b>				
Maximum surface water use by facility (cfs)	NA (in-river boxes)	0.042 cfs	0.084 cfs	0.105 cfs



Parameter	South Fork Chinook Salmon Eggbox	Steelhead Streamside Incubator A-run and B-run		
		Indian Creek	Panther Creek	Yankee Fork
Goal: pHOS and/or pNOB <sup>4</sup>	see Table 2-4 for South Fork Salmon River Summer Chinook Salmon Program	NA	NA	NA
Method of Adult Management	NA	NA	NA	NA
Within basin targeted fisheries	Selective or Non-selective tribal fisheries	Non-selective tribal fisheries	Non-selective tribal fisheries	Non-selective tribal fisheries

- 1 <sup>1</sup>Broodstock for South Fork Salmon Chinook Salmon Eggbox program included in the number collected for the South Fork Salmon
- 2 Summer Chinook Salmon program; broodstock for Indian and Beaver creeks included in the number collected for the Pahsimeroi A-
- 3 run Summer Steelhead program; broodstock for Yankee Fork included in the number collected for the Salmon River B-run
- 4 Steelhead program.
- 5 <sup>2</sup>FH = fish hatchery
- 6 <sup>3</sup>PBT = parentage-based tagging
- 7 <sup>4</sup>pHOS = % hatchery-origin fish on the spawning grounds, pNOB = % natural-origin fish in broodstock

8

9 Table 2-7. Sliding scale broodstock and weir management for integrated program component of  
 10 Pahsimeroi Summer Chinook Salmon program.

Escapement of NOR <sup>1</sup> to Pahsimeroi Weir	Number of NORs Released Above Weir	Number of NOR Broodstock	Maximum Percent of NOR Held for Broodstock	Minimum pNOB <sup>1</sup>	Maximum Percent pHOS <sup>1</sup> Above Weir
50-124	35-87	15-37	30	0.35	Not Applicable
125-249	88-208	38-41	30	0.90	0.70
250-499	209-458	41	30	1.00	0.30
500-999	459-958	41	20	1.00	0.25
>1000	>958	41	20	1.00	0.25

- 11 <sup>1</sup>NOR = Natural-origin returns, pHOS = % hatchery-origin fish on the spawning grounds, pNOB = % natural-origin fish in broodstock
- 12

1 Table 2-8. Sliding scale broodstock and weir management for the Upper Salmon River Spring  
 2 Chinook Salmon program.

NOR <sup>1</sup> to Weir		NOR Released Above Weir <sup>2</sup>		Number of NOR Held for Brood		Maximum Percent of NOR Retained for Brood	Maximum pHOS <sup>1</sup> upstream of weir
Low	High	Low	High	Low	High		
50	249	30	149	20	100	40.0%	NA
250	499	150	368	100	131	40.0%	0.75
500	699	369	568	131	131	40.0%	0.45
700	999	569	868	131	131	40.0%	0.45
1,000	1,299	790	1,089	210	210	40.0%	0.35
1,300	1,599	881	1,180	419	419	40.0%	0.35
1,600	2,000	866	1266	734	734	50.0%	0.35

3 <sup>1</sup>NOR = Natural-origin return, pHOS = proportion of hatchery-origin spawners

4 <sup>2</sup>A minimum of 300 adults would be released upstream to spawn naturally. If there are insufficient natural-origin and integrated  
 5 hatchery-origin adults to meet this minimum, segregated adults may be released upstream of the weir.

6

7 Table 2-9. Sliding scale of natural-origin abundance at the Sawtooth Weir used to determine the  
 8 size of the Upper Salmon River Spring Chinook Salmon integrated component.

Projected NOR <sup>1</sup> Return to Weir (Jacks Excluded)	Size of Integrated Smolt Program	Targeted pNOB <sup>1</sup>	Minimum Percent of Segregated Brood composed of integrated Adults	Maximum Percent of Segregated Brood composed of integrated Adults	Mark/Tag for Integrated Smolts	Mark/Tag for Segregated Smolts
<1,000	250,000	100%	20%	30%	100% CWT, no Ad-clip	100% Ad, 120k Ad-CWT
1,000 -1,299	500,000	80%	20%	50%	100% Ad-CWT	100% Ad, no CWT
1300 -1599	1,000,000	80%	20%	60%	100% Ad, 500k Ad-CWT	100% Ad, no CWT
>1,600	1,700,000-2,000,000	70%	NA	NA	100% Ad, 120k Ad-CWT	N/A

9 <sup>1</sup>NOR = Natural-origin returns, pHOS = % hatchery-origin fish on the spawning grounds, pNOB = % natural-origin fish in broodstock

10

1 Table 2-10. RM&amp;E activities associated with Clearwater River and Hells Canyon programs.

Program	Adult	Juvenile
All	<ul style="list-style-type: none"> <li>Measure and examine for gender, tags and marks</li> <li>Recover CWTs</li> <li>Collect genetic samples for PBT baseline</li> <li>Monitor survival metrics for all life stages in the hatchery from spawning to release</li> <li>Tissue sample collection at Lower Granite Dam to provide escapement estimates from PBT</li> </ul>	<ul style="list-style-type: none"> <li>Monitor survival metrics for all life stages in the hatchery from spawning to release</li> <li>Monitor disease occurrence in the hatchery</li> <li>CWT and/or PBT tag representative groups</li> </ul>
South Fork Clearwater Steelhead	<ul style="list-style-type: none"> <li>Run size, PBT sampling, and PIT tagging at Lower Granite Dam</li> <li>Insert radio transmitters into adult steelhead</li> </ul>	<ul style="list-style-type: none"> <li>PIT tag representative groups to estimate migration timing, outmigration survival rate, and adult returns</li> <li>Rotary screw trap in the South Fork Salmon River to insert PIT tags into hatchery-origin and natural-origin juveniles</li> </ul>
Hells Canyon A-run Summer Steelhead	<ul style="list-style-type: none"> <li>Run size, PBT sampling, and PIT tagging at Lower Granite Dam.</li> </ul>	<ul style="list-style-type: none"> <li>PIT tag representative groups to estimate migration timing, outmigration survival rate, and adult returns</li> </ul>
Hells Canyon Snake River Spring Chinook Salmon	<ul style="list-style-type: none"> <li>Trapping and tissue collection at Rapid River weir and Hells Canyon adult trap for genetic monitoring</li> </ul>	--

2

3 Table 2-11. RM&amp;E activities associated with Salmon River Steelhead programs.

Program	Adult	Juvenile
All	<ul style="list-style-type: none"> <li>Run size, PBT sampling, and PIT tagging at Lower Granite Dam</li> <li>Trapping and tissue sampling at hatchery traps/weirs for recording: date, sex, length, origin (hatchery or natural), marks/tags, and disposition</li> <li>Monitor survival metrics for all life stages in the hatchery from spawning to release</li> </ul>	<ul style="list-style-type: none"> <li>Monitor survival metrics for all life stages in the hatchery from spawning to release</li> <li>PIT tag representative groups to estimate migration timing, outmigration survival rate, and adult returns</li> </ul>
Salmon River B-run Steelhead	--	<ul style="list-style-type: none"> <li>Direct stream versus acclimated fish releases to evaluate homing efficiency between release strategies</li> </ul>
Steelhead Streamside Incubator Project A-run and B-run	--	<ul style="list-style-type: none"> <li>Rotary screw traps in the Yankee Fork and Panther Creek to insert PIT tags into hatchery-origin and natural-origin juveniles</li> <li>Electrofishing in the Yankee Fork and Panther Creek to insert PIT tags into hatchery-origin and natural-origin juveniles</li> <li>Adult trapping and tissue collection for PBT in the Yankee Fork</li> </ul>

1 Table 2-12. RM&amp;E activities associated with Salmon River Chinook Salmon programs.

Program	Adult	Juvenile
All	<ul style="list-style-type: none"> <li>Tissue sample collection at Lower Granite Dam to provide escapement estimates from PBT</li> </ul>	<ul style="list-style-type: none"> <li>Monitor survival metrics for all life stages in the hatchery from spawning to release</li> <li>CWT and/or PBT tag representative groups to estimate harvest in mixed stock fisheries</li> <li>PIT tag representative groups to estimate migration timing, outmigration survival rate, and adult returns</li> </ul>
Little Salmon/Rapid River Spring Chinook Salmon	<ul style="list-style-type: none"> <li>Trapping and tissue collection at Rapid River weir and Hells Canyon adult trap for genetic monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Screw trap downstream of Rapid River weir</li> </ul>
South Fork Salmon River Summer Chinook Salmon	<ul style="list-style-type: none"> <li>Carcass surveys, redd counts, genetic monitoring</li> <li>Adult trapping and tissue collection for PBT</li> </ul>	<ul style="list-style-type: none"> <li>Screw trap downstream of South Fork Salmon River Satellite</li> <li>Most fish counted/released or anesthetized, measured, weighed, and released; smaller groups receive PIT before release</li> <li>Estimate production and survival to Lower Granite Dam, and monitor migration timing</li> </ul>
Johnson Creek Artificial Propagation Enhancement	<ul style="list-style-type: none"> <li>Temporary picket weir on Johnson Creek to monitor adult return timing, escapement, origin, age and sex of most returns, and to collect tissue for genetic monitoring</li> <li>Multiple-pass spawning ground and carcass surveys to inform population-based M&amp;E performance measures</li> </ul>	<ul style="list-style-type: none"> <li>Screw trap on Johnson Creek is operated March to November to monitor juvenile Chinook salmon production/productivity, as well as migratory survival, and timing to Lower Granite Dam</li> <li>Anesthetize, measure, weigh, mark (via clips for trap efficiency estimates) and release; PIT-tag small groups before release</li> <li>Small-scale studies include mark observability, juvenile pedigree analysis, and ageing</li> </ul>
South Fork Chinook Salmon Eggbox	<ul style="list-style-type: none"> <li>Adult trapping and tissue collection for PBT</li> <li>Monitor adult recruitment back to the South Fork Satellite using PBT</li> </ul>	<ul style="list-style-type: none"> <li>Electrofishing in the South Fork Salmon River above the weir, Cabin Creek, and Curtis Creek to assess survival at various lifestages of hatchery- and natural-origin Chinook salmon and population estimates of natural-origin population.</li> </ul>

Program	Adult	Juvenile
Pahsimeroi Summer Chinook Salmon	<ul style="list-style-type: none"> <li>• Pahsimeroi weir and fish trap operation; applying marks and collecting tissue samples for PBT</li> <li>• Multiple-pass spawning ground surveys, pre-spawning mortality, and carcass surveys, genetic monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor survival metrics for all life stages in the hatchery from spawning to release</li> <li>• CWT and/or PBT tag representative groups to estimate harvest in mixed stock fisheries</li> <li>• PIT tag representative groups to estimate migration timing, outmigration survival rate, and adult returns</li> <li>• Screw trap near Pahsimeroi weir</li> <li>• Estimate juvenile production and survival to Lower Granite Dam, and monitor migration timing</li> <li>• Anesthetize, measure, weigh, and release; PIT-tag small groups before release</li> </ul>
Upper Salmon Spring Chinook Salmon	<ul style="list-style-type: none"> <li>• Sawtooth Fish Hatchery weir and fish trap operation; apply marks and collect tissue samples for PBT</li> <li>• Multiple-pass spawning ground surveys, pre-spawning mortality, and carcass surveys, genetic monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor survival metrics for all life stages in the hatchery from spawning to release</li> <li>• CWT and/or PBT tag representative groups to estimate harvest in mixed stock fisheries</li> <li>• PIT tag representative groups to estimate migration timing, outmigration survival rate, and adult returns</li> <li>• Screw trap upstream of Sawtooth weir</li> <li>• Estimate juvenile production and survival to Lower Granite Dam, and monitor migration timing</li> <li>• Anesthetize, measure, weigh, and release; PIT-tag small groups before release</li> </ul>

**2.2 Alternative 2, Proposed Action**

Under this alternative, NMFS would make ESA section 4(d) determinations for the 15 hatchery programs in the programs to operate as described in the HGMPs, as described in Section 2.1, Alternative 1, No Action (Table 2-1), including RM&E (Section 2.1.3, Research Monitoring, and Evaluation) and operations and maintenance (Section 2.1.4, Operation and Maintenance). BPA would either (1) fund the JCAPE Program or (2) not fund the JCAPE Program. Under this alternative, the 15 hatchery programs would operate as described in the HGMPs regardless of BPA’s funding decision.

**2.3 Alternative 3, Reduced Production**

Under this decreased production alternative, NMFS would determine that the 15 hatchery programs described for the No Action Alternative 1 and the Proposed Action Alternative 2 would be consistent with the requirements of the ESA. BPA would either (1) provide enough funding to JCAPE Program to produce 50 percent of the production levels described in the HGMP or (2) not fund JCAPE Program. Under this alternative, the hatchery production would be reduced by 50 percent of what is described in the HGMPs. Decreasing hatchery production by 50 percent would likely result in a reduction in harvest by a similar percentage. The RM&E would continue to operate at the same levels.

1 This alternative would not provide sufficient hatchery production identified in the HGMPs as necessary to  
2 restore coho salmon in the Clearwater River Subbasin, or contribute to the survival and recovery of the  
3 ESA-listed Chinook salmon and steelhead in the Snake River Basin.

#### 4 **2.4 Alternative 4, Program Termination**

5 Under this alternative, NMFS would determine that the 15 hatchery programs described for the No Action  
6 Alternative 1 and the Proposed Action Alternative 2 do not meet the criteria for 4(d) determinations and all  
7 actions related to those programs would be terminated. BPA would not provide funding to the JCAPE  
8 Program. This termination would occur whether or not those actions may already have existing ESA  
9 authorizations. None of the 15 hatchery programs would operate under this alternative.

10 With the complete termination of hatchery programs, facilities would not be used for these programs, but  
11 most would continue to operate for other salmon or steelhead programs described by NMFS (2014a) and  
12 USFWS (2017a, 2017b). Facilities that may cease operations because they are dedicated to programs  
13 considered in this EA include the Hells Canyon Dam Trap, Rapid River Fish Hatchery, South Fork Salmon  
14 Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, and Niagara Springs  
15 Fish Hatchery.

16 This alternative would not provide sufficient hatchery production identified in the HGMPs as necessary to  
17 restore coho salmon in the Clearwater River Subbasin, or contribute to the survival and recovery of the  
18 ESA-listed Chinook salmon or steelhead in the Snake river Basin.

#### 19 **2.5 Alternatives Considered but not Analyzed in Detail**

20 The following alternatives were considered, but not analyzed in detail because the alternatives would not  
21 meet the Federal purpose and need.

##### 22 **2.5.1 Hatchery Programs with Increased Production Levels**

23 Under this alternative, NMFS would issue an ESA 4(d) determination for increased production levels  
24 associated with the 15 hatchery programs, as compared to the level described in the HGMPs. This  
25 alternative is not analyzed in detail because substantially higher production levels would be outside the  
26 scope of current agreements and the proposed hatchery programs (NMFS 2014c; 2018), thus not  
27 meeting the NMFS's purpose and needs to evaluate the proposed hatchery programs.

##### 28 **2.5.2 Hatchery Programs with Other Decreased Production Levels**

29 A version of a reduced production level alternative is analyzed in this EA as Alternative 3, and termination  
30 of all production is analyzed as Alternative 4. Alternatives that reduce production for select programs but  
31 not others are not analyzed. Reduced production level or termination of programs for select species,  
32 while maintaining other programs, would either would not provide additional insight compared to  
33 Alternative 3 and 4, and/or not meet NMFS's purpose and need to conserve and protect listed species;  
34 therefore, other reduced production alternatives will not be further analyzed in this document.

##### 35 **2.5.3 Increased Harvest to Reduce Hatchery Fish on Spawning 36 Grounds**

37 Fishery harvest could be used in the Clearwater and Salmon River subbasins to reduce the number of  
38 hatchery-origin adults on spawning grounds to reduce genetic and ecological risks of hatchery-origin fish  
39 interacting with natural-origin fish. However, this is likely not possible without also increasing impacts on  
40 ESA-listed fish in the project area that are incidentally taken while removing the hatchery-origin adults,  
41 which may require an ESA consultation. Harvest fishery is not a necessary component of the proposed

- 1 programs, and other methods of reducing the number of hatchery-origin adults on the spawning ground
- 2 are considered under Alternative 1 and Alternative 2.

## 3 Affected Environment

This subsection describes current conditions for nine resources that may be affected by implementation of the EA alternatives:

- Water quantity—Section 3.1
- Water quality—Section 3.2
- Salmon and steelhead—Section 3.3
- Fisheries—Section 3.4
- Other fish species—Section 3.5
- Wildlife—Section 3.6
- Socioeconomics—Section 3.7
- Cultural Resources—Section 3.8
- Environmental Justice—Section 3.9
- Human Health and Safety—Section 3.10

Internal scoping identified no other resources that would potentially be impacted by current operation, the Proposed Action, or other alternatives. Current conditions include the operation of hatchery programs very similar to those described in the Mitchell Act FEIS (NMFS 2014a) and the HGMPs because they were both largely developed through refinement of ongoing programs. Production and operation details are included in Table 2-2, Table 2-3, Table 2-4, and Table 2-6 of this EA. As previously noted in Section 1.2, Project Area and Study Area, the geographic scope of the study area is specific to each resource being analyzed. For some resources, the study area is limited to the area immediately surrounding the project facilities where operations could affect water quantity, wildlife, or human health and safety. For other resources, such as socioeconomics, project operations could have wider-reaching effects.

### 3.1 Water Quantity

Each of the 15 currently operating Snake River Basin hatchery programs included in this EA takes water from a nearby stream or lake (surface water), or wells or springs (ground or spring water) to use in the hatchery facility (Table 3-1). The use of surface water for hatchery programs may reduce instream flow, sometimes leading to substantial reduction in stream flow between the water intake and discharge structures. In particular, operations of adult holding tanks, egg incubation, juvenile fish rearing, and/or acclimation ponds affect water quantity. Surface water use is nonconsumptive because, with the exception of small amounts lost through leakage or evaporation, water that is diverted from a river or reservoir is discharged back to the river (downstream from the reservoir where applicable) after it circulates through the hatchery facility. Although groundwater is not directly replenished, it is also discharged after circulating through the facility, sometimes increasing a small amount of stream flow below the discharge point.

Most facilities are located in the Clearwater River Subbasin, the Hells Canyon Reach of the Snake River, or the Salmon River Subbasin (Figure 1-1; Figure 2-1; Figure 2-3). Additional facilities used to meet program needs are located along the Snake River upstream from Hells Canyon, and in the Payette River Subbasin. The study area for water quantity is limited to the stream reaches between intake and outfall for each facility, which range in length from 180 feet to 9,985 feet (Table 3-1). The longest diversion



- 1 reaches are associated with withdrawals from reservoirs; no diversions from streams exceed 1 mile in
- 2 length.

1 Table 3-1. Water source and use at facilities currently utilized by the hatchery programs included in this EA.

Facility	Maximum Water Use (cfs)	Maximum Ground or Spring Water Use (cfs)	Maximum Surface Water Use (cfs)	Surface Water Source	Surface Water Discharge Location	Surface Water Diversion Distance (Feet)	Average Flow (cfs)	Maximum Surface Water Use Compared to River Flow (%)
<b>Clearwater River Subbasin</b>								
Clearwater Fish Hatchery	89	0	89	Dworshak Reservoir	North Fork Clearwater River	9,895	64	--
Dworshak National Fish Hatchery	182	0	182	Dworshak Reservoir; North Fork Clearwater River	North Fork Clearwater River	Reservoir = 8,854; River = 902	14.5	5.3
Kooskia National Fish Hatchery	16	0	16	Clear Creek	Clear Creek; Middle Fork Clearwater River	3,696	7.7	82 <sup>1</sup>
<b>Snake River – Hells Canyon Reach</b>								
Hells Canyon Trap	130	0	130	Snake River	Snake River		130	<1
Oxbow Fish Hatchery	15.5	0	15.5	Snake River	Snake River	180	15.5 <sup>2</sup>	<0.5
<b>Snake River – Upstream from Hells Canyon Reach</b>								
Hagerman National Fish Hatchery	84.6	84.6	0	Unnamed springs	--	--	60	--
Niagara Springs Fish Hatchery	120	120	0	Niagara Springs	--	--	120	--
Magic Valley Fish Hatchery	87.2	87.2	0	Crystal Springs	--	--	87.2	--
<b>Salmon River Subbasin</b>								
Rapid River Trap	18	0	18	Rapid River	Rapid River	59	18	--
Rapid River Fish Hatchery	46.6	0	46.6	Rapid River	Rapid River	682	34	51.8 <sup>3</sup>
South Fork Salmon River Satellite	20	0	20	South Fork Salmon River	South Fork Salmon River	2,750	9.2 <sup>2</sup>	11
Lower Pahsimeroi Fish Hatchery	40	0	40	Pahsimeroi River	Pahsimeroi River	1,980	40 <sup>2</sup>	26.5

Facility	Maximum Water Use (cfs)	Maximum Ground or Spring Water Use (cfs)	Maximum Surface Water Use (cfs)	Surface Water Source	Surface Water Discharge Location	Surface Water Diversion Distance (Feet)	Average Flow (cfs)	Maximum Surface Water Use Compared to River Flow (%)
Upper Pahsimeroi Fish Hatchery	34	14	20	Pahsimeroi River	Pahsimeroi River	800	20	13.2
East Fork Salmon River Satellite	15	0	15	East Fork Salmon River	East Fork Salmon River	200	15 <sup>2</sup>	15.6
Sawtooth Fish Hatchery	54.6	11.6	43	Salmon River	Salmon River	4,850	28	18.7
<b>Payette River Subbasin</b>								
McCall Fish Hatchery	20	0	20	Payette Lake	North Fork Payette River	3,700	16	--

1 Sources: IDFG (2011a, 2011e, 2011f; 2016b); Nez Perce Tribe (2016); USFWS (2017a)

2 <sup>1</sup> Documented in January 2017. No water is diverted from Clear Creek from June through September.

3 <sup>2</sup> Surface water is diverted only from October through July at Oxbow Fish Hatchery, from June through September at the South Fork Salmon River Satellite, from February through September at Lower Pahsimeroi FH, and from March through May at the East Fork Salmon River Satellite.

4 <sup>3</sup> Information shown is for diversion of flows in the Rapid River. NMFS (2017a) reported an average diversion of 2 to 22 percent of annual Little Salmon River flows.

### 3.1.1 Surface Water

Surface water withdrawal for currently-operating hatchery programs often fluctuates seasonally based on propagation needs, with the highest hatchery water demand often occurring in the spring when streamflow levels are highest. Prior to release, hatcheries have more fish on hand, fish under propagation are at their largest size, and the need for rearing flows for fish health maintenance is greatest. Hatchery water withdrawal for fish rearing is often lowest in the late summer months (when river flows are also at their lowest) because fewer fish are on station after release.

Of the 11 facilities that divert water from a stream, Kooskia National and Rapid River fish hatcheries generally withdraw the highest proportion of stream flow (Table 3-1). Based on rearing levels from 2014 through 2016, the surface flow requirements for Kooskia National Fish Hatchery reach 13 cfs in March and April and approximately 9 cfs in February and May. Surface flow is not used for rearing from June through September; typical surface water demands for the remaining months range from approximately 3 to 6 cfs.

Rapid River Fish Hatchery diverts approximately 50 percent of the flow from the Rapid River during low winter flows in January and February (Table 3-1). Diversion rates decrease to as low as approximately 4 percent of Rapid River streamflow during high-flow periods in May. Actual withdrawals range from a low of about 16 cfs in May to a high of about 35 cfs in February and December.

Compared to Rapid River Fish Hatchery and Kooskia National Fish Hatchery, maximum surface water diversions for all other facilities typically comprise a relatively low percentage of streamflows (Table 3-1), and maximum reported diversion rates are short term in nature (1 to 2 months per year; USFWS 2017a, 2017b). Two facilities, Clearwater Fish Hatchery and McCall Fish Hatchery, utilize only lake water, and divert a very small percentage of the water available. Dworshak National Fish Hatchery utilizes a small amount of lake water as well, but receives most of its water from the North Fork of the Clearwater River (Table 3-1).

Sawtooth Fish Hatchery may withdraw up to 18.7 percent of Salmon River monthly flow (Table 3-1); however, the hatchery diverts an average of 10.6 percent of flow during typical low flow conditions, and less at all other times. During the lowest flow periods, the Pahsimeroi River facilities may divert up to 53.9 percent of the flow, but the average diversion is 39.7 percent during low-flow conditions. Typically, the Pahsimeroi facilities use about 26 percent of the flow based on the annual average streamflow of the Pahsimeroi River (NMFS 2017b).

In addition to surface water use at hatchery facilities, the SFCEP and SSI programs use surface water, and the incubators are utilized during summer low flow. However, the incubators use less than 1 percent of the water available and the water is almost immediately passed through the incubators and returned to the stream.

### 3.1.2 Ground and Spring Water

The three facilities on the Snake River upstream from the Hells Canyon Reach (Hagerman National, Niagara Springs, and Magic Valley fish hatcheries) all utilize spring water only (Table 3-1). The hatcheries receive water from springs emanating from the Eastern Snake Plain Aquifer (ESPA), which provides many spring outflows in the area. The ESPA is one of the largest confined aquifers west of the Continental Divide (occupying 10,800 square miles), and was designated as a sole source aquifer by the U.S. Environmental Protection Agency in 1991. A wide variety of uses, including drinking water, agriculture, food processing, aquaculture, and fish and wildlife habitat, are dependent on the ESPA. The ESPA is also critical to the maintenance of flows in the Snake River. The water quantity in the springs is

1 diminishing as a result of the overall decline of the groundwater aquifer. For a detailed discussion of  
2 ESPA, see BPA et al. (2017). Two facilities, the Upper Pahsimeroi and Sawtooth fish hatcheries, utilize  
3 well water in addition to surface water (Table 3-1). Well water at both facilities is used for egg incubation  
4 and early rearing.

### 5 **3.2 Water Quality**

6 Current Snake River Basin hatcheries primarily affect water quality by discharging treated wastewater  
7 from adult holding, spawning, incubation, and juvenile rearing activities to downstream receiving waters.  
8 Adult collection and juvenile release activities may also have temporary and minor impacts to water  
9 quality through disturbance of the streambed at collection or release sites, or by anglers collecting  
10 broodstock.

11 Because large numbers of fish are concentrated within hatcheries, effluent with elevated water  
12 temperature, ammonia, organic nitrogen, total phosphorus, biochemical oxygen demand (BOD), pH, and  
13 solids levels is typically produced (WDE 1989; Kendra 1991; Cripps 1995; Michael 2003; USEPA 2006a).  
14 Nutrients discharged to receiving waters from hatchery effluent may cause an increase in algal growth,  
15 which may lead to increased fluctuations in dissolved oxygen and pH because of increased algal  
16 photosynthesis and respiration. Decay of senesced algae may also decrease dissolved oxygen  
17 concentrations in receiving waters.

18 Current water quality in downstream receiving waters from the existing hatcheries has been characterized  
19 with data as recent as 2014 (Table 3-2). Receiving waters in the Clearwater River Subbasin do not  
20 exceed federal water quality standards for anything related to hatchery effluent. Standards for total  
21 phosphorous and total suspended solids are exceeded in receiving waters for Niagara Springs, Magic  
22 Valley, and Hagerman National fish hatcheries, each of which is located along the mainstem Snake River  
23 (Figure 2-3). All receiving waters in the Salmon River Subbasin except the Pahsimeroi River attain water  
24 quality standards.

25 All of the hatcheries used for the Snake River programs (except for Oxbow Fish Hatchery) are permitted  
26 to discharge treated wastewater to receiving waters under the United States Environmental Protection  
27 Agency (USEPA) general NPDES permit for Cold Water Aquaculture Facilities or the USEPA's general  
28 wasteload allocation (WLA) permit for Aquaculture Facilities (Table 3-2). The Cold Water Permit covers  
29 facilities that are not subject to specific wasteload allocations under the Total Maximum Daily Load  
30 (TMDL) process because wasteload allocations were not established at the time of permit issuance. The  
31 WLA Permit covers facilities that are subject to wasteload allocations under selected TMDLs (USEPA  
32 2007). Both permits regulate:

- 33 • Oxygen-demanding materials, measured as BOD
- 34 • Biological wastes (e.g., dead fish)
- 35 • Floating, suspended, or submerged matter of any kind
- 36 • Nutrients, including phosphorus
- 37 • Disinfectants, including chlorine
- 38 • Disease control drugs, pesticides, and other chemicals
- 39 • Feed and nutritional supplements
- 40 • Total suspended solids
- 41 • Toxic substances

42 Oxbow Fish Hatchery produces less than 20,000 pounds of fish per year or distributes less than 5,000  
43 pounds of feed at any one time and therefore is not required to have NPDES permits.

1 The USEPA (2006b) summarizes past compliance with general permit limits. Compliance with effluent  
2 limits during the prior permit cycle was met 100 percent of the time by about 90 percent of the facilities.  
3 The percentage of facilities exceeding the average monthly concentration limits for total suspended solids  
4 was about 2 percent and for total phosphorus about 6 percent. Maximum daily concentration limits for  
5 total suspended solids and total phosphorus were exceeded only 1 percent of the time.  
6

1 Table 3-2. Current hatchery program facility NPDES permit and receiving water attributes.

Program	Facility	Permit No.	Permit Type <sup>1</sup>	Receiving Waters	Impairment Listings <sup>2</sup>
Clearwater River Coho Salmon	Kooskia National Fish Hatchery	IDG130025	Cold Water	Clear Creek	None
Clearwater River Coho Salmon	Dworshak National Fish Hatchery	IDG130012	Cold Water	North Fork Clearwater River	Dissolved Gas Supersaturation
South Fork Clearwater Steelhead	Clearwater Fish Hatchery	IDG130099	Cold Water	Clearwater River	Dissolved Gas Supersaturation
Hells Canyon Snake River A-run Summer Steelhead; Little Salmon River A-run Summer Steelhead; Pahsimeroi A-run Summer Steelhead	Niagara Springs Fish Hatchery	IDG130013	WLA	Niagara Springs Creek	Flow Alteration; Total Phosphorus; Total Suspended Solids
Hells Canyon Snake River Spring Chinook Salmon; Little Salmon/Rapid River Spring Chinook Salmon	Rapid River Fish Hatchery	IDG130037	Cold Water	Shingle Creek	None
South Fork Salmon River Summer Chinook Salmon; Johnson Creek Artificial Propagation Enhancement; South Fork Chinook Salmon Eggbox	McCall Fish Hatchery	IDG130052	Cold Water	North Fork Payette River	None
Little Salmon River A-run Summer Steelhead; Salmon River B-run Steelhead	Magic Valley Fish Hatchery	IDG130016	WLA	Snake River	Flow Alteration; Total Phosphorus; Total Suspended Solids
Pahsimeroi A-run Summer Steelhead; Pahsimeroi Summer Chinook Salmon; Steelhead Streamside Incubator Project A-run	Upper Pahsimeroi Fish Hatchery	IDG130039	Cold Water	Pahsimeroi River	Sedimentation/Siltation; Water Temperature
East Fork Salmon River Natural A-run Steelhead	Hagerman National Fish Hatchery	IDG130004	WLA	Riley Creek	Total Phosphorus; Total Suspended Solids; Fecal Coliform
East Fork Salmon River Natural A-run Steelhead; Steelhead Streamside Incubator B-run; Upper Salmon Spring Chinook Salmon	Sawtooth Fish Hatchery	IDG130074	Cold Water	Salmon River	None
Hells Canyon Snake River A-run Summer Steelhead; Little Salmon/Rapid River Spring Chinook Salmon	Oxbow Fish Hatchery	Not Required <sup>3</sup>	Not Required	Hells Canyon Reservoir	Water Temperature; Dissolved Gas Supersaturation

2 Source: Idaho Department of Environmental Quality (2017)

3 <sup>1</sup> WLA = wasteload allocation4 <sup>2</sup> Impairments associated with those receiving waters for facilities regulated by WLA permits have established TMDLs.5 <sup>3</sup> NPDES permits are not required because the facility produces less than 20,000 pounds of fish per year or distributes less than  
6 5,000 pounds of feed at any one time.

### 3.3 Salmon and Steelhead

Adult and juvenile fish currently propagated at the 15 hatchery programs included in this EA have the potential to interact with salmon and steelhead species in the natural environment. This subsection describes the affected environment for salmon and steelhead and how ongoing hatchery operations may potentially affect salmon and steelhead species, including effects of fish ladders, weirs, traps, and surface water intakes.

NMFS has prepared four biological opinions (NMFS 2017a, 2017b, 2017c, 2017d) that consider the effects of the 15 hatchery programs included in the proposed action on ESA-listed salmon and steelhead. In each biological opinion, NMFS determined that the programs do not jeopardize listed species, nor result in destruction or adverse modification of their designated critical habitat (NMFS 2017a, 2017b, 2017c, 2017d). The opinions provide additional detail on the anticipated effects of the programs on ESA-listed salmon and steelhead, and are consistent with the pertinent portions of the analysis provided herein.

#### 3.3.1 Study Area

Hatchery fish from the Snake River Basin hatchery programs may currently interact with salmon and steelhead during three different life phases: first, as smolts for those released from facilities; second, as juveniles rearing in streams from egg box programs; and, third, as adults upon return. The study area for salmon and steelhead includes locations where hatchery fish are captured, reared, and released, as well as areas where they are currently monitored or known to stray, including upstream of release sites.

The area within which NMFS believes the effects on anadromous salmon and steelhead could be detected includes all waterbodies downstream of hatchery release sites to Ice Harbor Dam. Given the extent of other hatchery programs above and below Ice Harbor Dam (NMFS 2014a), the relatively rapid migration rates of released hatchery smolts, and survival rates for hatchery program fish below the dam, current Snake River hatchery releases do not likely have discernible effects below Ice Harbor Dam. The study area also includes anadromous reaches adjacent to facilities used to rear program fish. Therefore, the study area for salmon and steelhead includes the Clearwater River Subbasin from the confluence of Clear Creek (Kooskia Fish Hatchery) downstream to the Snake River, the Snake River from Hells Canyon Dam downstream to Ice Harbor Dam, and the Salmon River Subbasin from Sawtooth Fish Hatchery downstream to the Snake River (Figure 1-1; Figure 2-1; Figure 2-2; Figure 2-3). Specifically, the study area includes the following waterbodies:

- Middle Fork and mainstem Clearwater River downstream of confluence with Clear Creek
  - Clear Creek downstream of Kooskia National Fish Hatchery
  - South Fork Clearwater River
    - Meadow Creek
    - Newsome Creek
- Snake River downstream of Hells Canyon Dam
- Salmon River downstream of Sawtooth Hatchery
  - Yankee Fork Salmon River
    - Ramey Creek
    - Cearly Creek



- 1                   ▪ Jordan Creek
- 2                   ▪ Swift Gulch Creek
- 3                   ▪ Greylock Creek
- 4           ○ East Fork Salmon River
- 5           ○ Pahsimeroi River
- 6           ○ Indian Creek
- 7           ○ Panther Creek
- 8                   ▪ Beaver Creek
- 9           ○ South Fork Salmon River
- 10                   ▪ East Fork of the South Fork Salmon River
- 11                   ➤ Johnson Creek
- 12                   ▪ Cabin Creek
- 13                   ▪ Curtis Creek
- 14           ○ Little Salmon River
- 15                   ▪ Rapid River

16 The study area also includes springs or stream reaches adjacent to facilities that are used for fish rearing  
17 for several programs included in this EA:

- 18           • North Fork Clearwater River downstream of Dworshak Dam (dam is a barrier to salmon and  
19           steelhead, and therefore the reservoir is not part of study area)
- 20           • Snake River near Oxbow Fish Hatchery
- 21           • Snake River from Magic Valley Fish Hatchery downstream to Upper Salmon Falls Dam
- 22           • North Fork Payette River (McCall Hatchery)
- 23           • Tucker Springs and Riley Creek (Hagerman National Fish Hatchery)
- 24           • Niagara Springs

25 Available knowledge and research abilities are insufficient to discern any important role or contribution of  
26 hatchery fish in density dependent interactions (i.e., competition and predation) affecting salmon and  
27 steelhead growth and survival in the mainstem Columbia River (NMFS 2008a, 2009). Therefore,  
28 measurable effects are unlikely downstream of Ice Harbor Dam for adults from the programs included in  
29 this EA returning to the Snake River Basin. Accordingly, the analysis area for ongoing hatchery-related  
30 effects on salmon and steelhead is limited to the study area described above.

### 31                   **3.3.2       ESA-Listed Salmon and Steelhead Populations**

32 The ESA-listed salmon and steelhead populations in the study area are part of major population groups  
33 (MPGs) within the Snake River Spring/Summer Chinook Salmon ESU (79 FR 20802, April 14, 2014), the  
34 Snake River Fall Chinook Salmon ESU (79 FR 20802, April 14, 2014), the Snake River Steelhead DPS  
35 (79 FR 20802, April 14, 2014), and the Snake River Sockeye Salmon ESU (79 FR 20802, April 14, 2014).  
36 Both natural-origin and hatchery-origin Snake River spring/summer Chinook salmon, fall Chinook salmon,  
37 steelhead, and sockeye salmon occur in the study area (NMFS 2017a):

- 38           • Snake River Spring/Summer Chinook Salmon ESU

- 1           o Upper Salmon River MPG
- 2           o Middle Fork Salmon River MPG
- 3           o South Fork Salmon River MPG
- 4           o Grande Ronde River/Imnaha River MPG
- 5           o Lower Snake River MPG (Tucannon River)
- 6           o 11 hatchery programs, including four covered in this EA
  - 7               ▪ South Fork Salmon River Summer Chinook Salmon (South Fork Salmon River
  - 8               MPG)
  - 9               ▪ JCAPE (South Fork Salmon River MPG)
  - 10              ▪ Pahsimeroi Summer Chinook Salmon (Upper Salmon River MPG)
  - 11              ▪ Upper Salmon River Spring Chinook Salmon (Upper Salmon River MPG)
- 12       • Snake River Fall Chinook Salmon ESU
  - 13           o Snake River MPG (Lower Snake River Population, including tributaries)
  - 14           o Four hatchery programs
- 15       • Snake River Steelhead DPS
  - 16           o Salmon River MPG
  - 17           o Clearwater River MPG
  - 18           o Imnaha River MPG
  - 19           o Grande Ronde River MPG
  - 20           o Lower Snake River MPG
  - 21           o 6 hatchery programs, including the East Fork Salmon River Natural A-run (Salmon River
  - 22           MPG)
- 23       • Snake River Sockeye Salmon ESU
  - 24           o Sawtooth Valley MPG
  - 25           o One hatchery program

### 26           **3.3.3 Critical Habitat and Essential Fish Habitat**

27 Critical habitat has been designated in the Snake River Basin for the Snake River Spring/Summer  
28 Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Snake River Sockeye Salmon ESU, and  
29 Snake River Basin Steelhead DPS. Within designated critical habitat, NMFS identifies physical and  
30 biological features, also called primary constituent elements, such as freshwater spawning and rearing  
31 sites, as well as freshwater estuarine migration corridors. NMFS (2017a, 2017b, 2017c, 2017d) provide  
32 an analysis of hatchery program effects on essential fish habitat (EFH), defined under the Magnuson-  
33 Stevens Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth  
34 to maturity.” Chinook salmon and coho salmon have designated EFH, and NMFS recognizes the need to  
35 consider EFH in terms of the need to minimize risks from hatchery water withdrawals, and genetic and  
36 ecological interactions of hatchery-origin fish with natural-origin fish (NMFS 2016a). EFH is designated for  
37 both Chinook and coho salmon throughout the study area.

### 3.3.4 Non-ESA-listed Salmon Populations

Native spring/summer Chinook and coho salmon were extirpated from the Clearwater River Subbasin in 1927 by the construction of Lewiston Dam (also known as the Washington Water Power Diversion Dam) at the mouth of the Clearwater River. Lewiston Dam was removed in 1973. Spring Chinook salmon were reintroduced in 1961, and coho salmon in 1994. More recent efforts to reestablish summer Chinook salmon in the Clearwater Subbasin were initiated in 2009.

The non-ESA-listed salmon populations in the study area include both natural- and hatchery-origin coho salmon that are reintroduced into the Clearwater River Subbasin through the Clearwater River Coho Restoration Program. Similarly, natural- and hatchery-origin populations of spring/summer Chinook salmon in the Clearwater River Subbasin are not listed, and are not part of the Snake River Spring/Summer Chinook Salmon ESU.

### 3.3.5 Ongoing Effects of Hatchery Programs

Hatchery programs can affect natural-origin salmon and steelhead and their habitat in a variety of ways (Table 3-3). The extent of effects (adverse or beneficial) on salmon and steelhead and their habitat depends on the design of hatchery programs, the condition of the habitat, and the status of the species, among other factors. The following subsections describe each hatchery effect pathway in more detail as they pertain to the 15 Snake River Basin hatchery programs included in this EA, as they currently operate.

Table 3-3. General effects of hatchery programs on natural-origin salmon and steelhead resources.

Pathway	Description of Pathway
Genetics	<ul style="list-style-type: none"> <li>Interbreeding with hatchery-origin fish can change the genetic character of the local populations.</li> <li>Interbreeding with hatchery-origin fish may reduce the reproductive performance of the local populations.</li> </ul>
Masking	<ul style="list-style-type: none"> <li>Hatchery-origin fish can increase the difficulty in determining the status of the natural-origin component of a salmon population.</li> </ul>
Competition and Predation	<ul style="list-style-type: none"> <li>Hatchery-origin fish can increase competition for food and space.</li> <li>Hatchery-origin fish can prey on natural-origin fish.</li> </ul>
Prey Enhancement	<ul style="list-style-type: none"> <li>Hatchery-origin fish can increase the number of prey for natural-origin salmonids.</li> </ul>
Disease	<ul style="list-style-type: none"> <li>Concentrating salmon for rearing in a hatchery facility can lead to an increased risk of carrying pathogens and outbreaks. When hatchery-origin fish are released from hatchery facilities, they may increase the disease risk to natural-origin salmon and steelhead through pathogen transmission.</li> </ul>
Population Viability	<ul style="list-style-type: none"> <li>Abundance: Preserve, increase, or decrease the abundance of a natural-origin fish population</li> <li>Spatial Structure: Preserve, expand, or reduce the spatial structure of a natural-origin fish population</li> <li>Genetic Diversity: Increase, retain or homogenize within-population genetic diversity of a natural-origin fish population</li> <li>Productivity: Maintain, increase, or decrease the productivity of a natural-origin fish population</li> </ul>
Nutrient Cycling	<ul style="list-style-type: none"> <li>Returning hatchery-origin adults can increase the amount of marine-derived nutrients in freshwater systems.</li> </ul>

Pathway	Description of Pathway
Facility Operations	<ul style="list-style-type: none"> <li>• Hatchery facilities can reduce water quantity or quality in adjacent streams through water withdrawal and discharge.</li> <li>• Weirs for broodstock collection or to control the number of hatchery-origin fish on the spawning grounds can have the following unintentional consequences:               <ul style="list-style-type: none"> <li>○ Isolation of formerly connected populations</li> <li>○ Limiting or slowing movement of migrating fish species, which may enable poaching or increase predation or prespawn mortality</li> <li>○ Alteration of streamflow</li> <li>○ Alteration of streambed and riparian habitat</li> <li>○ Alteration of the distribution of spawning within a population</li> <li>○ Increased mortality or stress due to capture and handling</li> <li>○ Impingement of downstream migrating fish</li> <li>○ Forced downstream spawning by fish that do not pass through the weir</li> </ul> </li> <li>• Increased straying due to either trapping adults that were not intending to spawn above the weir, or displacing adults into other tributaries</li> </ul>
Research, Monitoring, and Evaluation (RM&E)	<ul style="list-style-type: none"> <li>• Surveying and sampling to assess program objectives and goals may increase the risk of injury and mortality to salmon that are the focus of the actions, or that may be incidentally encountered.</li> <li>• RM&amp;E will also provide information on the status of the natural population.</li> </ul>

### 1 3.3.5.1 Genetics

2 Ongoing hatchery operations currently affect salmon and steelhead in the study area. Genetic effects  
3 may depend on the type of hatchery program being operated. Most hatchery programs included in this EA  
4 are segregated<sup>5</sup>; however, some are wholly integrated or have integrated components.

5 Segregated programs use only hatchery-origin fish for broodstock, which may result in greater  
6 domestication compared to integrated programs that use natural-origin broodstock to maintain genetic  
7 similarities with wild fish; therefore, a potential for negative effects exists if hatchery fish from segregated  
8 programs interbreed with natural fish on spawning grounds. Integrated programs are designed to  
9 supplement natural populations by using natural-origin broodstock to increase production. NMFS  
10 considers three major areas of genetic effects of hatchery programs: within-population diversity,  
11 outbreeding effects, and hatchery-influenced selection.

12 Within-population genetic diversity is a general term for the quantity, variety, and combinations of genetic  
13 material in a population (Busack and Currens 1995). Within-population diversity is gained through  
14 mutations or gene flow from other populations and is lost primarily due to genetic drift (i.e., a random loss  
15 of diversity, usually only exacerbated at low population size). For a population to maintain its genetic  
16 diversity reasonably well, the effective population size should at least be in the hundreds (Lande and  
17 Barrowclough 1987).

18 Outbreeding effects are caused by gene flow from other populations. Gene flow occurs naturally among  
19 salmon and steelhead populations, a process referred to as straying (Quinn 1993, 1997). Natural straying  
20 serves a valuable function in preserving diversity that would otherwise be lost through genetic drift and in  
21 recolonizing vacant habitat. Straying is considered a risk only when it occurs at unnatural levels or from  
22 unnatural sources. Gene flow from straying populations can have two effects, it can increase genetic  
23 diversity (Ayllon et al. 2006), but it can also alter established allele frequencies along with coadapted  
24 gene complexes and reduce the population's level of adaptation (i.e., outbreeding depression) (Edmands

<sup>5</sup> It should be noted that both Pahsimeroi and Sawtooth programs could use integrated returns in segregated programs if abundance is sufficient to do so. This would slightly lessen the domestication risk due to the addition of a partially wild component. The use of integrated fish in these programs will likely be very small within the next 10 years.

2007; McClelland and Naish 2007). In general, the greater the geographic separation between the source or origin of hatchery fish and the recipient natural population, the greater the genetic difference between the two populations (ICTRT 2007), and the greater the potential for outbreeding depression.

Hatchery-influenced selection occurs when hatchery spawning and rearing allows for selection different than that imposed by the natural environment. For example, fish being reared in hatcheries can have different age-at-length, age at maturity, fecundity, life stage-specific mortality, and run timing compared to fish of the same species from natural parents reared naturally. This difference causes genetic change that is passed on to natural populations through interbreeding with hatchery-origin fish. These selection pressures can be a result of differences in environments (i.e., fish reared in hatchery vs. natural) or a consequence of protocols and practices used by a hatchery program that affects the fish in a way that would not occur in nature (e.g., no allowance for mate selection). Hatchery selection can range from relaxation of natural selection that would normally occur in nature to intentional selection for desired characteristics (Waples 1999).

The typical metrics used to describe the influence of hatchery-origin spawners on the natural population are called proportionate natural influence (PNI) and the proportion of hatchery-origin fish on the spawning grounds (pHOS). A PNI exceeding 0.5 indicates that natural selection outweighs hatchery-influenced selection (i.e., the use of natural-origin broodstock contributes to higher PNI). In other words, the use of more natural-origin broodstock equates to less genetic effects on natural-origin populations. The Hatchery Scientific Review Group (HSRG) has developed guidelines for allowable pHOS levels in populations, scaled by the population's conservation importance, recommending a maximum of 5 percent in "primary" populations, 10 percent for "contributing" populations, and at a level required to maintain "sustaining" populations (HSRG 2014). NMFS has not adopted the HSRG guidelines per se; however, the HSRG guidelines are the only acknowledged quantitative standards available, so NMFS considers them a useful screening tool. NMFS evaluates each hatchery program specifically, but generally, if a program meets HSRG standards, NMFS will typically consider the risk levels to be acceptable. Listed salmonid populations in the Snake River Basin are classified by recovery expectation (ICTRT 2007) rather than by the HSRG classification scheme, but "viable" and "highly viable" equate to "primary" and "maintain" equates to "contributing" and "sustaining." Highly viable populations are those with less than 1 percent risk of extinction over 100 years, viable populations are those with negligible (less than 5 percent) risk of extinction over 100 years, and maintained populations are those with less than 25 percent risk of extinction over 100 years (McElhany et al. 2000; NWFSC 2015).

The 15 existing hatchery programs included in this EA currently support artificial production of three salmonid species: spring/summer Chinook salmon, coho salmon, and steelhead. Because no fall Chinook or sockeye salmon are produced under any of these hatchery programs, they are not genetically affected through interbreeding. Therefore, only individuals from the Snake River Spring/Summer Chinook Salmon ESU, Snake River Steelhead DPS, and introduced Clearwater River coho salmon have the potential to be affected.

### Spring/Summer Chinook Salmon Programs

Existing hatchery programs have influenced the current genetic condition of salmon and steelhead in the study area. Natural-origin salmon and steelhead genetics have been affected by hatchery fish from the seven spring/summer Chinook salmon hatchery programs presented in this section:

- Little Salmon/Rapid River Spring Chinook Salmon (segregated)
- Hells Canyon Snake River Spring Chinook (segregated)
- South Fork Salmon River Summer Chinook Salmon (portions segregated and integrated)
- SFCEP (segregated with integrated option)

- 1 • JCAPE (integrated)
- 2 • Pahsimeroi Summer Chinook Salmon (portions segregated and integrated)
- 3 • Upper Salmon Spring Chinook Salmon (portions segregated and integrated)

#### 4 ***Segregated Little Salmon/Rapid River and Hells Canyon Programs***

5 Combined, the segregated Little Salmon/Rapid River Spring Chinook Salmon and Hells Canyon Snake  
6 River Spring Chinook Salmon programs release nearly 3 million hatchery-origin spring/summer Chinook  
7 salmon into the Rapid River, Little Salmon River, and Snake River (Table 2-1). Hatchery spring/summer  
8 Chinook salmon from the segregated programs have the greatest hatchery-influenced selection over the  
9 natural-origin Snake River spring/summer Chinook salmon in the Salmon River Subbasin because of  
10 overlap in time and space.

#### 11 Diversity and Outbreeding

12 All spring/summer Chinook salmon populations that receive hatchery-origin spawners from these  
13 hatchery programs are within the South Fork Salmon River MPG. Currently, although the Little  
14 Salmon/Rapid River and Hells Canyon programs may contribute hatchery-origin returns (HORs) to the  
15 Little Salmon River population, historical outbreeding effects of spring/summer Chinook salmon released  
16 from the hatchery programs appear to be low. According to tagging data from IDFG from 2011 to 2015, a  
17 5-year mean of 16.8 fish from the Little Salmon/Rapid River program strayed into the Lower Salmon River  
18 area, and a mean of 0.2 adult fish from the program strayed into the Sawtooth Fish Trap (NMFS 2017a).  
19 Currently, strays into the Hells Canyon reach do not affect the Snake River Spring/Summer Chinook  
20 Salmon ESU because Hells Canyon is not within the geographic boundaries of the Snake River  
21 Spring/Summer Chinook Salmon ESU.

#### 22 Hatchery-Influenced Selection Effects

23 NMFS assesses the genetic effects of the segregated Little Salmon/Rapid River and Hells Canyon  
24 programs by considering how many fish from each program might spawn in the natural environment.  
25 Because supplementation of the natural population is not an objective for either program, the  
26 number/proportion of hatchery-origin spawners should ideally be zero. However, the HSRG recommends  
27 a maximum pHOS of 5 percent for receiving populations that are targeted as viable or highly viable, and  
28 10 percent for those receiving populations that are maintained. Viable populations are those that are  
29 critical for recovery of a listed ESU whereas maintained populations are those that do not meet the  
30 criteria for a viable population, but do support ecological functions and preserve options for recovery  
31 (NMFS 2017f). The Little Salmon River population is considered maintained.

32 The proportion of hatchery-origin fish on spawning grounds from the segregated Little Salmon/Rapid  
33 River and Hells Canyon programs is currently unknown. Natural and hatchery-origin spawning in the Little  
34 Salmon River population is not well documented; therefore, it is difficult to estimate pHOS levels.  
35 However, because the Little Salmon River population plays only a maintained role in viability scenarios  
36 (NMFS 2017b), PNI and pHOS calculations are not a concern under current hatchery operations.

#### 37 ***Segregated and Integrated South Fork Salmon River, South Fork Chinook Eggboxes, and JCAPE*** 38 ***Programs***

39 The South Fork Salmon River Summer Chinook Salmon, SFCEP, and JCAPE programs use varying  
40 proportions of natural-origin spring/summer Chinook salmon for broodstock (Table 2-4). Currently, NMFS  
41 believes that the removal of broodstock for these programs would not result in more than a minimal effect  
42 on abundance and that the genetic impacts to the populations are not considered a substantial risk

1 (NMFS 2017a). Because the integrated components of the JCAPE and South Fork Salmon River  
2 programs are designed to supplement natural populations by using natural-origin broodstock to increase  
3 production, they provide some benefit to natural Chinook salmon populations in the South Fork Salmon  
4 River and Johnson Creek (NMFS 2017a).

#### 5 Diversity and Outbreeding

6 Current outbreeding effects of spring/summer Chinook salmon released from these hatchery programs  
7 appear to be low. A 5-year mean of 0.8 adult fish (from CWT data) and 2.8 fish (PBT data) from the South  
8 Fork Salmon River Summer Chinook Salmon program was detected at the Rapid River Fish Trap from  
9 2011 through 2015. A 5-year average of 0.2 fish from the program was detected at Red River (South Fork  
10 of the Clearwater River), and a mean of 3.4 (CWT) and 0.2 (PBT) fish from various hatchery programs  
11 strayed to the South Fork Salmon River.

12 The Nez Perce Tribe uses 100 percent natural-origin brood for the JCAPE program. Therefore,  
13 outbreeding depression from straying from this program is likely minimal. From 2011 through 2015, an  
14 annual mean of 0.2 adult fish (CWT) from the JCAPE program was detected at the South Fork Salmon  
15 River Trap. All adipose fin clipped hatchery fish captured at the JCAPE weir are removed from the  
16 population.

17 The outbreeding effects of the SFCEP are unknown, as fish from these programs are not marked and  
18 cannot be distinguished from natural-origin spring/summer Chinook salmon. However, NMFS does not  
19 expect current effects from the SFCEP to differ greatly from those of the South Fork program, which has  
20 low straying, as discussed above, because the South Fork program is the source of the eggs for the  
21 SFCEP.

#### 22 Hatchery-Influenced Selection Effects

23 Because of the overlap in time and space with their natural counterparts, hatchery spring/summer  
24 Chinook salmon from these programs likely have the greatest hatchery-influenced selection over the  
25 natural-origin Snake River spring/summer Chinook salmon in the Salmon River Subbasin.

26 Hatchery-influenced selection is minimized by using as many natural-origin fish for broodstock as possible  
27 for the integrated components of the South Fork Salmon River Summer Chinook Salmon, SFCEP, and  
28 JCAPE programs. Both the South Fork Salmon River Summer Chinook Salmon and SFCEP programs  
29 use natural-origin fish on a sliding-scale approach, whereas JCAPE uses 100 percent natural-origin  
30 broodstock (Section 2.1.2.2, South Fork Salmon River). Operation of these programs using the sliding  
31 scale for integrated and segregated programs currently poses considerably less risk of hatchery-  
32 influenced selection than segregated programs because of the genetic relationship between the programs  
33 (Busack 2015). In this case, the presence of returning segregated hatchery-origin adults on the South  
34 Fork Salmon River spawning grounds poses little additional risk over returning integrated hatchery-origin  
35 adults.

36 As discussed in the introduction to Section 3.3.5.1, Genetics, NMFS generally evaluates PNI and pHOS  
37 values to estimate hatchery-influenced selection effects. A PNI exceeding 0.5 indicates that natural  
38 selection outweighs hatchery-influenced selection (i.e., the use of natural-origin broodstock contributes to  
39 higher PNI). Both programs currently operate on a sliding scale (Table 2-7 and Table 2-8) and remove  
40 natural-origin fish for broodstock

41 Program-specific modeling (NMFS 2017a) indicates that the recent transitioning of the South Fork  
42 Salmon River Summer Chinook Salmon program into a program with both integrated and segregated  
43 components has increased the South Fork Salmon River population PNI in recent years. From 2010  
44 through 2014, the PNI ranged from 0.19 (2013) to 0.63 (2014). Over that same period, the pHOS ranged

1 from 0.18 (2014) to 0.28 (2013). When the SFCEP program is included in the 2010 through 2014 data,  
2 the mean PNI is 0.40, with a mean pHOS of 0.33 (NMFS 2017a). From 2011 through 2015, the PNI for  
3 the JCAPE program at a release level of 100,000 smolts ranged from 0.69 to 0.79, and the integrated  
4 pHOS ranged from 0.27 to 0.45. These values indicate that natural selective forces are currently  
5 dominant in the JCAPE integrated program.

6 Overall, NMFS believes that the population level pHOS values observed from 2010 through 2014 for  
7 these programs did not constitute a serious threat to the Snake River Spring/Summer Chinook Salmon  
8 ESU.

### 9 ***Segregated and Integrated Pahsimeroi and Upper Salmon Programs***

10 The Pahsimeroi Summer Chinook Salmon and the Upper Salmon Spring Chinook Salmon programs use  
11 varying proportions of natural-origin spring/summer Chinook salmon for broodstock (Table 2-4). The  
12 removal of broodstock for these programs is not believed to have resulted in more than a minimal effect  
13 on the populations, and the genetic impacts to the populations are not currently considered a substantial  
14 risk (NMFS 2017a). Because the integrated components are designed to supplement natural populations  
15 by using natural-origin broodstock to increase production, they provide some benefit to natural Chinook  
16 salmon populations in the Pahsimeroi River and in the upper Salmon River (NMFS 2017a).

#### 17 Diversity and Outbreeding

18 Outbreeding effects of spring/summer Chinook salmon released from the Pahsimeroi Summer Chinook  
19 and Upper Salmon Spring Chinook salmon programs appear to be low. According to IDFG data from  
20 2011 through 2015, a 5-year mean of 0.8 fish from the Pahsimeroi Summer Chinook Salmon program  
21 strayed into the Upper Salmon River area during spawning ground surveys. No strays from any Salmon  
22 River hatchery programs were detected at the Pahsimeroi trap. The average population level pHOS from  
23 2011 through 2015 was estimated at 0.07. Because no strays were detected at the Pahsimeroi trap,  
24 NMFS believes that the 0.07 pHOS is likely fish from the Pahsimeroi Summer Chinook Salmon program  
25 (NMFS 2017b).

26 Recent data indicate a low number of strays from the Upper Salmon Spring Chinook Salmon program.  
27 From 2011 through 2015, a mean of 2.4 adult fish from the program was detected in the Upper Salmon  
28 River during spawning ground surveys. The average population level pHOS from 2010 through 2014 was  
29 estimated at 0.30, and stray levels from the Upper Salmon River mainstem hatchery program are low  
30 (NMFS 2017b).

#### 31 Hatchery-Influenced Selection Effects

32 NMFS believes a PNI exceeding 0.5 puts the Pahsimeroi River population on a trajectory to achieve  
33 viability. Data from 2014 through 2016 indicates that PNI ranged from 0.44 to 0.62 for this population  
34 (NMFS 2017b). For the Upper Salmon River mainstem population, data from 2014 through 2016 indicate  
35 that PNI ranged from 0.12 to 0.35 based on the multipopulation component model analysis tool  
36 developed by Busack (2015).

### 37 **Steelhead Programs**

38 With the exception of the East Fork Salmon River Natural A-run Steelhead Program, all of the steelhead  
39 hatchery programs included in this EA are segregated programs (Table 2-1; Table 2-2; Table 2-3). The  
40 segregated programs include the South Fork Clearwater Steelhead, Hells Canyon Snake River A-run  
41 Summer Steelhead, Little Salmon River A-run Summer Steelhead, Pahsimeroi A-run Summer Steelhead,  
42 Salmon River B-run Steelhead (including Little Salmon River B-run, Pahsimeroi River B-run, and Yankee



1 Fork B-run), and the SSI programs (receives eggs from Salmon River B-Run and Pahsimeroi A-run  
2 programs). The hatchery programs pose both genetic and ecological risks, although there is some benefit  
3 to the species from the integrated program designed to supplement the East Fork Salmon River  
4 population. Steelhead from these programs appear to exhibit low to no straying.

### 5 ***Segregated Programs***

#### 6 Diversity and Outbreeding

7 Available information suggests that very few fish from Idaho steelhead programs return to a place from  
8 which they were not released. NMFS compared adults detected at Lower Granite Dam to detections  
9 further upstream, and determined that the percent of detections that classify as strays ranged from 0.3  
10 percent for fish released from the Little Salmon River to 3 percent for fish released from the South Fork  
11 Clearwater River and Red River satellite facility in the South Fork Clearwater River watershed (a previous  
12 acclimation site that is no longer used). Stray rates for the Pahsimeroi A-run and from Upper Salmon B-  
13 run releases in the Yankee Fork were 0.5 and 0.4 percent, respectively (Leth 2017a, as cited in NMFS  
14 2017c).

15 Because the majority of the steelhead hatchery programs included in this EA have been ongoing for quite  
16 some time, and the effects of any hatchery-origin fish spawning naturally are likely reflected to some  
17 degree in the status review data, NMFS (2017c) has previously concluded that the hatchery steelhead  
18 strays do not negatively impact steelhead population recovery.

#### 19 Hatchery-Influenced Selection Effects

20 For the segregated programs, genetic effects are assessed by considering how many fish from each  
21 program spawn naturally. Information for steelhead is not adequate to estimate pHOS with confidence,  
22 but applicants remove hatchery-origin fish from the wild to the extent possible. Hatchery steelhead from  
23 the segregated programs are most likely to have the greatest hatchery-influenced selection over the  
24 natural-origin Snake River steelhead in the Salmon and Clearwater river subbasins, compared to all other  
25 natural-origin steelhead populations because of overlap in time and space.

### 26 ***Integrated Program - East Fork Salmon River Natural A-run program***

#### 27 Diversity and Outbreeding

28 NMFS (2017c) assessed stray rates of adults from the East Fork Salmon River Natural A-run Program by  
29 comparing adult PIT tag detection at Lower Granite Dam to subsequent detections outside the natal  
30 hatchery reach. Stray rates were low; about 1.3 percent of adults from the integrated East Fork Salmon  
31 River Natural A-run program strayed (NMFS 2017c).

#### 32 Hatchery-Influenced Selection Effects

33 The East Fork Salmon River Natural A-run Steelhead Program's genetic evaluation is different from  
34 evaluation of the segregated programs because of the use of natural-origin broodstock. Data from 2013  
35 through 2016 indicate that PNI ranged from 0.39 to 0.52, despite very low natural-origin returns. In  
36 addition, smolt releases were reduced in 2013 from 170,000 to 60,000 steelhead. Although 2016 would  
37 have been the first year with returns from this reduction, NMFS applied the proportional decrease in smolt  
38 releases to the observed PNI from 2013 through 2016. This allowed for estimation of what pHOS and  
39 proportion of natural-origin spawners (pNOS) would have been for 2013 through 2015 if only 60,000  
40 smolts had been released, assuming natural-origin returns were the same. Using this approach, the PNI

1 would have ranged from 0.44 to 0.52. PNIs within this range are likely to reflect a balance between  
2 natural selective forces and hatchery selective forces.

### 3 **Clearwater River Coho Salmon**

4 Native Clearwater River coho salmon were extirpated from the Clearwater River Subbasin in 1927 by the  
5 construction of Lewiston Dam, and all coho salmon that currently exist in the subbasin originate from  
6 recent reintroduction efforts initiated in 1994. Therefore, because all coho salmon in the study area exist  
7 because of the reintroduction efforts, they are linked genetically throughout the study area. Despite this,  
8 hatchery broodstock sources have changed over the years, and as a result, the genetic profile of the  
9 natural-origin population likely differs from hatchery-origin genetics at some level. That level, however, is  
10 currently unknown.

#### 11 **3.3.5.2 Masking**

12 Masking occurs when unmarked hatchery-origin salmon and/or their offspring are included when making  
13 population estimates (e.g., abundance, productivity) of natural-origin fish because hatchery-origin salmon  
14 cannot be distinguished from the natural-origin fish. This inclusion of hatchery-origin fish results in an  
15 overestimation of the count of natural-origin fish. To minimize masking effects, hatchery-origin fish are  
16 often marked (e.g., adipose fin clips, PIT-tags, CWT). This allows hatchery-origin fish to be distinguished  
17 from natural-origin fish. PBT is another marking method that may be used to alleviate masking effects. It  
18 uses genotyping of hatchery broodstock to identify the progeny of hatchery-origin fish. Tissue samples  
19 are typically collected at hatchery traps, during spawning ground surveys, or sampling at Lower Granite  
20 Dam. With this information, parentage assignments are used to identify the origin and brood year of their  
21 progeny. PBT is used widely among hatchery programs in the Snake River Basin, and is the only method  
22 by which to identify juveniles from the egg box programs. Although PBT can be used to alleviate masking  
23 effects, it is only effective if sampled fish are matched back to parents and if that information is integrated  
24 into the abundance estimates.

25 Most of the spring/summer Chinook salmon and steelhead from the hatchery programs included in this  
26 EA are adipose-fin clipped (Table 2-2; Table 2-3; Table 2-4; Table 2-6) to differentiate program fish from  
27 natural-origin fish as juveniles, in fisheries, and upon adult return. Mass-marking allows for monitoring of  
28 hatchery fish stray rates to natural spawning areas, and where applicable, natural spawning population  
29 objectives. This, in turn, decreases potential masking effects from the ongoing hatchery releases.

30 Because no fall Chinook or sockeye salmon are produced under any of the hatchery programs included in  
31 this EA, masking of these populations is not a concern. Further, native Clearwater River coho salmon  
32 were extirpated from the Clearwater River in 1927. Coho salmon abundance is not currently estimated,  
33 but all coho salmon that currently exist in the subbasin originated from reintroduction efforts initiated in  
34 1994. Although some level of genetic divergence between natural-origin coho and hatchery coho has  
35 likely occurred since the initiation of reintroduction efforts, particularly with changes in hatchery  
36 broodstock sources, natural- and hatchery-origin coho in the study area are genetically linked. Therefore,  
37 individuals currently released from the Clearwater Coho Salmon program (16 to 50 percent CWT) are  
38 unlikely to mask natural-origin fish in the study area.

#### 39 **3.3.5.3 Competition and Predation**

40 Under current operations, ecological interactions between natural- and hatchery-origin fish may occur  
41 during both the adult and juvenile life-history stages. Hatchery smolts released into habitats where  
42 natural-origin juvenile salmon and steelhead rear may compete with or prey on natural-origin fish.

1 Hatchery adults may also compete with natural-origin salmon and steelhead for spawning sites and  
2 resources.

### 3 **Spring/Summer Chinook Salmon Programs**

#### 4 *Interactions Between Hatchery- and Natural-Origin Juveniles*

5 The likelihood of competition or predation between natural- and hatchery-origin fish under current  
6 operations is influenced by a variety of factors including the size of predators and prey, spatial and  
7 temporal overlap, and the number of fish released at any time.

#### 8 Hatchery Releases

9 In the study area, all hatchery spring/summer Chinook salmon smolts are released in March or April, and  
10 outmigrate from March through September. Eggs from the SFCEP are placed in October so that fish may  
11 hatch and rear in the natural environment and outmigrate volitionally in spring. Despite these release  
12 periods, some natural-origin salmon and steelhead juveniles are lost to competition and predation from  
13 the release of hatchery-origin juveniles, particularly when there is overlap in time and space (Table 3-4;  
14 NMFS 2017a, 2017b). All releases could overlap with natural-origin Chinook and sockeye salmon and  
15 steelhead in the Snake River Basin.

16 Predation on some species by hatchery-origin smolts is less likely than competition because of fish size.  
17 Some reports suggest that hatchery-origin fish can prey on fish that are one-half their length (Pearsons  
18 and Fritts 1999; HSRG 2004), but other studies have concluded that hatchery-origin predators prefer fish  
19 one-third or less their length (Hillman and Mullan 1989; Beauchamp 1990; Cannamela 1992; CBFWA  
20 1996). Thus, past predation by spring Chinook salmon hatchery smolts has been limited to fish that are  
21 less than 2.8 inches, given the typical length of smolts released from programs under current operations  
22 (NMFS 2017a, 2017b). The average size of most natural-origin fish that may be encountered by juvenile  
23 hatchery fish is larger than 2.8 inches (Table 3-4).

24 NMFS (2017a, 2017b) determined that the current levels of competition and predation from  
25 spring/summer Chinook salmon hatchery programs in this EA are minimal. Hatchery-origin Chinook  
26 salmon likely have the largest effect on natural-origin Chinook salmon, followed by steelhead and  
27 sockeye salmon (NMFS 2017a, 2017b). Using return data from 2007 through 2016, the maximum number  
28 of fish lost from competition and predation during the juvenile life stage attributed to spring/summer  
29 Chinook salmon hatchery programs from the Little Salmon/Rapid River Spring Chinook Salmon, Hells  
30 Canyon Snake River Spring Chinook Salmon, South Fork Salmon River Summer Chinook Salmon, and  
31 JCAPE programs equates to about 2.1 to 2.2, 1.5 to 1.6, and 2.0 percent (respectively) of the potential  
32 adult returns for Chinook salmon (all races), steelhead, and sockeye salmon (NMFS 2017a). NMFS  
33 (2017a) acknowledges that these percentages of adult return losses are likely overestimated because  
34 models assumed 100 percent overlap of all populations.

35 Using data from 2007 through 2016, the maximum number of fish lost from competition and predation  
36 from the Pahsimeroi Summer Chinook Salmon and Upper Salmon Spring Chinook Salmon programs  
37 equates to about 0.8, 0.7, and 0.5 percent of the potential adult return for Chinook salmon (all races),  
38 steelhead, and sockeye salmon, respectively (NMFS 2017b). The past effects from all programs are  
39 spread out over the various populations that comprise the Snake River ESUs/DPSs, and also include the  
40 unlisted spring/summer Chinook salmon originating from the Clearwater Subbasin. It should be noted that  
41 models could not account for all the variables that could influence competition and predation of hatchery  
42 juveniles on natural juveniles. The predation model provides worst-case estimates on natural-origin fish  
43 loss. However, the model likely overestimates predation because in fresh water, hatchery-origin juveniles

1 consume a wide variety of invertebrates, other fish species, and other hatchery-origin fish in addition to  
2 natural-origin smolts (NMFS 2017a).

3 Past Chinook salmon hatchery smolts releases are unlikely to have affected age-0 steelhead. Steelhead  
4 spawn from March to June, with a peak from April to May in the study area (Busby et al. 1996). Thus, it is  
5 unlikely that any age-0 steelhead emerge in time to interact with the hatchery Chinook smolts that are  
6 released in mid-late spring. A lack of geographic overlap prevents current Chinook hatchery releases  
7 from interacting with age-0 sockeye in Redfish, Pettit, and Alturas Lakes. Natural-origin coho juveniles are  
8 also likely to be subject to some level of competition or predation from all Chinook hatchery releases;  
9 however, because coho are not listed in the study area, NMFS has not estimated historic losses and adult  
10 equivalents.

11 Despite the number of smolts released into the study area, negative ecological effects from residual  
12 hatchery Chinook salmon preying on or competing with natural-origin salmonids have likely been minimal.  
13 Although residualism has not been studied in Chinook salmon as extensively as for steelhead, recent  
14 data suggests that residualism may occur as result of hatchery rearing and has been measured in some  
15 Upper Columbia River hatchery programs (NMFS 2017a).

16 Table 3-4. General information on size and freshwater occurrence/release for natural and  
17 hatchery-origin juvenile salmonids in the Snake River Basin.

Species, Race (Origin)	Life Stage	Estimated size (inches)	Occurrence/Release Timing
<b>Chinook Salmon</b>			
Spring/Summer (natural)	Fry	<2.5	January to April
	Pre-smolts	2.5 to 4.0	April to February
	Smolts	4.0 to 6.0	March to June
Spring/Summer (hatchery)	Smolts	5.7 to 6.7	March to April
Fall (natural)	Fry	<1.8	April to June
	Pre-smolts	1.8 to 2.5	May to June
	Smolts	>2.5	May to August
Fall (hatchery)	Smolts	5.9 to 7.0	April
<b>Steelhead</b>			
Natural	Fry	<2.5	June to October
	Pre-Smolts	2.5 to 6.0	October to May
	Smolts	6.0 to 8.0	March to June
Hatchery	Smolts	6.0 to 8.0	Mid-March to May
<b>Coho Salmon</b>			
Natural	Fry	<2.5	March to May
	Pre-Smolts	2.5 to 4.5	May to April
	Smolts	4.5 to 5.5	late April to May
Hatchery	Smolts	4.5 to 5.5	April to May
<b>Sockeye Salmon</b>			
Natural	Fry	<2.5	January to June
	Pre-smolts	2.5 to 4.0	April to March
	Smolts	4.0 to 7.0	April to May
Hatchery	Pre-smolts	3.0 to 3.5	October
	Smolts	4.7 to 7.0	May

18 Sources: Connor et al. (2002), Nez Perce Tribe (2016), NMFS (2017a, 2017b), WDFW et al. (2017).

### Naturally Produced Progeny Competition

The progeny of naturally-spawning hatchery-origin Chinook salmon likely compose a sizable portion of the juvenile fish population for those areas where hatchery fish are allowed to spawn naturally. This is a desired result of the integrated recovery programs.

NMFS does not have any data suggesting that offspring of naturally spawning hatchery-origin adults behave differently from the offspring of natural-origin parents (NMFS 2017c). Therefore, ongoing competition and predation is similar among juveniles, regardless of origin. The only expected effect of natural production by hatchery fish spawning naturally is a density-dependent response of decreasing growth and potential exceedance of habitat capacity. Because various species of salmonids historically coexisted in substantial numbers with spring/summer Chinook salmon, it follows that passage and habitat were adequate to allow all species to be productive and abundant (NMFS 2017c).

### ***Competition Between Hatchery- and Natural-Origin Adults***

If hatchery- and natural-origin fish overlap in spawning areas, hatchery-origin fish (as well as natural-origin fish) may spawn over (superimpose) redds of natural-origin fish. Run and spawn timing between hatchery-origin and natural-origin Snake River spring/summer Chinook salmon is very similar (NMFS 2017a), and redd superimposition may currently occur. Therefore, hatchery-origin fish that make it onto spawning grounds currently may compete with natural-origin spring/summer Chinook salmon for spawning habitat.

The ongoing JCAPE program and portions of the South Fork Salmon River Summer Chinook Salmon, Pahsimeroi Summer Chinook Salmon, and Upper Salmon Spring Chinook Salmon programs produce hatchery-origin fish that are intended to spawn with natural-origin fish to supplement the natural-origin population. Target pHOS for each integrated program are generally below 0.51, depending on sliding scale management of natural-origin brood (see Table 2-4). For all other programs, hatchery staff currently attempt to reduce the number of hatchery-origin spawners on natural-origin spawning grounds.

Spawning site competition or redd superimposition is unlikely between spring/summer Chinook salmon hatchery fish and Snake River fall Chinook salmon, sockeye salmon, steelhead, or coho (Table 3-5). Spawn timings largely do not overlap; therefore, opportunity for these potential ecological interactions to occur has been limited. It is possible that hatchery-origin spring/summer Chinook salmon may have competed with natural-origin fall Chinook salmon because of a slight overlap in spawn timings in late September. However, the Snake River Fall Chinook Salmon ESU boundary overlaps only with a portion of the Snake River Spring/Summer Chinook Salmon ESU.

1 Table 3-5. Run and spawn timing of Snake River Spring/Summer Chinook salmon, steelhead, fall  
2 Chinook salmon, sockeye salmon, and coho salmon.

Species		Run Timing	Holding	Spawning
Spring/summer Chinook Salmon (natural or hatchery-origin)		March-August	April-July	Late July to October
Fall Chinook Salmon		July-October	August to October	Late-September to October
Steelhead		May-November	October-April	March to June
Sockeye Salmon <sup>1</sup>	Resident life history 1 - residual	NA	NA	Late fall
	Resident life history 2: kokanee	NA	NA	Late summer to early fall
	Anadromous	June to September	August to October	Late fall
Coho Salmon		September to December	October to December	Mid-October to mid-December

3 Source: NMFS 2017a, 2017b; IDFG website, <http://fishandgame.idaho.gov>

4 <sup>1</sup>Sockeye have two resident life forms in the Snake River Basin: 1) more closely resembles sockeye salmon life history traits in that  
5 it spawns in lakes in late fall with most juveniles remaining in the lake, maturing and spawning without rearing in the ocean; 2) the  
6 more common resident form known as kokanee, spawns in tributary streams to the lake during late summer/early fall (IDFG 2005).

## 7 Steelhead Programs

### 8 *Interactions Between Hatchery- and Natural-Origin Juveniles*

#### 9 Hatchery Releases

10 Steelhead smolts from the ongoing hatchery programs in this EA are released from mid-March to May.  
11 These smolts may overlap with natural-origin Chinook salmon, sockeye salmon, steelhead, and coho  
12 salmon in the study area (Table 3-4).

13 Based on historic travel and residence time, an average size at release of 7.9 inches, and the  
14 corresponding size of natural-origin salmon and steelhead juveniles in the study area (NMFS 2017c),  
15 currently-released hatchery steelhead likely affect natural-origin steelhead most, followed by sockeye and  
16 Chinook salmon. Steelhead likely prey on or compete with natural-origin coho salmon juveniles at some  
17 level; however, because coho salmon are not listed in the study area, NMFS has not estimated juvenile  
18 losses and adult equivalents.

19 Using the average number of each species that passed over Lower Granite Dam from 2011 through  
20 2016, the maximum number of fish lost due to current competition and predation during the juvenile life  
21 stage from steelhead hatchery programs equates to about 1.8, 4.6, and 2.6 percent of the potential adult  
22 return for Chinook salmon, steelhead, and sockeye salmon, respectively (NMFS 2017c). These ongoing  
23 losses are spread out over the various populations that comprise the Snake River ESUs/DPSs, and also  
24 include the unlisted spring/summer Chinook salmon from the Clearwater River. Residual hatchery  
25 steelhead are not accounted for in these estimates.

26 Residual hatchery steelhead are those fish that do not immigrate to the ocean after release from the  
27 hatchery. These fish have the potential to compete with and prey on natural-origin fish for a longer period  
28 relative to fish actively outmigrating, and could impart some genetic effects when they spawn naturally.  
29 Although residualism is a natural life history and may occur at rates around 5 percent naturally  
30 (Melnychuk 2011), hatchery programs have the potential to increase residualism rates through hatchery  
31 rearing.

1 Similar to Chinook and coho salmon hatchery programs, steelhead smolts currently released from the  
2 subject hatchery programs are unlikely to affect age-0 steelhead because steelhead spawn from March  
3 to June, with a peak from April to May in the study area (Busby et al. 1996). Thus, it is unlikely that any  
4 age-0 steelhead emerge from the gravel in time to interact with the hatchery steelhead smolts as they  
5 migrate downstream. A lack of geographic overlap prevents steelhead hatchery releases from interacting  
6 with age-0 sockeye salmon in Redfish, Pettit, and Alturas Lakes.

#### 7 Naturally Produced Progeny Competition

8 As presented above for Chinook salmon, offspring of naturally spawning hatchery-origin steelhead  
9 compose a portion of the juvenile fish population for those areas where hatchery-origin steelhead are  
10 allowed to spawn naturally. This is a desired result of the integrated recovery programs (e.g., East Fork  
11 Salmon River Natural A-run). Further, juveniles produced from outplanted eggs from the SSI program  
12 may also compete with natural-origin salmon and steelhead. From 1995 through 2009, about  
13 82.3 percent of the eggs outplanted into the Yankee Fork have survived to the fry stage (NMFS 2017c).  
14 NMFS currently has no data suggesting that offspring of naturally spawning hatchery-origin adults behave  
15 differently from the offspring of natural-origin parents (NMFS 2017c). Therefore, ongoing competition and  
16 predation is similar among juveniles, regardless of origin.

#### 17 ***Competition Between Hatchery- and Natural-Origin Adults***

18 Natural-origin and naturally spawning hatchery-origin steelhead likely overlap in their selection of  
19 spawning sites due to similar spring spawn times and habitat requirements. Because straying appears to  
20 be low (Section 3.3.5.1, Genetics), although some hatchery fish may spawn naturally, this primarily  
21 occurs within populations that are not targeted as viable or highly viable populations in the DPS. Thus,  
22 competition with natural-origin steelhead may occur, but has had little effect on the recovery of the Snake  
23 River steelhead population.

24 Competition between adult hatchery-origin steelhead and other salmonids is unlikely due to differences in  
25 run timing, holding, and spawn timing. Steelhead begin their entry into freshwater during the last portion  
26 of the spring/summer Chinook salmon migration and reach the study area after spring/summer Chinook  
27 salmon have held over the summer and spawned. Although sockeye and fall Chinook salmon overlap  
28 with the steelhead run, Snake River sockeye salmon spawn only in lakes in the Upper Salmon River  
29 Subbasin, and both complete their spawning before steelhead spawning begins. Therefore, competition  
30 between steelhead adults and other salmon species is unlikely (NMFS 2017c).

#### 31 **Coho Salmon Program**

32 Hatchery-released juveniles and returning adult Coho compete with their natural-origin counterparts for  
33 resources in the study area. Under past operations, released hatchery smolts may have preyed upon  
34 other species of natural-origin salmon and steelhead.

#### 35 ***Interactions Between Hatchery-origin Coho and Natural-Origin Salmonids***

36 NMFS estimates that 6,500 hatchery-origin coho adults currently return to the study area from the  
37 500,000 coho smolt releases considered in this EA (NMFS 2017d). Juveniles are released from April  
38 through May into Clear Creek, and may overlap with natural-origin coho salmon, Chinook salmon,  
39 sockeye salmon, and steelhead in the study area. Based on data from 2010 through 2016, hatchery coho  
40 salmon survival to Lower Granite Dam is estimated at 58 percent; individuals take 30 days, on average,  
41 to reach Lower Granite Dam, with an additional nine days of travel time to Ice Harbor Dam (NMFS  
42 2017d). Based on travel and residence time, an average size at release of 5.2 inches (NMFS 2017d), and  
43 the corresponding size of natural-origin salmon and steelhead juveniles in the study area (Table 3-4),

1 current hatchery coho salmon releases likely affect natural-origin Chinook salmon the most (NMFS  
2 2017d), followed by natural-origin coho. Based on release timing and size (Table 3-4), coho salmon  
3 smolts do not overlap with age-0 steelhead, and are highly unlikely to overlap geographically with  
4 sockeye. Therefore, coho release do not likely prey on other salmon and steelhead (NMFS 2017d).

5 Based on ecological interaction models using 2008 through 2015 data, the maximum annual numbers of  
6 salmon and steelhead currently lost from competition with and predation by hatchery-origin Clearwater  
7 River coho salmon equates to 51 to 53 adult Chinook salmon, 50 to 51 adult steelhead, and 2 adult  
8 sockeye salmon (NMFS 2017d). These ongoing adult-equivalent losses from predation and competition  
9 provide worst-case estimates. In fresh water, hatchery-origin fish juveniles consume a wide variety of  
10 invertebrates, other fish species, and other hatchery-origin fish, in addition to natural-origin smolts (NMFS  
11 2017a). In their freshwater stage, coho primarily feed on plankton and insects (NMFS 2016b), and  
12 terrestrial drift and benthic aquatic invertebrates (Dill et al. 1981; Gonzales 2006). NMFS has not  
13 estimated natural coho salmon losses because they are not listed in the study area.

14 Similar to Chinook salmon and steelhead programs, current coho salmon hatchery releases do not likely  
15 affect age-0 steelhead because steelhead spawn from March to June with a peak from April to May in the  
16 study area (Busby et al. 1996). Thus, it is unlikely that any age-0 steelhead emerge in time to interact with  
17 the hatchery coho smolts as they migrate downstream. A lack of geographic overlap also prevents current  
18 coho salmon releases from interacting with age-0 sockeye in Redfish, Pettit, and Alturas Lakes.  
19 Considering the low number of coho salmon currently released into the study area, if coho releases  
20 residualize, ongoing predation and competition is likely minimal.

#### 21 ***Competition Between Hatchery- and Natural-Origin Adults***

22 Naturally spawning hatchery-origin coho salmon spawn from October to early December and prefer small  
23 gravel substrates in tributaries. Therefore, potential temporal or geographic overlap with other salmon or  
24 steelhead is limited, including fall Chinook salmon that may spawn through early October. Ongoing Coho  
25 salmon redd superimposition on other salmon and steelhead redds in the study area is likely minimal.  
26 Considering the low number of hatchery-origin coho that currently return to the study area (6,500; NMFS  
27 2017d), redd superimposition on natural-origin coho, though possible, is likely low. Because they are not  
28 ESA-listed, NMFS has not estimated current hatchery-origin coho redd superimposition on natural-origin  
29 coho in the study area.

#### 30 **3.3.5.4 Prey Enhancement**

31 Upon release into the natural environment, hatchery-origin juveniles may become prey items for  
32 natural-origin salmon and steelhead and provide an additional food source.

#### 33 **Spring/Summer Chinook Salmon Programs**

34 On average, almost 7 million hatchery-origin juvenile spring/summer Chinook salmon have been released  
35 annually since 2012 into the Snake River Basin from hatchery programs included in this EA (Table 3-6).  
36 Any resident adult fish<sup>6</sup> can prey on hatchery-origin juveniles. Similarly, larger natural-origin juvenile fish  
37 can prey on hatchery-origin juveniles. Though the occurrence of predation by some species on hatchery-  
38 origin smolts is likely to be low because of fish size (Section 3.3.5.3, Competition and Predation), prey  
39 enhancement can nonetheless occur for any fish species that are larger than the hatchery-origin juveniles  
40 (e.g., fish that residualize).

---

<sup>6</sup> Rainbow trout is the resident form of steelhead, and is discussed in Section 3.4, Other Fish Species.



**1 Steelhead Programs**

2 On average, about 5 million hatchery-origin juvenile steelhead have been released annually into the  
3 Snake River Basin from hatchery programs included in this EA (Table 3-7). Similar to spring/summer  
4 Chinook salmon releases discussed above, these hatchery smolts provide prey for adults that may be  
5 present (e.g., steelhead) as well as any fish that are larger than the hatchery-origin juvenile steelhead.

**6 Clearwater River Coho Salmon Program**

7 For the portion of the coho salmon restoration program included in this EA, the average number of coho  
8 salmon smolts released into Clear Creek from 2007 through 2015 was about 575,000 (USFWS 2017b).  
9 Though predation by some species on hatchery-origin coho salmon smolts is likely to be low because of  
10 smolt size at release, prey enhancement can be realized for any fish that are larger than the hatchery-  
11 origin juvenile coho salmon.

12

1 Table 3-6. Approximate 10-year average juvenile releases from Spring/Summer Chinook Salmon  
2 programs included in this EA.

Program	Release site or Program	Release Years Used for Average	Average Juvenile Releases <sup>1</sup>
Hells Canyon Snake River Spring Chinook Salmon	Hells Canyon Dam	2003 to 2014	414,447
Little Salmon/Rapid River Spring Chinook Salmon	Rapid River Hatchery	2003 to 2014	2,529,489
	Little Salmon River	2003 to 2014	204,925
South Fork Salmon River Summer Chinook Salmon <sup>2</sup>	Segregated	2003 to 2014	990,832
	Integrated	2012 to 2014	243,042
Johnson Creek Artificial Propagation Enhancement	Johnson Creek	2003 to 2014	100,485
South Fork Chinook Eggbox	Cabin and Curtis creeks	2007 to 2014	310,505
Pahsimeroi Summer Chinook Salmon	Segregated	2003 to 2013	975,002
	Integrated	2012 to 2013	173,239
Upper Salmon Spring Chinook Salmon	Segregated	2004 to 2013	828,182
	Integrated	2012 to 2013	156,577

3 Source: USFWS (2017a)

4 <sup>1</sup> Historical release numbers may vary from those under the Proposed Action, but are still representative of conditions expected  
5 under Alternatives 1 and 2 of this EA

6 <sup>2</sup> In 2012, the South Fork Salmon River fully segregated program was changed to a segregated and integrated program, and  
7 average releases for the segregated program consider both fully segregated and segregated + integrated years.

8 Table 3-7. Average juvenile releases from steelhead hatchery programs included in this EA.

Program	Release sites	Release Years Used for Average	Average Juvenile Releases <sup>1</sup>
South Fork Clearwater	Red House Hole	2007 to 2016	228,480
	Meadow Creek	2012 to 2016	526,078
	Newsome Creek	2012 to 2016	129,719
Hells Canyon Snake River A-run	Hells Canyon Dam	2003 to 2014	536,905
Little Salmon River A-run	Little Salmon River	2003 to 2014	931,741
Pahsimeroi A-run	Pahsimeroi River	2003 to 2013	823,918
East Fork Salmon River Natural A-run	East Fork Salmon River	2004 to 2016	84,508
Steelhead Streamside Incubator Project	Confluence of Beaver and Panther creeks	2006 to 2013	335,661
	Indian Creek	2006 to 2013	138,242
	Yankee Fork tributaries	2006 to 2013	446,302
Salmon River B-run	Little Salmon River	2011 to 2017	193,000
	Pahsimeroi River	2010 to 2013	148,142
	Yankee Fork	2004 to 2013	629,856

9 Sources: USFWS (2017a, 2017b); Brian Leth, IDFG, email sent to Dave Ward, HDR, February 26, 2018a, regarding hatchery  
10 releases

11 <sup>1</sup> Historic release numbers may vary from those under the Proposed Action, but are still representative of conditions expected under  
12 Alternative 1 and Alternative 2 of this EA. Facility operators typically produce a 10 percent buffer to account for losses throughout  
13 the rearing period; therefore, actual releases may exceed Proposed Action release targets by up to 10 percent.

### 3.3.5.5 Diseases

Ongoing hatchery programs may introduce exotic pathogens into the natural environment. When a hatchery fish is infected in a hatchery facility, the pathogen can be amplified in the water column and among the other fish because hatchery fish are reared at higher densities and closer proximity than in the natural environment. Transmission of pathogens between infected hatchery fish and natural fish can occur indirectly through hatchery water effluent or directly if infected hatchery fish contact natural-origin fish after the hatchery fish are released into the natural environment.

Currently, major diseases identified in salmonids from the Snake River Basin include Bacterial Kidney Disease (BKD) and Infectious Hematopoietic Necrosis (IHN), both of which are caused by pathogens endemic to the basin (bacterium *Renibacterium salmoninarum* and IHN virus, respectively).

Under current operations, hatchery operators monitor the health status of hatchery-produced salmon and steelhead from the time they are ponded at rearing facilities until their release. Prior to release, a pre-release fish health inspection is completed, and all fish production is conducted according to the USFWS National Fish Health Policy, and policies and guidelines of the Integrated Hatcheries Operations Team.

#### Spring/Summer Chinook Salmon Programs

From 2014 to 2016, several pathogens endemic to the Snake River Basin were detected in rearing hatchery spring/summer Chinook salmon for programs included in this EA, but only one of these detections resulted in a disease outbreak (Table 3-8). An outbreak is defined as an infectious disease that results in a higher than normal mortality within a specific rearing unit for five consecutive days (NWIFC and WDFW 2006).

For all programs, fish health staff monitor hatchery fish from all programs throughout their rearing cycle for signs of disease. Fish are checked, and any mortalities are removed daily. A subset of live fish are tested monthly. Fish are also tested prior to transfer to acclimation sites. Prior to release, the Eagle Fish Health Laboratory conducts a final prerelease fish health inspection. These fish health practices minimize the risk of pathogen transfer to salmon and steelhead and in the natural environment.

1 Table 3-8. Pathogen detections in hatchery Spring/Summer Chinook salmon juveniles reared and/or  
 2 acclimated as part of programs included in this EA.

Facility	Program	Year	Pathogen-caused Disease	Outbreak
Oxbow Fish Hatchery	Hells Canyon Snake River Spring Chinook; Little Salmon/Rapid River Spring Chinook	2014	Bacterial kidney disease	No
		2015	Bacterial kidney disease	No
		2016	Bacterial kidney disease	No
Rapid River Fish Hatchery <sup>1</sup>	Hells Canyon Snake River Spring Chinook; Little Salmon/Rapid River Spring Chinook	2014	Bacterial kidney disease	No
		2015	Bacterial kidney disease	No
		2016	Bacterial kidney disease	No
McCall Fish Hatchery <sup>2</sup>	South Fork Salmon River Summer Chinook	2014	Fungal disease	No
		2015	Fungal disease	No
		2016	Fungal disease	No
Pahsimeroi Fish Hatchery	Pahsimeroi Summer Chinook	2014	Bacterial kidney disease; white spot	No
		2015	Bacterial kidney disease; white spot <sup>3</sup>	Yes
		2016	Bacterial kidney disease; white spot	NA
Sawtooth Fish Hatchery	Upper Salmon Spring Chinook	2014	Bacterial kidney disease; Cotton mould; cotton mouth; white spot	No
		2015	Cotton mould; cotton mouth; white spot	Unknown
		2016	Cotton mould; Bacterial kidney disease	No

3 Source: Hebdon (2017a, 2017b as cited in NMFS 2017a, 2017b)

4 <sup>1</sup>Pathogen information for Rapid River Fish Hatchery is identical to pathogen information for Oxbow Fish Hatchery.

5 <sup>2</sup>Includes fish reared for the JCAPE. South Fork Chinook Eggbox Program fish are reared in the natural environment from  
 6 eggboxes, and no pathogens have been detected for this program.

7 <sup>3</sup>This infection resulted in an outbreak in November 2015 and was treated with erythromycin medicated feed.

## 8 Steelhead Programs

9 From 2014 through 2016, a variety of pathogens endemic to the Snake River Basin were detected in  
 10 facilities used to rear juvenile steelhead for programs included in this EA (Table 3-9). Juvenile rearing for  
 11 all steelhead programs in the Salmon River Subbasin occurs on spring or well water, with minimal, if any,  
 12 exposure to pathogens through the water source. In addition, most of the rearing facilities for steelhead  
 13 released in the Salmon River Subbasin are out of anadromous areas. Thus, even though detections and  
 14 outbreaks with endemic pathogens do occur (Table 3-9), it is currently very unlikely that salmon or  
 15 steelhead in the natural environment are exposed to pathogens shed from hatchery fish during rearing. In  
 16 addition, treatments for the pathogens responsible for outbreaks usually are effective within 3 to 10 days  
 17 after treatment begins. Thus, the amount of time available over which shedding of pathogens occurs is  
 18 limited. Ongoing implementation of fish health protocols prevent, minimize and control outbreaks.

19

1 Table 3-9. Pathogen detections and disease outbreaks in hatchery steelhead juveniles included in  
 2 this EA.

Facility	Program	Years	Pathogen-caused Disease	Outbreak
Clearwater Fish Hatchery	South Fork Clearwater	2014	No data	No data
		2015	Bacterial gill disease	Yes
		2016	IHNV <sup>1</sup>	No
Oxbow Fish Hatchery	Hells Canyon Snake River A-run	2014	None	No
		2015	IHNV	No
		2016	None	No
Pahsimeroi Fish Hatchery	Pahsimeroi A-run	2014	None	No
		2015	IHNV	No
		2016	Whirling disease	No
	Salmon River B-run	2014	IHNV; Bacterial kidney disease	No
		2015	Bacterial kidney disease	No
		2016	Bacterial kidney disease; whirling disease	No
Sawtooth Fish Hatchery	East Fork Salmon River Natural A-run	2014	Bacterial kidney disease	No
		2015	None	No
		2016	Bacterial kidney disease; whirling disease	No
Magic Valley Fish Hatchery	Pahsimeroi A-run	2014	None	No
		2015	None	No
		2016	Bacterial gill disease (x2)	No
	Salmon River B-Run	2014	Bacterial gill disease	No
		2015	Bacterial gill disease	Yes
		2016	Bacterial gill disease (x2)	No
Niagara Springs Fish Hatchery	Hells Canyon Snake River A-run	2014	Bacterial gill disease; ulcer disease	Yes
		2015	IHNV, Bacterial gill disease	Yes
		2016	Ulcer disease; Bacterial gill disease	Yes
	Pahsimeroi A-run	2014	Ulcer disease	Yes
		2015	Bacterial gill disease	Yes
		2016	Ulcer disease	No
Hagerman National Fish Hatchery	East Fork Salmon River Natural A-run	2014	Infectious gill disease; Bacterial kidney disease; ulcer disease; fluke	No
		2015	Infectious gill disease; Bacterial gill disease; white spot	Yes
		2016	Infectious gill disease; Bacterial gill disease; white spot	Yes

3 Source: NMFS (2017c)

4 <sup>1</sup>IHNV = infectious hematopoietic necrosis virus

### 5 Coho Salmon Programs

6 NMFS (2017d) assessed the ongoing risk of pathogen transmission to natural-origin salmon and  
 7 steelhead for that portion of the Clearwater Coho Salmon program included in this EA. From 2014

1 through 2016, coho salmon from the Clearwater program were infected with IHNV, *R. salmoninarum*  
2 (causes BKD), and *Aeromonas salmonicida* (causes furunculosis). Both of these pathogens are endemic  
3 to the Snake River Basin, and can be transmitted to natural-origin salmon and steelhead that occupy  
4 rivers near existing coho rearing facilities.

### 5 **3.3.5.6 Population Viability**

6 Salmon and steelhead population viability is determined through a combination of four parameters  
7 including abundance, productivity, spatial structure, and diversity. As part of status reviews and recovery  
8 planning for threatened and endangered populations, NMFS defines population performance measures  
9 for these key parameters and then estimates the effects of hatchery programs at the population scale on  
10 the survival and recovery of an entire ESU or DPS. NMFS has established population viability criteria for  
11 the Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Snake  
12 River Steelhead DPS, and Snake River Sockeye Salmon ESU. Appendix A presents a detailed summary  
13 of current population viability trends for these salmon ESUs and the Snake River Steelhead DPS,  
14 including estimates of abundance, productivity, spatial structure, and genetic diversity for all MPGs.  
15 Spring/summer Chinook and coho salmon populations in the Clearwater River Subbasin are not  
16 ESA-listed; therefore, NMFS has not developed population viability criteria.

17 The effects of hatchery programs on the status of an ESU or Steelhead DPS “will depend on which of the  
18 four key attributes are currently limiting the ESU, and how the hatchery fish within the ESU affect each of  
19 the attributes” (70 FR 37215, June 28, 2005). Although ongoing hatchery production for programs  
20 considered in this EA currently affect each of the four population viability parameters in different ways,  
21 overall, hatchery programs have a minimal, negative effect on natural-origin fish from the Snake River  
22 Spring/Summer Chinook Salmon ESU and Snake River Steelhead DPS. Ongoing hatchery production  
23 has little to no effect on population viability for natural-origin individuals from the Snake River Fall Chinook  
24 Salmon and Snake River Sockeye Salmon ESUs.

25 One potential effect on population viability for integrated programs stems from broodstock collection,  
26 where the maximum number of natural-origin fish proposed for collection and the proportion of the donor  
27 population tapped to provide hatchery broodstock are considered. When natural-origin fish are removed  
28 from the natural population to be used as broodstock, a “mining” effect could be caused, where the  
29 broodstock collection contributes to reducing population abundance and spatial structure, though it would  
30 decrease genetic risks by incorporating more natural-origin brood.

### 31 **3.3.5.7 Nutrient Cycling**

32 Salmon are important transporters of marine-derived nutrients into the freshwater and terrestrial systems  
33 through the decomposition of adult carcasses (Cederholm et al. 2000). Naturally spawning  
34 hatchery-origin fish, or carcass placement of hatchery fish, contributes to increased nutrient cycling in the  
35 natural environment.

36 Phosphorous is one example of a marine-derived nutrient that is added to natural systems from salmonid  
37 carcasses. Estimating the quantity of phosphorous added to the natural environment from hatchery  
38 programs is one method to estimate nutrient transport. Increased phosphorus can benefit salmonids  
39 because phosphorus is typically a limiting nutrient for the growth of prey sources (e.g., *Daphnia* spp., a  
40 prey item for juvenile salmonids).

### 41 **Spring/Summer Chinook Salmon Programs**

42 NMFS (2017a, 2017b) estimates that hatchery-origin fish and eggs from the seven Salmon River  
43 Subbasin spring/summer Chinook hatchery programs included in this EA currently add about 766 kg of

1 phosphorus annually into the environment, in addition to what is typically added to the system by natural-  
2 origin fish. This is likely an overestimation of nutrients added to the system, because hatchery-origin  
3 returns are subjected to removal from harvest, broodstock collection, and gene flow management. With  
4 the use of mark selective fisheries and fish collected for broodstock, the true contribution is likely less  
5 than this value, perhaps about 50 percent (NMFS 2017b). Regardless, hatchery-origin fish increase  
6 phosphorous concentrations, which likely compensates for some marine-derived nutrients lost from  
7 declining numbers of natural-origin fish.

### 8 **Steelhead Programs**

9 NMFS (2017c) estimates that, if all returning fish spawn naturally, hatchery steelhead from programs  
10 included in this EA currently contribute about 373 kg of phosphorous to the study area annually. With the  
11 use of mark selective fisheries, the iteroparous (i.e., repeat-spawning) life history of steelhead, and fish  
12 collected for broodstock, the true contribution is likely less than this value, perhaps by about 30 percent  
13 (NMFS 2017c), so approximately 261 kg.

### 14 **Coho Salmon Program**

15 NMFS (2017d) estimates that hatchery-origin fish and eggs from that portion of the Clearwater Coho  
16 Salmon program included in this EA currently adds about 136 kg of phosphorus annually into the  
17 environment, in addition to what is typically added to the system by natural-origin fish. As discussed  
18 above, this is likely an overestimation of nutrients added to the system, and the actual value is perhaps  
19 30 percent less (or about 95 kg).

### 20 **3.3.5.8 Facility Operations**

21 Because water quantity and water quality are assessed as separate resources in Sections 3.1, Water  
22 Quantity, and 3.2, Water Quality, the discussion of current facility operations in this subsection is  
23 restricted to operation of weirs and traps for adult collection, water diversions, intake structures, and  
24 facility maintenance activities relative to their operations resultant direct impacts on salmon and  
25 steelhead. The facilities (or related activities) that may currently affect salmon and steelhead species  
26 include:

- 27 • Dworshak National Fish Hatchery Ladder and North Fork Clearwater Intake (ladder downstream  
28 of Dworshak Dam)
- 29 • Kooskia National Fish Hatchery
- 30 • Hells Canyon Dam Trap
- 31 • Rapid River Hatchery Trap and Intake
- 32 • South Fork Salmon River Satellite and Intake
- 33 • Johnson Creek Weir
- 34 • Pahsimeroi Fish Hatchery Trap and Intakes (lower and upper)
- 35 • East Fork Salmon River Satellite and Intake
- 36 • Yankee Fork Weir
- 37 • Sawtooth Fish Hatchery Trap and Intake

38 Niagara Springs, Magic Valley, and Hagerman National fish hatcheries are all located in nonanadromous  
39 waters. No surface water is diverted, no adults are collected at, and no juveniles are released from these  
40 facilities. Therefore, operation of these facilities for steelhead incubation and rearing does not modify

1 salmon or steelhead habitat use or decrease availability of water in rearing or spawning areas. Similarly,  
2 Oxbow Fish Hatchery is located upstream of Hells Canyon Dam, which is impassible to anadromous  
3 salmon and steelhead. Therefore, operation of these facilities has no effect on salmon and steelhead in  
4 the study area, and they are not discussed further in this subsection.

### 5 **Adult Collection**

6 The current operation of adult collection facilities, particularly seasonal, channel-spanning weirs, affects  
7 salmon and steelhead species via migratory delay, and may lead to changes in spawning distribution.  
8 Though adult passage is delayed slightly, current weir operation guidelines and monitoring minimizes  
9 delays to and impacts on fish. Traps are checked daily at all collection facilities. All nontarget fish are  
10 handled and released in accordance with current standard operating procedures (SOPs) for *Salmon and*  
11 *Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2017).

### 12 ***Spring/Summer Chinook Salmon Programs***

13 As presented in Section 2.1.1, Clearwater Subbasin and Hells Canyon Programs (Table 2-2), and Section  
14 2.1.2, Salmon River Programs (Table 2-4), spring/summer Chinook salmon are collected for broodstock  
15 for programs at Hells Canyon Dam, the Rapid River Hatchery Trap, South Fork Salmon Satellite, Johnson  
16 Creek Weir, Lower Pahsimeroi Hatchery Weir, and Sawtooth Hatchery Ladder. Natural-origin adults are  
17 collected for broodstock as part of integrated program components but can also be encountered at traps  
18 collecting brood for segregated programs. Natural-origin spring/summer Chinook salmon are the primary  
19 nontarget species encountered during broodstock collection for spring/summer Chinook salmon programs  
20 (Table 3-10). Such encounters may delay migration and cause stress or mortality from sorting, holding,  
21 and handling. Collected nontarget species are typically returned upstream of collection sites on the same  
22 day they are captured, with the exception of fish collected at Hells Canyon Dam (fish are returned to the  
23 Snake River below the dam the same day as they are captured).

24 Hatchery spring/summer Chinook salmon collection periods do not overlap with typical run timing of  
25 natural-origin steelhead, and therefore, steelhead are rarely captured at facilities. Sockeye and fall  
26 Chinook salmon are separated spatially and/or temporally from spring/summer Chinook salmon  
27 broodstock collection periods, and have not been encountered previously at program weirs (NMFS  
28 2017a, 2017b).



1 Table 3-10. Average annual number of natural-origin Spring/Summer Chinook salmon trapped during  
 2 broodstock collection at facilities under the Proposed Action.

Facility (type)	Collection Period	Average Number Handled (percent mortality of fish actually trapped)
Hells Canyon Dam Weir (fixed)	Late April to early September	14 <sup>1</sup> (0)
Rapid River Fish Hatchery weir (seasonal velocity barrier)	Late April to early September	145 <sup>1</sup> (0.08%)
South Fork Salmon Satellite (seasonal picket weir)	Mid-June to mid-September	749 <sup>2</sup> (4.9%)
Johnson Creek Weir	May to September	466 <sup>3</sup> (4.8%)
Lower Pahsimeroi Fish Hatchery Weir	June to September	271 <sup>4</sup> (1-6%)
Sawtooth Fish Hatchery Weir (seasonal picket weir)	June to September	493 <sup>5</sup> (0-1.6%)

3 <sup>1</sup> 12-year average from 2001-2012 (NMFS 2017a)

4 <sup>2</sup> 14-year average from 2001-2014 (NMFS 2017a)

5 <sup>3</sup> 17-year average from 1998-2015, excluding 1999 (NMFS 2017a)

6 <sup>4</sup> NMFS 2017b

7 <sup>5</sup> NMFS 2017b

### 8 **Steelhead Programs**

9 As discussed in Section 2.1.1, Clearwater Subbasin and Hells Canyon Programs (Table 2-2), and Section  
 10 2.1.2, Salmon River Programs (Table 2-4), steelhead are collected for broodstock at the Dworshak  
 11 National Fish Hatchery Ladder, Hells Canyon Dam Trap, and seasonal weirs at the Lower Pahsimeroi  
 12 Hatchery, East Fork Salmon River Satellite, and Yankee Fork Weir. In addition to these facilities,  
 13 steelhead broodstock are also collected via angling in South Fork Clearwater River and, if needed, on the  
 14 Yankee Fork in the Salmon River Subbasin. Only the East Fork Salmon River Natural A-run Steelhead  
 15 program removes fish from the local natural population for broodstock, leading to an effect on steelhead  
 16 return numbers. However, the removal of natural-origin broodstock is limited by abundance-based sliding  
 17 scales (Section 2.1.2.4, East Fork Salmon River) to reduce risk to the naturally spawning population.

18 Annually these programs likely encounter natural-origin steelhead and fall Chinook salmon, with little if  
 19 any incidental mortality (Table 3-11). The effects of angling are subsumed in the overall Snake River  
 20 Basin fishery, which is not a part of this EA, though angling effects are considered generally as part of the  
 21 current conditions for salmon and steelhead (NMFS 2017c).

22

1 Table 3-11. Annual number of natural-origin steelhead and fall Chinook salmon handled during  
 2 collection of adult hatchery steelhead.

Facility	Collection Period	Number Handled (Mortalities)	
		Steelhead	Fall Chinook Salmon
Dworshak National Fish Hatchery Ladder <sup>1</sup>	October to April	31 (2)	0
Hells Canyon Weir <sup>2</sup>	October to November	63 (1)	14 (0)
Pahsimeroi Fish Hatchery Weir <sup>3</sup>	February to May	125 (0)	0
East Fork Salmon River Weir <sup>3</sup>	March to May	30 (0)	0
Yankee Fork Weir and hook-and-line angling <sup>4</sup>	April to May	Not available	0
Sawtooth Fish Hatchery Weir <sup>3</sup>	February to May	48 (0)	0

3 Source: (Izbicki 2017; Leth 2017b, as cited in NMFS 2017c)

4 <sup>1</sup>Broodstock collection for the Salmon River B-run Steelhead program currently occurs primarily at Pahsimeroi Fish Hatchery with a  
 5 portion provided by Dworshak National Fish Hatchery and with some collection in Yankee Fork using a picket weir as needed.  
 6 Dworshak NFH ladder is not open continuously, but rather 10 times for less than one week over collection period to collect  
 7 representative fish throughout the run. Average handling, and min and max mortalities information for Dworshak Hatchery based on  
 8 actual values for the most recent three years (2015-2017).

9 <sup>2</sup>Hells Canyon Dam trap operated three days per week, eight hours per day

10 <sup>3</sup>Pahsimeroi, Sawtooth and East Fork traps are operated 24-hours a day, 7 days per week;

11 <sup>4</sup>Yankee Fork picket weir operated and checked daily; angling is conducted by Shoshone-Bannock Tribal staff to supplement brood  
 12 collections at the weir

13

#### 14 ***Coho Salmon Program***

15 For the portion of the Clearwater Coho Salmon Program included in this EA, broodstock are collected  
 16 from October through December at Lapwai Creek, Dworshak National Fish Hatchery, and Kooskia  
 17 National Fish Hatchery (Section 2.1.1, Clearwater Subbasin and Hells Canyon Programs, Table 2-2). A  
 18 seasonal picket weir is installed annually on Lapwai Creek. The Dworshak National Fish Hatchery Ladder  
 19 is a fixed facility located on the right bank of the North Fork Clearwater River downstream of Dworshak  
 20 Dam. At Kooskia National Fish Hatchery, broodstock enter a trap after encountering a velocity barrier and  
 21 finger weir on Clear Creek.

22 Although unlikely considering the timing of adult coho salmon collection, salmon and steelhead are  
 23 occasionally trapped at Kooskia National Fish Hatchery and Lapwai Creek. Captured individuals are  
 24 temporarily delayed in their migrations and returned to the stream within 24 hours of collection. To date,  
 25 no incidental captures of natural-origin steelhead or fall Chinook salmon have been reported at either  
 26 facility; however, hatchery-origin steelhead and fall Chinook salmon have been occasionally collected  
 27 (Nez Perce Tribe 2016).

28 USFWS and the Nez Perce Tribe operate the Dworshak National Fish Hatchery Trap from October  
 29 through April to collect returning adult steelhead, and any coho salmon trapped are opportunistically  
 30 collected from October through December. All salmon and steelhead trapped are returned to the  
 31 Clearwater River if not targeted for hatchery broodstock (Nez Perce Tribe 2016).

## 1 **Water Diversions**

2 As described in Section 3.1, Water Quantity, the diversion of surface water for hatchery programs  
3 reduces instream flow between the water intake and discharge structures. Flow reductions and  
4 dewatering may affect salmon and steelhead if migration is impeded or if it leads to increased water  
5 temperatures. A relatively low percentage of streamflow is used in most cases, the distance of most  
6 diversions is relatively short, and the water use is non-consumptive; however, water is still removed from  
7 the system as a result of current hatchery operations. Dewatering of redds or prevention of natural-origin  
8 fish movement has not been observed historically at any facility when water flow could be limited by  
9 hatchery operations during low-flow months (NMFS 2017a). During low flow periods, habitat complexity  
10 may be reduced in some areas, but the diversion reaches are not completely disconnected from flow, and  
11 fish in the area are still able to either use the remaining habitat or migrate up or downstream.

12 Although surface water diversion for Kooskia National Fish Hatchery took up to 82 percent of Clear Creek  
13 flow in January 2017 (Table 3-1), measurable effects on salmon and steelhead have not been observed.  
14 Steelhead do not enter Clear Creek until spring, and Kooskia National Fish Hatchery does not use Clear  
15 Creek water from June through September because of high water temperatures (Johnson 2017, as cited  
16 in NMFS 2017d).

## 17 **Intake Screening**

18 Each facility with intakes, pumps, or screens has the potential to impact salmon and steelhead via  
19 impingement or entrainment during water intake. Facilities are routinely observed for any signs that  
20 screens are not effectively excluding fish from intakes. Although all intake facilities were designed to meet  
21 NMFS screening criteria applicable at the time of construction, not all facilities have been upgraded or  
22 retrofitted to meet the current (NMFS 2011a) screening criteria. Those that have not been upgraded may  
23 pose a greater risk of entrainment and impingement potential. Assessments of LSRCP facilities have  
24 been completed, and coordination with NMFS is underway to develop an implementation and  
25 prioritization strategy.

26 Because the intake screen at Dworshak National Fish Hatchery was installed in 1968, it does not adhere  
27 to the most recent NMFS screening criteria (NMFS 2011a). While this alone may not be a problem,  
28 occurrences of natural-origin juvenile salmonids within the hatchery water system have been  
29 documented, including some mortalities. Mortalities are usually newly emerged fry (fewer than 200 per  
30 year), but occasionally larger juveniles are found. The hatchery has not kept a record of mortalities, and  
31 species identification has been hampered by the small size and deteriorated condition of the specimens  
32 (Nemeth 2017). Therefore, operation of this intake is likely to result in some salmon and steelhead  
33 mortalities.

## 34 **Effluent Discharge**

35 All of the current hatchery facilities considered in this EA are either operated under NPDES permits, or do  
36 not need a NPDES permit because rearing levels are below permit minimums (Section 3.2, Water  
37 Quality). Eggbox programs produce less than 20,000 pounds of fish per year and distribute less than  
38 5,000 pounds of feed at any one time; therefore, no NPDES wastewater permit is required. For those  
39 facilities that operate under NPDES permits, facility effluent is monitored to ensure compliance with permit  
40 requirements. Though compliance with NPDES permit conditions is not an assurance that effects on  
41 salmon and steelhead do not currently occur, the facilities use the water specifically for the purposes of  
42 rearing salmon and steelhead, which have a low mortality during hatchery residence compared to survival  
43 in the natural-environment (~55 percent compared to 7 percent [Bradford 1995]). Because the same  
44 water used for rearing (where survival is high compared to the natural environment) is then discharged  
45 into the surrounding habitat and then further diluted once it is combined with the river water, NMFS

1 believes effluent currently has a negligible impact on salmon and steelhead in the study area (NMFS  
2 2017c).

3 Facilities discharge proportionally small volumes of water with waste (predominantly biological waste) into  
4 a larger waterbody, which results in temporary, very low or undetectable levels of contaminants. General  
5 effects of biological waste in hatchery effluent are summarized in NMFS (2004), though the biological  
6 waste is not likely to have a detectable effect on salmon and steelhead because of pollution abatement  
7 practices that reduce the biological waste at each facility, as well as the relatively small volume of effluent  
8 compared to the streamflow.

9 Therapeutic chemicals used to control or eliminate pathogens (i.e., formaldehyde, sodium chloride,  
10 iodine, potassium permanganate, hydrogen peroxide, antibiotics), can also be present in hatchery  
11 effluent. However, these chemicals are not likely to be problematic for salmon and steelhead because  
12 they are quickly diluted beyond manufacturer's instructions when added to the total effluent and again  
13 after discharge into the recipient waterbody. Therapeutants are also used periodically, and not constantly  
14 during hatchery rearing. Many therapeutants break down quickly in the water and/or are not likely to  
15 bioaccumulate in the environment. For example, formaldehyde readily biodegrades within 30 to 40 hours  
16 in stagnant waters. Similarly, potassium permanganate would be reduced to compounds of low toxicity  
17 within minutes. Aquatic organisms are also capable of transforming formaldehyde through various  
18 metabolic pathways into nontoxic substances, preventing bioaccumulation in organisms (USEPA 2015).

### 19 Facility Maintenance Activities

20 HGMPs referenced in Section 2.2, Alternative 2, Proposed Action (NMFS 2017a, 2017b, 2017c, 2017d)  
21 prepared for each hatchery program describe facility-specific maintenance activities that currently occur at  
22 each location, which are incorporated herein by reference. NMFS also references details on maintenance  
23 activities provided in two Biological Opinions recently prepared for the effects of ongoing hatchery  
24 operation and maintenance on bull trout (*Salvelinus confluentus*; USFWS 2017a, 2017b). Routine  
25 preventative maintenance of hatchery facility structures is necessary for proper functionality.

26 For most facilities in anadromous waters, hatchery-related infrastructure (e.g., weirs and water source  
27 intakes) are located within migration and/or spawning habitat of salmon and steelhead. Therefore,  
28 individual fish are temporarily displaced from occupied habitats when personnel or heavy equipment are  
29 working in or near the river channel. Hatchery maintenance activities may displace juvenile fish through  
30 noise and instream activity or expose them to brief pulses of sediment as activities occur instream.

31 During debris removal activities at intakes and weirs, noise or sediment likely currently displaces juvenile  
32 fish. To prevent exposure of embryonic and age-0 juvenile life stages during in-water maintenance  
33 activities, all work is currently completed within agency-approved summer in-water work windows unless  
34 site-specific variances are authorized by state and Federal resource agencies. When maintenance  
35 activities occur within water, they are currently implemented using BMPs described in Section 2.1.4,  
36 Operation and Maintenance.

### 37 3.3.5.9 Research, Monitoring, and Evaluation

38 Although some hatchery programs have program-specific RM&E activities (Table 2-9; Table 2-10;  
39 Table 2-11), RM&E activities associated with other research programs are currently conducted  
40 independent of hatchery operations. NMFS (2017a, 2017b, 2017c, and 2017d) determined that the  
41 effects of ongoing program RM&Es on natural-origin salmon and steelhead populations are unlikely to  
42 contribute to a decrease in the abundance, productivity, diversity, or spatial structure of the populations.  
43 RM&E activities that are directly related to hatchery programs are currently implemented using  
44 well-established (e.g., Galbreath et al 2008) methods and protocols. Because the intent of RM&E for all

1 programs is to improve the understanding of salmon and steelhead populations, the information gained  
2 outweighs the risks to the populations, based on the small proportion of fish encountered. Incidental  
3 effects may result from tagging, such as injury to salmon and steelhead.

4 Collection of adults at traps delays individuals in their upstream migration and could alter spawning  
5 behaviors upon release. Individuals may also suffer stress or mortality during tagging or tissue sampling.  
6 Mortality from tagging is both acute (occurring during or soon after tagging) and delayed (occurring long  
7 after the fish have been released into the environment).

8 NMFS has developed general guidelines to reduce impacts when collecting listed adult and juvenile  
9 salmonids (NMFS 2000, 2008b). Currently, hatchery operators and staff must abide by these guidelines,  
10 which are incorporated as terms and conditions into current ESA Section 7 opinions and Section 10  
11 permits for research and enhancement. Additional monitoring principles for supplementation programs  
12 have been developed (Galbreath et al. 2008).

13 Ongoing spawning ground surveys are likely to temporarily harass salmon and steelhead in surveyed  
14 reaches of the study area. At times, the research involves observing adult fish, which are more sensitive  
15 to disturbance than juveniles. These avoidance behaviors are likely in the range of normal predator and  
16 disturbance behaviors.

17 Individual salmon and steelhead are currently captured at rotary screw traps associated with juvenile  
18 outmigration monitoring for several hatchery programs. These ongoing collections temporarily delay  
19 downstream migration, and stress fish during handling (if required).

20 Electrofishing is also used to collect natural- and hatchery-origin steelhead in Panther Creek and the  
21 Yankee Fork for PIT tagging. Steelhead in these streams are therefore likely exposed to potential stress  
22 from handling and tagging.

23 In addition, electrofishing is used in the South Fork Salmon River above the weir, Cabin Creek, and Curtis  
24 Creek to assess survival at various lifestages of hatchery- and natural-origin Chinook salmon and  
25 population estimates of natural-origin population. Summer Chinook salmon in these streams are also  
26 likely exposed to potential stress from handling.

### 27 **3.3.5.10 Critical Habitat and Essential Fish Habitat**

28 As discussed in Section 3.3.3, Critical Habitat and Essential Fish Habitat, critical habitat has been  
29 designated in the study area for the Snake River Spring/Summer-run Chinook Salmon ESU, Snake River  
30 Fall-run Chinook Salmon ESU, Snake River Sockeye Salmon ESU, and Snake River Basin Steelhead  
31 DPS. In addition, with the exception of hatchery programs that operate in nonanadromous waters  
32 (Niagara Springs, Magic Valley, and Hagerman National fish hatcheries), all facilities that support  
33 hatchery programs included in this EA currently operate and/or release juvenile hatchery fish into EFH for  
34 Chinook salmon and historic EFH for extirpated natural coho salmon. Further, those programs that  
35 operate or release hatchery fish into the Clearwater River Subbasin also overlap with EFH for  
36 reintroduced coho salmon.

37 Ongoing direct effects on critical habitat and EFH result from facility operation (e.g., water diversion and  
38 effluent discharge), maintenance, and the presence of hatchery program-related weirs and water  
39 withdrawal structures. Genetic and ecological interactions between hatchery-reared fish and fish in the  
40 natural environment also contribute to minor degradation of critical habitat and EFH, particularly as  
41 related to rearing habitat.

42 As described in Section 3.3.5.8, Facility Operations, ongoing water withdrawals for hatchery operations  
43 can affect critical habitat and EFH by reducing streamflow, impeding migration, or limiting the amount of

1 stream-dwelling organisms that could provide prey for juvenile salmonids. Water withdrawals can also kill  
2 or injure juvenile salmonids through impingement upon inadequately designed intake screens or by  
3 entrainment of juvenile fish into the water diversion structures. All hatchery programs are currently  
4 operated to minimize each of these effects. In general, water withdrawals are small enough in scale that  
5 changes in flow are low, and measurable impacts on critical habitat and EFH do not occur. Minor  
6 modifications to channel habitat by construction and operation of weirs or maintenance actions results in  
7 short-term water quality impairments. However, impacts on water quality are typically short-lived, and do  
8 not currently alter the function or usability of critical habitat and EFH once turbidity subsides.

9 Currently, hatchery fish returning to the Snake River Basin largely spawn and rear near the hatchery of  
10 origin, and do not generally enter areas that are identified as critical habitat and/or EFH for other species  
11 outside of the study area. Some spring/summer Chinook salmon, coho salmon, and steelhead from  
12 ongoing programs might stray into other rivers. However, because straying is low from these programs  
13 (NMFS 2017a, 2017b, 2017c, 2017d), these few strays do not exceed the carrying capacities of natural  
14 production areas, or increase disease or predation in these habitats.

### 15 **3.4 Fisheries**

16 The ongoing operation of hatchery programs increases the number of hatchery-origin fish that are  
17 available for fisheries. Abundance of natural-origin salmon and steelhead can limit tribal and recreational  
18 fisheries. However, hatchery production and fishery management strategies such as selective  
19 recreational fisheries (fisheries that target ad-clipped hatchery-origin fish) may allow fishing effort to be  
20 focused on hatchery-origin fish rather than natural-origin fish. Careful monitoring and analysis of fisheries  
21 practices can determine how specific fisheries may benefit or maintain populations.

22 Salmon and steelhead from the 15 hatchery programs included in this EA may be exposed to fisheries in  
23 the Pacific Ocean, the Columbia River, and in the Snake River Basin; however, as described in Section  
24 3.3.1, Study Area, effects on fisheries downstream of Ice Harbor Dam are not likely to be discernable.  
25 Very few spring/summer Chinook salmon and steelhead are caught in ocean fisheries (NMFS 2014b).  
26 Substantial numbers of coho salmon are caught in ocean fisheries (PFMC 2016); however, the  
27 Clearwater River Coho Salmon Program contributes an extremely small proportion of the total number of  
28 coho salmon smolts released into the Columbia River Basin, and therefore, an extremely small  
29 contribution to fisheries. Although spring/summer Chinook salmon, steelhead, and coho salmon may all  
30 be harvested by commercial, tribal, and recreational fisheries in the Columbia River through plans  
31 developed by parties to the *U.S. v Oregon* process, the likelihood of detecting specific effects of the  
32 programs included in this EA on these fisheries is low. Therefore, the subsections below focus on  
33 fisheries in the Snake River Basin, specifically in the Clearwater River Subbasin, the Hells Canyon Reach  
34 of the Snake River, and the Salmon River Subbasin.

35 Discussion is limited to fisheries for spring/summer Chinook salmon, steelhead, and coho salmon within  
36 the study area. One exception is the spring/summer Chinook salmon fishery in the Clearwater River  
37 subbasin because no Clearwater River spring/summer Chinook salmon hatchery programs are included  
38 in this EA; therefore, only steelhead and coho salmon fisheries are discussed for the Clearwater River  
39 subbasin. Although Snake River fall Chinook salmon may be harvested during fall fisheries, the hatchery  
40 programs included in this EA have little or no effect on this fishery. Furthermore, harvest of fall Chinook is  
41 very low relative to that of spring/summer Chinook salmon, and is limited to the Snake and Clearwater  
42 rivers.

43 IDFG regulates and manages recreational fisheries in the Clearwater and Salmon River subbasins,  
44 comanages recreational fisheries in the Hells Canyon Reach of the Snake River with ODFW, and

1 comanages recreational fisheries in the Snake River along the Washington border with WDFW. WDFW  
2 manages recreational fisheries in the Snake River from the Idaho border downstream to Ice Harbor Dam.

3 Tribal fisheries in the study area are managed by either the Nez Perce Tribe or the Shoshone-Bannock  
4 Tribes (see Section 3.8. Cultural Resources). The most recent *U.S. v. Oregon* Management Agreement  
5 (NMFS 2018) provides a framework for managing some of the fisheries from Ice Harbor Dam to Lower  
6 Granite Dam for the spring/summer Chinook fisheries. The agreement includes a list of tribal and non-  
7 tribal salmonid fisheries in the Columbia River Basin that are intended to ensure fair sharing of  
8 harvestable fish between tribal and non-tribal fisheries in accordance with Treaty fishing rights standards  
9 and *U.S. v. Oregon*. Other fisheries not in the *U.S. v. Oregon* Management Agreement include steelhead,  
10 fall Chiook salmon, and coho fisheries in the analysis area, as well as spring/summer Chinook salmon  
11 fisheries above Lower Granite Dam.

### 12 3.4.1 Spring/Summer Chinook Salmon

13 Timing and duration of recreational fisheries for spring/summer Chinook salmon are highly variable each  
14 year and depends on run size and allocation (Brian Leth, IDFG, email sent to Dave Ward, HDR, February  
15 23, 2018b, regarding recreational fisheries). The recreational fishery in the Salmon River Subbasin  
16 includes both spring and summer seasons, and is limited to portions of the Salmon, Little Salmon, and  
17 South Fork Salmon rivers (IDFG 2018a). Fishing is generally allowed in a short section of the lower  
18 Salmon River and in most of the Little Salmon River in spring. Fishing is generally allowed in the upper  
19 Salmon River (downstream from Sawtooth Fish Hatchery) and in the South Fork Salmon River in summer  
20 (NMFS 2011b). Fishing is also authorized in the Grande Ronde and Imnaha Subbasins (NMFS 2013).  
21 Recreational fisheries are selective; only fish with clipped adipose fins may be retained.

22 Recreational harvest has varied widely among recent years, but catch in the Salmon River Subbasin is  
23 usually at least 15 times greater than that in the Hells Canyon Reach. Catch and subsequent release of  
24 fish without clipped adipose fins has also been highest in the Salmon River Subbasin.

25 The Nez Perce Tribe harvests Snake River spring/summer Chinook salmon throughout its treaty territory  
26 and at usual and accustomed locations. Harvest occurs primarily in the Rapid River within the Salmon  
27 River Subbasin; however, harvest also occurs in the South Fork Salmon River and other locations  
28 throughout the Salmon River and Clearwater River subbasins. Harvest by the Shoshone-Bannock Tribes  
29 also occurs within the Salmon River Subbasin. Also in the Grande Ronde and Imnaha Subbasins, both  
30 the Nez Perce Tribe and the Shoshone-Bannock Tribes, as well as the Confederated Tribes of the  
31 Umatilla Indian Reservation fish for spring/summer Chinook salmon. Tribal fisheries may be selective or  
32 non-selective; fish with intact adipose fins may often be kept. Fisheries are open until specifically closed.

### 33 3.4.2 Steelhead

34 Recreational fisheries for steelhead are generally managed by changes in daily and possession limits,  
35 rather than by season duration (Brian Leth, IDFG, email sent to Dave Ward, HDR, February 23, 2018b,  
36 regarding recreational fisheries). Although fishing seasons vary among and within subbasins, fisheries  
37 generally have a spring component, open from January 1 through April or May, a closed season during  
38 portions of spring and/or summer, and a fall component for the remainder of the year. The early portion of  
39 the fall component (1 to 3 months) is designated as catch and release only in most areas. The  
40 recreational fisheries are selective; only fish with clipped adipose fins may be retained.

41 The recreational fishery in the Clearwater River Subbasin occurs in the mainstem, North Fork, Middle  
42 Fork, and South Fork of the Clearwater River. Fish are also harvested in the Hells Canyon Reach of the  
43 Snake River. Harvest in the Salmon River Subbasin is limited to the Salmon River downstream from

1 Sawtooth Fish Hatchery, and most of the Little Salmon River (IDFG 2018b). Harvest is generally higher in  
2 the fall than in spring, especially in the Hells Canyon Reach of the Snake River. Harvest has varied widely  
3 among recent years, but is generally highest in the Salmon River Subbasin. Catch and subsequent  
4 release of fish without clipped adipose fins has also been highest in the Salmon River Subbasin.

5 The Nez Perce Tribe harvests Snake River steelhead throughout its treaty territory and at usual and  
6 accustomed locations. Tribal members fish throughout the Salmon River and Clearwater River subbasins,  
7 but most current steelhead harvest occurs in the North Fork Clearwater River. Harvest by the Shoshone-  
8 Bannock Tribes occurs within the Salmon River Subbasin. Tribal fisheries may be selective or non-  
9 selective; fish with intact adipose fins may often be kept. Fisheries are open until specifically closed.

10 Currently, all steelhead fisheries in the analysis area are managed together in a framework that sets limits  
11 on lethal impacts rates for each MPG (NMFS 2019a). Furthermore, in years of critically low abundance,  
12 additional conservation measures will be implemented to reduce lethal impact rates by MPG. For  
13 example, when the returns were critically low for 2018-2019 fishing season, managers decided to reduce  
14 the bag limit for Idaho's recreational fishery as a conservation measure. Recently, NMFS determined that  
15 this framework is not likely to jeopardize the continued existence or recovery of any of the ESUs and  
16 DPSs listed in the Snake River (NMFS 2019a).

### 17 3.4.3 Coho Salmon

18 A recreational fishery for coho salmon has recently begun on the mainstem Clearwater, Middle Fork  
19 Clearwater, and North Fork Clearwater rivers, as well as the mainstem Snake River above Lower Granite  
20 Dam. Because Clearwater River coho salmon from the proposed hatchery production do not have clipped  
21 adipose fins, recreational anglers can keep fish with an intact adipose fin. Similar to spring/summer  
22 Chinook salmon, duration of the season each year depends on run size. To date, recreational fisheries in  
23 Idaho have occurred only in 2014, 2015, and 2017, generally from late summer through the middle of fall  
24 (Christine Kozfkay, IDFG, email sent to Emi Kondo, NMFS, April 10, 2019, regarding recreational coho  
25 salmon fisheries).

26 The Nez Perce Tribe harvests coho salmon in the Clearwater River Subbasin, as well as at usual and  
27 accustomed locations. The Tribal fishery is non-selective because Clearwater River coho salmon from the  
28 proposed hatchery production do not have clipped adipose fins. Fisheries for the Tribe are open until  
29 specifically closed.

## 30 3.5 Other Fish Species

31 Adult and juvenile fish propagated at the 15 hatchery programs included in this EA have the potential to  
32 interact with fish species other than salmon and steelhead in the natural environment. Approximately 100  
33 fish species have been documented in the Columbia River Basin, many of which are introduced (Ward  
34 and Ward 2004). Many of these species are also found in the Snake River Basin, including hatchery-  
35 origin salmon and steelhead. As described in Section 3.3.1, Study Area, the area within which the effects  
36 of the hatchery programs can be detected on fish species includes all waterbodies downstream of  
37 hatchery release sites to Ice Harbor Dam on the Snake River. The study area also includes stream  
38 reaches adjacent to facilities used to rear program fish. As noted in Section 3.3.5.8, Facility Operations,  
39 facilities that may potentially affect other fish species include:

- 40 • Dworshak National Fish Hatchery Ladder and North Fork Clearwater Intake (ladder downstream  
41 of Dworshak Dam)
- 42 • Kooskia National Fish Hatchery



- 1 • Hells Canyon Dam Trap
- 2 • Rapid River Fish Hatchery Trap and Intake
- 3 • South Fork Salmon River Satellite and Intake
- 4 • Johnson Creek Weir
- 5 • Pahsimeroi Fish Hatchery Trap and intakes (lower and upper)
- 6 • East Fork Salmon River Satellite and Intake
- 7 • Yankee Fork Weir
- 8 • Sawtooth Fish Hatchery Trap and Intake

9 No program-related broodstock collection or release of hatchery fish occurs at or near Oxbow, Niagara  
10 Springs, Magic Valley, or Hagerman National fish hatcheries. Because these facilities follow NPDES  
11 criteria and monitor effluent, it is not likely that ongoing hatchery operations, including water diversion,  
12 effluent discharge, or maintenance activities, affect other fish species.

13 The fish from the current programs can potentially interact with other fish species during two different life  
14 phases, first as smolts upon release, and second as adults upon return. As discussed in Section 3.3,  
15 Salmon and Steelhead, smolts are not likely to have a discernible effect downstream of Ice Harbor Dam.  
16 Adults returning to the Clearwater River Subbasin, Hells Canyon Reach, and Salmon River Subbasin are  
17 also not likely to have a discernible effect downstream of Ice Harbor Dam because the fish from these  
18 programs are likely to have similar density-dependent interactions (e.g., competitive or predator/prey  
19 relationships) with other fish species, comparable to that discussed in Section 3.3, Salmon and  
20 Steelhead.

21 Of the native and introduced fish species in the Columbia River Basin, 14 native and 3 introduced species  
22 have been identified as the most likely to have potential interactions with fish from the current programs  
23 (Table 3-12). Bull trout, listed under the ESA as threatened (64 FR 58909, November 1, 1999), may be  
24 locally common in much of the habitat occupied by anadromous fish in the Upper Snake River Basin. The  
25 primary interaction between bull trout and salmon and steelhead is predation of salmon and steelhead by  
26 subadult and adult bull trout. Further details about ecological interactions between bull trout and fish from  
27 the current programs are provided by USFWS (2017a, 2017b).

28 Pacific lamprey (*Entosphenus tridentatus*) and river lamprey (*Lampetra ayresii*) are considered culturally  
29 important to many tribes, and have declined to a remnant of their numbers prior to human development.  
30 Anadromous lamprey are vulnerable to similar threats as salmonids, including barriers to passage,  
31 reduced access to spawning habitat, degradation of habitat and water quality, and presence of introduced  
32 predators (Luzier et al. 2011). Hatchery fish may act as a buffer against marine mammal predation on  
33 lamprey.

34 Additional fish species are considered Federal species of concern, or are listed by individual or multiple  
35 states as endangered, sensitive, species of concern, or candidate species (Table 3-12). Hatchery fish  
36 may compete for spawning sites or have redd superimposition with other salmonid species such as  
37 westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and rainbow trout. Further details about these  
38 species' life history, current status and trends, limiting factors and threats, and interaction with salmon  
39 and steelhead are provided by NMFS (2014a).

1 Table 3-12. Species other than salmon or steelhead that may interact with hatchery-origin salmon  
2 and steelhead in the Study Area.

Species	Range	Federal/State Listing Status	Relationship		
			Prey	Competitor	Predator
<b>Native</b>					
Bull trout ( <i>Salvelinus confluentus</i> )	Throughout the Columbia River Basin	Federally threatened (64 FR 58909, November 1, 1999) Oregon State sensitive Washington State species of concern	✓	✓	✓
Pacific lamprey ( <i>Entosphenus tridentatus</i> )	Accessible reaches of the Columbia River Basin	Federal species of concern Idaho State endangered Oregon State sensitive	✓	✓	✓
River lamprey ( <i>Lampetra ayresii</i> )	Accessible reaches of the Columbia River Basin	Federal species of concern Washington State candidate	✓	✓	✓
Brook lamprey ( <i>L. richardsoni</i> )	Throughout the Columbia River Basin	Oregon State sensitive	✓	✓	
Westslope cutthroat trout ( <i>Oncorhynchus clarki lewisi</i> )	Upper Columbia River Basin and Snake River	Federal species of concern Oregon State sensitive	✓	✓	✓
Rainbow trout ( <i>O. mykiss</i> )	Throughout the Columbia River Basin	Not listed	✓	✓	✓
Leopard dace ( <i>Rhinichthys falcatus</i> )	Throughout the Columbia River Basin	Washington State candidate	✓		
Umatilla dace ( <i>R. umatilla</i> )	Columbia, Kootenay, Slocan, and Snake Rivers	Washington State candidate	✓	✓	
Margined sculpin ( <i>Cottus marginatus</i> )	Tucannon, Walla Walla and Umatilla River subbasins	Federal species of concern Washington State sensitive	✓	✓	✓
Mountain sucker ( <i>Catostomus platyrhynchus</i> )	Middle-Columbia and Upper Columbia River watersheds	Washington State candidate		✓	
Northern pikeminnow ( <i>Ptychocheilus oregonensis</i> )	Throughout the Columbia River Basin	Not listed	✓	✓	✓
Three-spine stickleback ( <i>Gasterosteus aculeatus</i> )	Throughout the Columbia River Basin	Not listed	✓	✓	
White sturgeon ( <i>Acipenser transmontanus</i> )	Accessible reaches of the Columbia River Basin	Not listed			✓
Mountain whitefish ( <i>Prosopium williamsoni</i> )	Columbia River Basin	Not listed	✓	✓	✓

Species	Range	Federal/State Listing Status	Relationship		
			Prey	Competitor	Predator
<b>Introduced</b>					
Brook trout ( <i>Salvelinus fontinalis</i> )	Upper reaches of watersheds throughout the Columbia River Basin	Not listed	✓	✓	✓
Smallmouth bass ( <i>Micropterus dolomieu</i> )	Columbia River Basin	Not listed		✓	✓
Largemouth Bass ( <i>Micropterus salmoides</i> )	Columbia River Basin	Not listed		✓	✓

1 Source: Ecovista et al. (2003); Ecovista (2004); Ward and Ward (2004); NMFS (2014a)

2 Other species may prey heavily on salmonid eggs or juveniles. Hatchery fish may act as a buffer against  
3 predation on wild fish. Conversely, releases of hatchery fish may attract additional predators that may  
4 then prey on wild fish.

5 Current disease and nutrient effects on salmonid species (e.g., bull trout) are likely to be similar to the  
6 effects discussed in Sections 3.3.5.5, Diseases, and 3.3.5.7, Nutrient Cycling. Diseases that pose  
7 particular risk to hatchery-origin salmonids (i.e., BKD and IHN) only affect salmonid species. Other  
8 diseases that are endemic to many fish species (e.g., freshwater ich, *Ichthyophthirius multifiliis*) may also  
9 be amplified in a hatchery to affect nonsalmonid species.

10 Other salmonid species, such as bull trout and westslope cutthroat trout, may occur near existing  
11 hatchery facilities and release sites; however, several factors currently reduce the likelihood of disease  
12 and pathogen transmission. The proportion of facility surface water withdrawal and subsequent discharge  
13 at most sites comprises only a portion of the total streamflow (Table 3-1), which reduces, via dilution, the  
14 likelihood for transmission of pathogens from effluent. Smolt release strategies promote distribution of  
15 hatchery fish throughout the system and rapid outmigration, which reduces the concentration of hatchery-  
16 released fish in the river, and therefore, the likelihood for a diseased hatchery fish to encounter other  
17 salmonids. Fish health protocols currently in place to address pathogens also minimize the likelihood for  
18 disease and pathogen effects on salmonids. More details about disease effects on bull trout are  
19 discussed by USFWS (2017a, 2017b).

20 Fish species other than salmon or steelhead may also be affected by operation of hatchery facilities,  
21 similar to the effects discussed in Section 3.3.5.8, Facility Operations. Flow reductions and dewatering  
22 may affect fish species other than salmon or steelhead if migration is impeded, or if such reduction in flow  
23 leads to increased water temperatures. During low-flow periods, habitat complexity may be reduced in  
24 some areas.

25 Each facility with intakes, pumps, or screens has the potential to affect fish via impingement or  
26 entrainment during water intake. Although all intake facilities were designed to meet NMFS screening  
27 criteria applicable at the time of construction, not all facilities have been upgraded or retrofit to meet the  
28 current (NMFS 2011a) screening criteria. Those that have not been upgraded may pose a greater risk of  
29 entrainment and impingement potential.

30 The spatial distribution of fish species other than salmon or steelhead are generally not affected by weir  
31 operations because weirs are designed to allow juvenile passage, and adults are passed upstream when  
32 captured. The operation of adult collection facilities, particularly seasonal, channel-spanning weirs, can  
33 affect migratory species (e.g., Pacific lamprey and bull trout) via migratory delay. If captured, fish may be  
34 harmed during handling at the collection facility. Although adult passage may be delayed slightly, weir  
35 operation guidelines and monitoring of weirs minimize delays and impacts on fish. All nontarget fish are

1 handled and released in accordance with SOPs (IDFG et al. 2017). Effects of facility operations on bull  
2 trout are further discussed by USFWS (2017a, 2017b).

3 Fish species other than salmon or steelhead may also be affected by effluent discharge from hatchery  
4 facilities, similar to the effects discussed in Section 3.3.5.8, Facility Operations. However, facilities  
5 currently discharge proportionally small volumes of water with waste (predominantly biological waste) into  
6 a larger waterbody, which results in temporary, very low or undetectable levels of contaminants.

7 Although many fish species may be incidentally collected during RM&E activities described in  
8 Section 3.3.5.9, Research, Monitoring, and Evaluation, general guidelines to reduce impacts on salmon  
9 and steelhead (NMFS 2000, 2008b) also reduce effects on other species. In addition, BMPs in place for  
10 ESA-listed salmon and steelhead (NMFS 2017a, 2017b, 2017c, 2017d) and for bull trout (USFWS 2017a,  
11 2017b) further reduce effects.

### 12 **3.6 Wildlife**

13 The hatchery facilities and hatchery-origin salmon and steelhead propagated for the 15 hatchery  
14 programs included in this EA have the potential to affect wildlife by acting as either predators or prey,  
15 enhancing nutrient availability, transferring pathogens or toxic contaminants outside the hatchery  
16 environment, or impeding wildlife movement. The study area for wildlife is limited to the project area as  
17 described in Section 1.2, Project Area and Study Area; therefore, marine mammals are not considered  
18 here because marine mammals are not present within the study area.

19 Numerous species of birds, mammals, and invertebrates may potentially interact with salmon and  
20 steelhead associated with the hatchery programs included in this EA, or may be otherwise affected by  
21 hatchery operations (Table 3-13). Hatchery fish may act as a buffer against predation on wild fish.  
22 Conversely, releases of hatchery fish may attract additional predators that may then prey on wild fish.

23 Birds that occur in the study area may consume salmon and steelhead, or may be affected by hatchery  
24 operations through noise of hatcheries using heavy equipment. Salmon and steelhead predators include  
25 the bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), osprey (*Pandion haliaetus*),  
26 and great blue heron (*Ardea Herodias*). One bald eagle's nest, a mature eagle, and a fledgling have been  
27 observed near Kooskia National Fish Hatchery. Also, only a vacant nest for a golden eagle was observed  
28 near Niagara Springs Fish Hatchery, indicating that there is no golden eagle within a close proximity to  
29 the Niagara Springs Fish Hatchery.

30 Mammals that occur in the study area may consume salmon and steelhead, or may encounter and be  
31 affected by hatchery operations, broodstock collection activities, or juvenile release activities. Canada  
32 lynx (*Lynx canadensis*) maintain large home ranges and are highly mobile, and may occasionally travel  
33 through the area near Hells Canyon and Salmon River hatchery programs (USFWS 2017a). Wolverines  
34 (*Gulo gulo luscus*) are also highly mobile and may travel through higher elevation areas associated with  
35 some hatchery programs. McCall Hatchery is located within the range of the northern Idaho ground  
36 squirrel (*Urocitellus brunneus*), and is approximately 2.5 miles from the nearest documented population  
37 (USFWS 2003 in USFWS 2017a). River otters (*Lontra canadensis*) and mink (*Neovison vison*) occur  
38 throughout the Study Area and may consume salmon and steelhead (Cederholm 2000; Melquist 1997 in  
39 NMFS 2014a).

40 The Bliss Rapids snail (*Taylorconcha serpenticola*) and the Snake River physa snail (*Physa natricina*)  
41 both occur in the vicinity of Hagerman National, Niagara Springs, and Magic Valley fish hatcheries  
42 (USFWS 2017a). Snails can be affected by changes in water quantity and water quality near hatcheries.  
43 Maintenance activities in springs at Hagerman National and Niagara Springs fish hatcheries can also  
44 disturb Bliss Rapids snails.

1 Table 3-13. Primary wildlife species that may interact with hatchery-origin salmon and steelhead or  
 2 be affected by hatchery operations in the Study Area.

Species <sup>1</sup>	Range in relationship to study area	Federal/State Listing Status	Relationship		
			Prey	Predator	Otherwise Affected by Operations
<b>Birds</b>					
Bald Eagle ( <i>Haliaeetus leucocephalus</i> )	Throughout the Columbia River Basin	Federally protected under Bald Eagle and Golden Eagle Protection Act		✓	✓
Golden Eagle ( <i>Aquila chrysaetos</i> )	Throughout the Columbia River Basin	Federally protected under Bald Eagle and Golden Eagle Protection Act Washington State candidate		✓	
Osprey ( <i>Pandion haliaetus</i> )	Throughout the Columbia River Basin	Federally protected under Migratory Bird Treaty Act		✓	✓
Great Blue Heron ( <i>Ardea herodias</i> )	Throughout the Columbia River Basin	Federally protected under Migratory Bird Treaty Act		✓	
<b>Mammals</b>					
Canada Lynx ( <i>Lynx canadensis</i> )	Subalpine forests in study area	Federally threatened (65 FR 16053 16086) Idaho State threatened Washington State endangered		✓	✓
North American Wolverine ( <i>Gulo gulo luscus</i> )	Subalpine forests in study area	Federally proposed threatened Oregon State threatened Washington State candidate		✓	✓
Northern Idaho Ground Squirrel ( <i>Urocitellus brunneus</i> )	Dry meadows surrounded by coniferous forests; near McCall Fish Hatchery	Federally threatened (65 FR 17780) Idaho State threatened			✓
River Otter ( <i>Lontra canadensis</i> )	Throughout the Columbia River Basin	Not listed		✓	✓
Mink ( <i>Neovison vison</i> )	Throughout the Columbia River Basin	Not listed		✓	✓
<b>Invertebrates</b>					
Bliss Rapids Snail ( <i>Taylorconcha serpenticola</i> )	Middle Snake River	Federally threatened (57 FR 59244)	✓		✓
Snake River Physa Snail ( <i>Physa natricina</i> )	Middle Snake River	Federally endangered (57 FR 59244)	✓		✓

3 Source: NMFS (2014a); USFWS (2017a, 2017b).

1 <sup>1</sup> Additional species are provided by NMFS (2014a); the various non-sensitive bird species that may potentially be  
2 affected by temporarily elevated noise are listed in BPA EGIS (2018).

3 Additional bird and mammal species may at times consume juvenile hatchery salmon and steelhead, and  
4 some invertebrates may serve as prey for hatchery salmon and steelhead. A comprehensive list of wildlife  
5 species and potential effects is provided in Section 3.5 of the Mitchell Act FEIS (NMFS 2014a). Three  
6 program hatcheries in the Upper Snake River Basin - Magic Valley Fish Hatchery, Niagara Springs Fish  
7 Hatchery, and Hagerman National Fish Hatchery – were not in the Mitchell Act FEIS project area.  
8 However, based on review of Information, Planning, and Consultation System (IPAC System) (USFWS  
9 2017c) and available literature, federally listed and non-listed species identified in the Mitchell Act FEIS  
10 encompass those species expected to occur in the vicinity of the three hatcheries in the Upper Snake  
11 River Basin that may be affected.

12 Similar to the discussion in Section 3.3, Salmon and Steelhead, the transfer of toxic contaminants and/or  
13 pathogens to wildlife associated with the ongoing hatchery programs is unlikely to contribute to their  
14 current presence/load in wildlife due to the regulation of hatchery operations through NPDES Aquaculture  
15 Facilities permits and the applicants' fish health policies (USFWS 2004; NWIFC and WDFW 2006; NMFS  
16 2014a; USFWS 2017a). The presence of hatchery-origin salmon and steelhead carcasses likely provides  
17 a benefit to local wildlife as a nutrient source. Weirs and traps used for collection of fish may impede  
18 wildlife movement and/or benefit wildlife by restricting fish migration and subsequently enhancing  
19 predation efficiency. The 15 programs currently utilize passive methods of predator control (i.e., netting  
20 around facilities).

### 21 **3.7 Socioeconomics**

22 The existing hatchery programs affect socioeconomic conditions by providing fish for commercial and  
23 recreational fishing opportunities, employment, and economic opportunities through hatchery operations.  
24 Hatchery-related spending affects the economy in the community surrounding the hatchery, and those  
25 economic impacts can extend outward, having a wider regional effect. As described in Section 3.3.1,  
26 Study Area, the study area for socioeconomics is limited to the Snake River Basin upstream from Ice  
27 Harbor Dam, with the focus on economic impacts of current hatchery operations.

28 One important impact hatchery programs can have on social economics is through tribal and nontribal  
29 commercial and recreational fisheries that target hatchery fish. Changes in hatchery production levels can  
30 create beneficial or adverse effects on harvests, which would affect the industries and communities that  
31 depend on them. The hatchery programs assessed in this EA are part of the larger Lower Snake River  
32 economic impact region analyzed in the Mitchell Act FEIS (NMFS 2014a, Figure 3-1). According to the  
33 Mitchell Act FEIS, the total hatchery-generated activity in the Lower Snake River economic impact region  
34 creates about 934 jobs, generates about \$24.5 million in personal income and results in about \$29.3  
35 million to \$35.0 million in recreational expenditures (NMFS 2014a, Table 3-23 and Table 4-109).

36 Section 3.4, Fisheries, describes salmon and steelhead in the Snake River Basin. IDFG regulates and  
37 manages recreational fisheries in the Clearwater and Salmon River subbasins, comanages recreational  
38 fisheries in the Hells Canyon Reach of the Snake River with ODFW, and comanages recreational  
39 fisheries in the Snake River along the Washington border with WDFW. WDFW manages recreational  
40 fisheries in the Snake River from the Idaho border downstream to Ice Harbor Dam. Recreational fisheries  
41 for Spring/Summer Chinook salmon and steelhead are selective; only fish with clipped adipose fins may  
42 be kept. Because Clearwater River coho salmon from the hatchery production included in this EA do not  
43 have clipped adipose fins, recreational anglers can keep fish with an intact adipose fin.

44 The Nez Perce Tribe and Shoshone-Bannock Tribes are fisheries comanagers in their designated areas  
45 with IDFG, WDFW, and ODFW. Tribes regulate and manage their own fisheries. Tribes have both

selective and non-selective fisheries that can potentially harvest hatchery-origin fish. The degree to which hatchery-origin fish wander (i.e., swim to a nonnative tributary first, but return to their native tributary during spawning season) is unknown and is not likely affecting Nez Perce Tribe or Shoshone-Bannock Tribes fisheries.

The current operating budgets of hatchery facilities associated with the 15 hatchery programs analyzed in this EA range from \$21,000 to \$3.4 million per year (Table 3-14). Operating budgets vary widely among facilities because some are used for most life stages of one or more programs, and others are used for as few as one life stage for one program. Many of the hatcheries are also used for programs not included in this EA. Hatchery facilities are funded by IPC, USFWS, LSRCP, Pacific Coastal Salmon Recovery Fund, or the U.S. Army Corps of Engineers (USACE).

The 15 hatchery programs included in this EA currently provide about 358 to 514 of the 934 hatchery-related jobs, \$9.4 million to \$13.5 million of the \$24.5 million in hatchery-related personal income, and \$13.4 to \$16.9 million of the \$29.3 to \$35.0 million in recreational expenditures in the Lower Snake River economic impact region (Table 3-15). Of note, the economic impact of hatchery spending on jobs is broader than employment at the hatcheries because these jobs include indirect employment opportunities in the community that provide goods and services related to hatchery operations and personnel.

Table 3-14. Funding source and operating budgets for programs included in this EA.

Program	Funding Source	Hatchery Staffing Level	Annual Operating Budget	Research, Monitoring & Evaluation Budget
<b>Clearwater River Subbasin</b>				
Clearwater Coho	PCSRF <sup>1</sup> ; USACE; USFWS-LSRCP	4.5 FTE	\$310,200	--
South Fork Clearwater Steelhead	PCSRF; USACE; USFWS – LSRCP	2.83 FTE, 62.7 seasonal months	\$1,059,600	--
<b>Hells Canyon Reach</b>				
Hells Canyon Snake River A-run Summer Steelhead)	Idaho Power Company	1.3 FTE, 27.2 seasonal months	\$510,700	\$99,800
Hells Canyon Snake River Spring Chinook Salmon	Idaho Power Company	0.4 FTE, 7.0 seasonal months	\$180,500	\$18,700
<b>Salmon River Subbasin</b>				
Little Salmon River A-run Summer Steelhead	USFWS - LSRCP; Idaho Power Company	2.0 FTE, 28.5 seasonal months	\$817,800	\$119,000
Little Salmon/Rapid River Spring Chinook Salmon	Idaho Power Company	3.1 FTE, 58.8 seasonal months	\$1,456,000	\$183,000
South Fork Salmon River Summer Chinook Salmon	USFWS - LSRCP	2.7 FTE, 35.6 seasonal months	\$932,300	\$125,400
Johnson Creek Artificial Propagation Enhancement	BPA	3.5 FTE	\$504,300	\$1,069,484
South Fork Chinook Salmon Eggbox	USFWS - LSRCP	0.4 seasonal months	\$7,400	--
Pahsimeroi A-run Summer Steelhead	Idaho Power Company	1.7 FTE, 32.7 seasonal months	\$667,000	\$128,600
Pahsimeroi Summer Chinook Salmon	Idaho Power Company	2.0 FTE, 16.9 seasonal months	\$666,500	\$116,700
East Fork Salmon River Natural A-run Steelhead	USFWS - LSRCP	0.2 FTE, 2.4 seasonal months	\$37,300	\$21,000

Program	Funding Source	Hatchery Staffing Level	Annual Operating Budget	Research, Monitoring & Evaluation Budget
Steelhead Streamside Incubator Project A-run and B-run	Idaho Power Company; USFWS - LSRCP	0.8 FTE, 12.7 seasonal months	\$131,500	--
Salmon River B-run Steelhead	USFWS - LSRCP; Idaho Power Company	1.1 FTE, 10.2 seasonal months	\$423,800	\$119,500
Upper Salmon Spring Chinook Salmon	USFWS - LSRCP	4.2 FTE, 67.9 seasonal months	\$1,470,500	\$148,500

1 Source: Gary Byrne, IDFG, email sent to David Ward, HDR on January 22, 2018, regarding Socioeconomic Information Request

2 <sup>1</sup> PCSRF = Pacific Coast Salmon Restoration Fund

3 Table 3-15. Economic impacts of current program operations.

Program	Number of Jobs Impacted <sup>1</sup>	Economic Impacts on Personal Income <sup>1</sup>	Effects on Recreational Expenses <sup>1</sup>
<b>Clearwater River Subbasin</b>			
Clearwater Coho	15 – 24	\$392,500 - 632,000	\$560,500 - 755,700
South Fork Clearwater Steelhead	25 – 41	\$661,800 – 1,065,500	\$945,100 – 1,274,200
<b>Hells Canyon Reach</b>			
Hells Canyon Snake River A-run Summer Steelhead)	16 – 26	\$431,800 – 695,200	\$616,600 – 831,300
Hells Canyon Snake River Spring Chinook Salmon	10 – 17	\$274,800 - 442,400	\$392,400 – 529,000
<b>Salmon River Subbasin</b>			
Little Salmon River A-run Summer Steelhead	19 – 31	\$499,300 – 803,900	\$713,000 – 961,300
Little Salmon/Rapid River Spring Chinook Salmon	79 – 128	\$2,080,300 – 3,349,500	\$2,970,900 – 4,005,400
South Fork Salmon River Summer Chinook Salmon	30 – 48	\$785,000 – 1,264,000	\$1,121,100 – 1,511,500
Johnson Creek Artificial Propagation Enhancement	4 – 7	\$117,800 – 189,600	\$168,200 – 226,700
South Fork Chinook Salmon Eggbox <sup>2</sup>	--	--	--
Pahsimeroi A-run Summer Steelhead	24 – 39	\$628,000 – 1,011,200	\$896,900 – 1,209,200
Pahsimeroi Summer Chinook Salmon	30 – 39	\$785,000 – 1,033,700	\$1,121,100 – 1,428,500
East Fork Salmon River Natural A-run Steelhead	2 – 3	\$47,100 – 75,800	\$67,300 – 90,700
Steelhead Streamside Incubator Project A-run and B-run <sup>3</sup>	--	--	--
Salmon River B-run Steelhead	32 – 43	\$851,700 – 1,121,600	\$1,216,400 – 1,549,900
Upper Salmon Spring Chinook Salmon	60 – 79	\$1,570,000 – 2,067,500	\$2,242,200 – 2,857,000
<b>Total</b>	<b>358 – 514</b>	<b>\$9,394,900 – 13,482,000</b>	<b>\$13,365,100 – 16,900,000</b>



Program	Number of Jobs Impacted <sup>1</sup>	Economic Impacts on Personal Income <sup>1</sup>	Effects on Recreational Expenses <sup>1</sup>
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Source: Gary Byrne, IDFG sent to David Ward, HDR on January 22, 2018, regarding Socioeconomic Information Request

<sup>1</sup> The estimated ranges of number of jobs, personal income, and recreational fisheries expenditures were calculated by applying the proportion of smolt releases from each program relative to the smolt releases in the Snake River Basin for the relevant Mitchell Act FEIS alternatives per Table 2-1 (NMFS 2014a).

<sup>2</sup> Impacts of the South fork Chinook Salmon Eggbox Program on jobs and income are included in estimates for the South Fork Salmon River Summer Chinook Salmon Program.

<sup>3</sup> Impacts of the Steelhead Streamside Incubator Program on jobs and income are included in estimates for the Pahsimeroi A-run Summer Steelhead and Salmon river B-run Steelhead programs.

### 3.8 Cultural Resources

Salmon fishing has been central to existence of Indian tribes in the Pacific Northwest for thousands of years. Beyond the generation of jobs and income for contemporary commercial Indian tribal fishers, salmon are regularly eaten by individuals and families, and are served at gatherings of tribal communities. As with other Pacific Northwest tribes, tribes of the Columbia River Basin have historically depended on salmon for subsistence purposes and attach great cultural importance to salmon for ceremonial purposes. Tribes of the Columbia River Basin share a passionate concern for the future of salmon runs in the region because of their importance to tribal culture, history, and economic sustenance. As described in Section 2.1, Alternative 1, No Action, excess or surplus adult salmon and steelhead from many of the hatchery programs included in this EA are provided to tribes for direct consumption or for tribal fisheries (Table 2-2; Table 2-3; Table 2-4). The Mitchell Act FEIS provides more details about the importance of salmon to Indian culture (NMFS 2014a, Subsection 3.4.4.1.1, Fish Harvests and Tribal Values and Subsection 3.4.4.1.2, Ceremonial and Subsistence Harvests).

The following Indian tribes are located within the study area and/or may rely on salmon fisheries in the Snake River Basin upstream from Ice Harbor Dam for cultural and subsistence purposes:

- Nez Perce Tribe
- Shoshone-Bannock Tribes
- Confederated Tribes of the Yakama Nation
- Confederated Tribes of the Umatilla Indian Reservation

Present day tribal reservations may encompass a fraction of a tribe's previously occupied territory; therefore, tribes have the exclusive right of taking fish at all usual and accustomed places in accordance with applicable treaties. For example, the combined amount of tribal reservation land for the Nez Perce, Umatilla, Yakama, and Warm Springs reservations consists of 2.5 million acres, but the tribes' aboriginal lands and ceded areas encompass 41 million acres (CRITFC 1994). The tribes are committed to rebuilding salmon and steelhead populations to healthy, harvestable levels, and fairly sharing the conservation burden so that they may fully exercise their right to take fish at all usual and accustomed fishing locations.

#### 3.8.1 Nez Perce Tribe

The Nez Perce Indian Reservation contains 770,000 acres in north-central Idaho (Figure 3-1). The Nez Perce Tribe, in its 1855 Treaty with the United States, reserved "[t]he exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians; as also the right of taking fish at a usual and accustomed places in common with citizens of the Territory..." 12 Stat. 957. Salmon and steelhead are central to the tribe's culture, spiritual beliefs, economics, and way of life. The tribe is committed to rebuilding salmon and steelhead to healthy, harvestable levels and fairly

1 sharing the conservation burden so that they may fully exercise their right to take fish at all usual and  
2 accustomed fishing places. The tribe currently conducts ceremonial, subsistence, and commercial  
3 fisheries in the mainstem Columbia "Zone 6" fishery and at its usual and accustomed fishing places  
4 throughout most of the Columbia and Snake River Basin, including locations within the study area.

### 5 **3.8.2 Shoshone-Bannock Tribes**

6 The Shoshone-Bannock Tribes consist of numerous bands of the Northern Shoshone and Bannock  
7 peoples who harvested anadromous fish resources from locations within the study area from time  
8 immemorial. Decades after contact with European-Americans the Fort Hall Reservation was established  
9 in 1867 by executive order and during negotiations for the Treaty with the Eastern Shoshone and  
10 Bannocks July 3, 1868 (commonly referred to as the Fort Bridger Treaty), the Shoshone and Bannock  
11 peoples specifically reserved almost 1.8 million acres in southeastern Idaho; the following year an  
12 executive order reaffirmed this reservation for the northern Shoshone and Bannock present at Fort  
13 Bridger. After the relocation of numerous bands of Shoshone, including the Lemhi Shoshone, the Fort  
14 Hall Reservation is home to almost 6,000 members with the current land base of 544,000 acres owned by  
15 the Tribes or individual members. The Reservation is situated between the cities of Pocatello, American  
16 Falls, and Blackfoot and comprises land in Bingham, Power, Bannock, and Caribou counties. The  
17 Shoshone-Bannock Tribes historically fished for salmon across the Snake and Columbia River basins,  
18 with significant fisheries below Shoshone Falls on the Snake River and throughout the upper Salmon  
19 River Subbasin; presently the hydrosystem has confined significant fisheries to the Salmon River  
20 subbasin or other tributaries of the Snake River basin below the Hells Canyon Complex.

21 Article IV of the Fort Bridger Treaty expressly reserved the right to 'hunt on unoccupied lands of the  
22 United States, so long as game may be found thereon', and the governing body for the Shoshone-  
23 Bannock Tribes extends those fishing rights to members in annual regulations and fishing guidelines.  
24 Currently, most members of the Shoshone-Bannock Tribes fish in the Salmon and Snake Rivers in Idaho  
25 and Northeast Oregon. In response to low returns of Snake River Sockeye salmon, Tribes petitioned to  
26 list Snake River sockeye salmon as endangered and supported efforts to list remaining anadromous  
27 stocks in the following years. In 2008, the Shoshone Bannock Tribes signed an accord with the action  
28 agencies, tribes, and states to collaboratively fund and implement ongoing projects that would ultimately  
29 benefit Snake River fisheries. The Shoshone-Bannock Tribes are active co-managers of fish resources  
30 within portions of the study area.

### 31 **3.8.3 Confederated Tribes and Bands of the Yakama Nation**

32 The Confederated Tribes and Bands of the Yakama Nation includes 14 tribes (CRITFC 2018b). The  
33 Yakama Indian Reservation is located at the base of Mount Adams in central Washington (Figure 3-1).  
34 The Yakama Nation has historically depended on the Columbia River and salmon for subsistence. The  
35 Yakama Nation has primarily harvested fish in the Columbia River between Bonneville and McNary  
36 Dams, Columbia River tributaries including the Yakima and Klickitat rivers, and in Icicle Creek (a tributary  
37 of the Wenatchee River). Although ceded lands of the 1855 Treaty encompassed 12 million acres, tribal  
38 elders have stated that historically their tribes have traveled as far north as Canada and south to  
39 present-day California. The Yakama Nation may have usual and accustomed places within the study  
40 area.

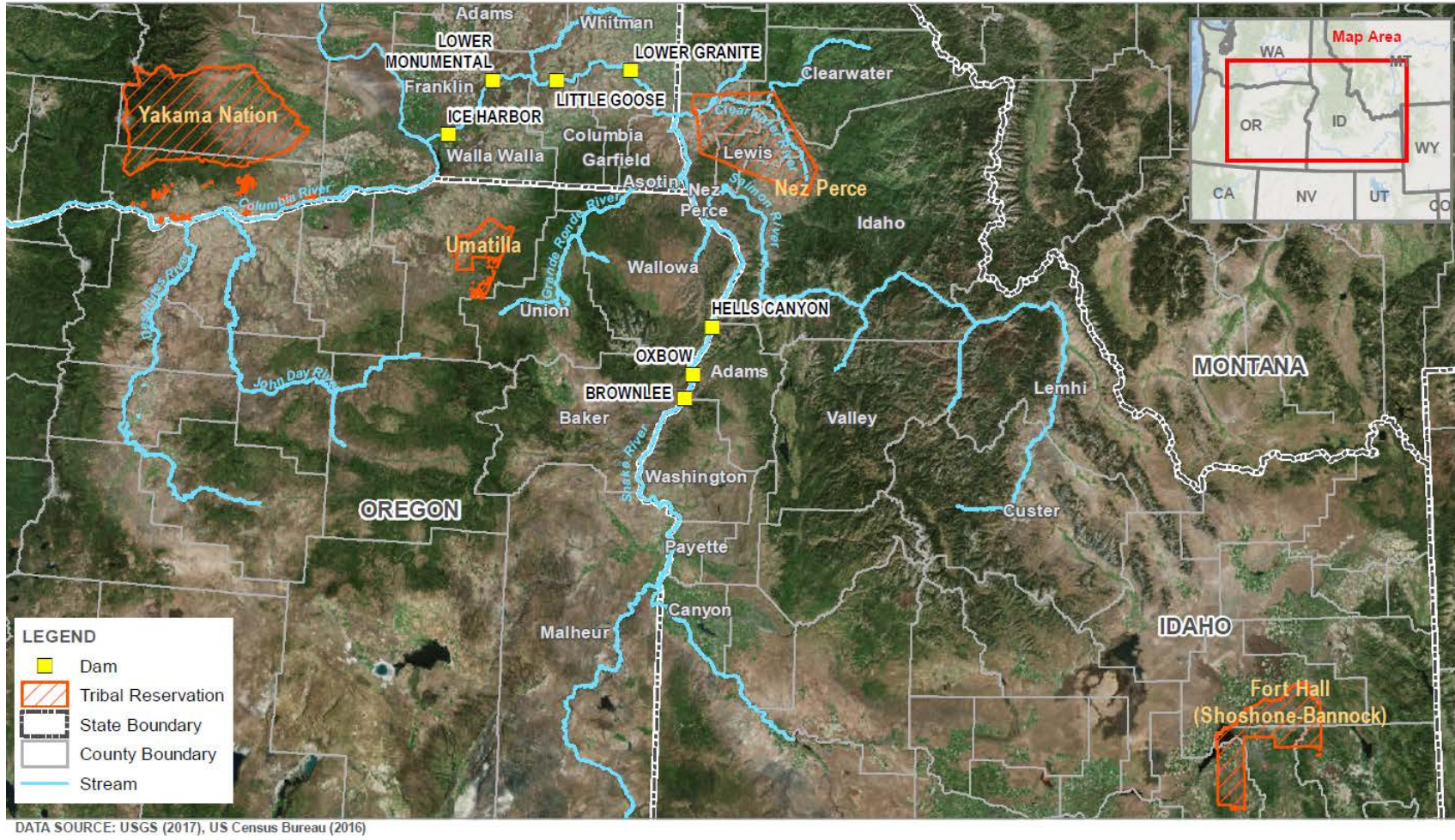
### 41 **3.8.4 Confederated Tribes of Umatilla Indian Reservation**

42 The Confederated Tribes of the Umatilla Indian Reservation includes the Umatilla, Walla Walla, and  
43 Cayuse tribes (CRITFC 2018c). These tribes have long depended on the abundant fisheries in the  
44 Columbia Plateau, historically living around the confluence of the Yakima, Snake, and Walla Walla rivers.

1 The Cayuse lived "...south of and between the Nez Perces and Wallah-Wallahs, extending from the Des  
2 Chutes or Wawanui river to the eastern side of the Blue Mountains. It [their country] is almost entirely in  
3 Oregon, a small part only, upon the upper Wallah-Wallah river, lying within Washington Territory" (CTUIR  
4 2018). The Umatilla tribes traveled over vast areas to take advantage of salmon and steelhead runs,  
5 traditionally fishing the Columbia and Snake rivers, and the Imnaha, Tucannon, Walla Walla, Grande  
6 Ronde, Umatilla, John Day, Burnt, and Powder rivers of northeastern Oregon and southeastern  
7 Washington (USBR 1986).

8 Tribal members typically harvest spring, summer, and fall Chinook salmon and steelhead in the Columbia  
9 River and its tributaries located in southeastern Washington and northeastern Oregon. The confederation  
10 has comanagement responsibilities of fishery activities within the Columbia, Snake, Walla Walla,  
11 Tucannon, and Grande Ronde rivers, including operation of hatcheries in tributaries to the Snake River in  
12 northeastern Oregon. Because of the close historical relationship and geographic proximity the  
13 Confederated Tribes of Umatilla Indian Reservation to the project area (Figure 3-1), the Confederated  
14 Tribes may have usual and accustomed places within the study area.

1



2



3 Figure 3-1. Map of Study Area for cultural resources and environmental justice showing counties and Tribal reservations.

### 3.9 Environmental Justice

In 1994, the President issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. Environmental justice is defined as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” The objectives of the Executive Order include developing Federal agency implementation strategies, identifying minority and low-income populations where proposed Federal actions could have disproportionately high and adverse human health and environmental effects, and encouraging the participation of minority and low-income populations in the NEPA process. Environmental justice analysis leads to a determination of whether high and adverse human health or environment effects of a program would be disproportionately borne by minority populations and low-income populations, often referred to as the environmental justice communities of concern. Minority and low-income populations that has the potential to be affected by a change in hatchery programs are those that harvest fish for subsistence and economic purposes.

For the environmental justice analysis for the current operation of the 15 hatchery programs, minority and low-income communities of concern were identified by comparing demographic data for counties in which physical hatchery facilities are located with a statewide reference area. The three environmental justice metrics used to determine if a county is considered a minority community of concern are (1) percentage of county residents that are nonwhite, (2) percentage that are Indian, and (3) percentage that are Hispanic. The metric for determining if a county is a low-income community of concern is based on the poverty rate and per capita income. Counties were determined to be minority or low-income communities of concern if the level in any category (percent minority, poverty rate, or income) exceeded the applicable data in the statewide reference area.

Seven counties in the study area qualify as communities of concern; six qualify based on minority population and low-income thresholds and one qualifies as low-income only (Table 3-16). Twin Falls, Gooding, Lemhi, Clearwater, and Idaho counties in Idaho, and Baker County in Oregon met both minority population and low-income thresholds. Custer County, Idaho met only the low-income threshold. Only Valley County, Idaho did not meet any criteria to be considered a community of concern. Of the 15 hatchery programs addressed in this EA, only the facilities in Valley County, Idaho, McCall Fish Hatchery and Johnson Creek Weir, are not in environmental justice communities of concern.

Through treaties, the United States made commitments to protect tribes’ rights to take fish. These rights are of enormous cultural and societal importance to the tribes; thus, impacts to commercial, subsistence, and recreational harvest opportunities are examined for any effect on tribal and low-income harvest. All tribes identified in Section 3.8, Cultural Resources are considered an environmental justice group of concern and, accordingly, tribal effects are a specific focus of the environmental justice analysis. Although individual tribes may not meet traditional environmental justice analysis thresholds for minority or low-income populations, they are regarded as affected groups for environmental justice purposes, as defined by USEPA guidance; guidance regarding environmental justice extends beyond statistical threshold analyses to consider explicit environmental effects on Indian tribes (USEPA 1998). The natural or physical environment of a tribe may include resources reserved and protected under the National Historic Preservation Act or the Native American Graves Protection and Repatriation Act.

1 Table 3-16. Summary of environmental justice communities of concern analysis.

State, County	Total Population (2016 estimates)	Percent Non White	Percent Indian	Percent Hispanic	Poverty Rate Percent	Per Capita Income \$ (2016)
<b>Idaho</b>						
Statewide Reference Area	1,635,483	17.2	1.1	12	18.0	\$24,280.00
Twin Falls County	80,955	19.0	0.7	15.1	18.5	\$21,682.00
Gooding County	15,157	31.9	1.3	29.0	18.5	\$20,418.00
Custer County	4,185	4.3	0.4	3.2	25.9	\$23,624.00
Valley County	9,897	2.2	0.1	1.1	16.3	\$28,133.00
Lehmi County	7,743	6.5	0.8	3.0	20.3	\$21,953.00
Clearwater County	8,528	8.8	1.9	3.9	15.0	\$21,316.00
Idaho County	16,251	8.4	2.5	3.1	19.3	\$19,524.00
<b>Oregon</b>						
Statewide Reference Area	3,982,267	23.1	0.9	12.4	18.66	\$28,822.00
Baker County	16,030	8.6	1.1	3.3	17.8	\$24,776.00

Source: U.S. Census Bureau (2017), 2012-2016 American Community Survey, Table B17001: Poverty Status in the Past 12 Months by Sex and Age; Table B19301: Per Capita Income in the Past 12 Months (in 2016 Inflation Adjusted Dollars).

### 2 3.10 Human Health and Safety

3 Potential risks to human health from hatchery facility operations include common chemical usage and  
4 handling, potential toxic contaminants in hatchery-origin fish, and potential pathogens transmitted from  
5 handling hatchery-origin fish. In addition, hatchery operators may get injured through various incidents,  
6 such as slipping, getting cuts, and getting electrocuted, though such risks are minimized by following  
7 state and federal safety standards. Risks, such as falling, hypothermia, and drowning, are also present  
8 when weirs are operated, though such risks are also minimized by following safety protocols.

9 Another risk to human health is contaminant exposure through consumption. Food from aquatic  
10 environments provides an important contribution to human nutrition and health. Risk is associated with  
11 the frequency of consuming fish, regardless of whether fish are of hatchery or natural origin. Risk is  
12 minimal when fish and fish products are harvested, handled, processed, stored, sold, and prepared  
13 properly in accordance to the Food and Drug Administration's "Procedures for the Safe and Sanitary  
14 Processing and Importing of Fish and Fishery Products" (USFDA 2018).

15 The minimal use of therapeutics in the United States and application of therapeutics in compliance with  
16 manufacturers' directions further limits the risk hatcheries pose to human health and the environment.  
17 However, locally high concentrations of therapeutics could occur depending on the nature of the receiving  
18 environment, if therapeutics are needed to control or prevent a disease outbreak.

19 Compliance with safety programs, rules, and regulations, and the use of personal protective equipment  
20 limits the spread of pathogens and the potential risk to human health. Accidental skin contact and  
21 needle-stick injuries involving infected fish are potential human health risks to hatchery personnel.  
22 Chemicals in the environment, including pesticides, heavy metals, and persistent organic pollutants, can  
23 accumulate in fish and pose a public health issue to people who consume it. Proper monitoring  
24 techniques, as well as control measures and risk-based surveillance, have been shown to be critical to  
25 the protection of public health.

## 4 Environmental Consequences

This chapter describes the analysis of the direct and indirect environmental effects associated with the alternatives on the nine resource categories. The effects of Alternative 1, No Action, are described in terms of how current conditions (Section 3, Affected Environment) are likely to appear into the future under implementation of the 15 hatchery programs as described in the HGMPs that are the subject of this EA. The effects of the other alternatives are described relative to Alternative 1. The relative magnitude of impacts are described using the following terms:

- Undetectable – The impact would not be detectable.
- Negligible – The impact would be at the lower levels of detection.
- Low – The impact would be slight, but detectable.
- Medium – The impact would be readily apparent.
- High – The impact would be severe.

The aspects of critical habitat as defined by the ESA that may be affected include (1) adequate water quantity and quality, and (2) freedom from excessive predation. Potential effects on critical habitat as defined by the ESA are analyzed in this EA in the broader discussion of impacts on habitat in Sections 4.1, Water Quantity; 4.2, Water Quality; 4.3, Salmon and Steelhead; 4.4, Fisheries; 4.5, Other Fish Species; and 4.6, Wildlife.

### 4.1 Water Quantity

The overall effect on water quantity from operation of the 15 hatchery programs as described in the HGMPs would be low-adverse under Alternative 1, Alternative 2, and Alternative 3 (Table 4-1). Relative to Alternative 1, effects would be negligible-beneficial under Alternative 4.

Table 4-1. Summary of effects on water quantity.

Resource	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Water Quantity	Low-adverse	Same as Alternative 1	Same as Alternative 1	Negligible-beneficial

#### 4.1.1 Alternative 1

Under Alternative 1, the hatchery programs would be operated as described in the HGMPs<sup>7</sup>. The 15 hatchery programs would continue to use surface water, spring water, and groundwater as previously described (Table 3-1). Kooskia National Fish Hatchery would continue to divert up to 82 percent of Clear Creek under winter low flow conditions; however, the hatchery would not divert water from June through September. Effects on salmon and steelhead would be low because steelhead do not enter Clear Creek until spring, and because no water is diverted in summer. Rapid River Fish Hatchery would continue to divert over 50 percent of the flow from the Rapid River during low winter flows. Surface water diversions

<sup>7</sup> Although JCAPE would increase broodstock collection numbers and juvenile releases from 100,000 to 150,000 under a future operational scenario, no increase in surface water use is proposed.

1 would continue for other facilities, with all diversions from streams under 1 mile in length. Clearwater and  
2 McCall fish hatcheries would continue to draw water from reservoirs, having a relatively small effect on  
3 water sources before water is returned to rivers below the reservoirs. Hagerman National, Niagara  
4 Springs, and Magic Valley fish hatcheries would continue to utilize spring water and potentially affect the  
5 groundwater aquifer contribution to decline of the groundwater would be an adverse effect. Overall, the  
6 continued operation of the hatchery programs under Alternative 1 would likely have a low-adverse effect  
7 on water quantity.

#### 8 **4.1.2 Alternative 2**

9 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
10 with no change in the quantity of water used. Therefore, this alternative would also have the same  
11 low-adverse effect as Alternative 1.

#### 12 **4.1.3 Alternative 3**

13 Under Alternative 3, the effect on water quantity would be similar to that under Alternative 1 even though  
14 the production levels of the hatchery programs would be reduced by 50 percent. Many facilities would  
15 continue to be operated for other programs as described by NMFS (2014a) and USFWS (2017a, 2017b),  
16 precluding substantial reductions in surface water withdrawals. Facilities that may reduce surface water  
17 diversion because they are dedicated solely to programs considered in this EA include Rapid River,  
18 McCall, and Niagara Springs fish hatcheries, and the Hells Canyon Trap, South Fork Salmon River  
19 Satellite, and East Fork Salmon River Satellite. Withdrawals from the Rapid River may decrease slightly  
20 with decreased production. Reduction in the amount of surface water from Payette Lake diverted to  
21 McCall Fish Hatchery would have a relatively small benefit, but would have little effect on streamflows  
22 downstream from the lake. Reductions in hatchery production would likely not affect the amount of water  
23 diverted at the Hells Canyon Trap, South Fork Salmon River Satellite, and East Fork Salmon River  
24 Satellite for adult collection facilities. It is possible that reducing the East Fork Salmon River Natural A-run  
25 Steelhead program by 50 percent would render the program too small to be viable and therefore result in  
26 terminating operations at the East Fork Salmon River Satellite. However, the assumption for this EA is  
27 that the program would continue at a 50 percent reduction from the current level.

28 Although dedicated to programs considered in this EA, Niagara Springs Fish Hatchery uses spring water.  
29 Reductions in production would have little effect on the amount of water used, or on the aquifer from  
30 which it is derived. Overall, Alternative 3 would have a similar low-adverse effect on water quantity as  
31 Alternative 1.

#### 32 **4.1.4 Alternative 4**

33 Even with immediate termination of all 15 hatchery programs under Alternative 4, many facilities would  
34 remain in operation for different programs described by NMFS (2014a) and USFWS (2017a, 2017b).  
35 Facilities that would continue operation include Clearwater, Dworshak National, Kooskia National,  
36 Hagerman National, Magic Valley, , and Sawtooth fish hatcheries, although all Chinook Salmon rearing  
37 would cease at Sawtooth Fish Hatchery. Reduced production at these facilities may result in slightly  
38 reduced surface and ground water withdrawals. Reductions in production would have little effect on  
39 spring water aquifers.

40 Facilities that divert water that may cease to operate because they are dedicated to programs considered  
41 in this EA would include the Hells Canyon Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South  
42 Fork Salmon River Satellite, McCall Fish Hatchery, East Fork Salmon River Satellite, Niagara Springs  
43 Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries. The diversion of up to



51.8 percent of the flow from the Rapid River during winter would cease if hatchery operations were terminated. Termination of water diversion to McCall Fish Hatchery would have a relatively small benefit to Payett Lake but would have little effect on streamflows downstream of the lake. Hells Canyon Trap, South Fork Salmon River Satellite, and East Fork Salmon River Satellite either divert a very small percentage of the streamflow or have a relatively short diversion distance (Table 3-1). Niagara Springs Fish Hatchery uses spring water, so termination of hatchery operations may have a negligible-beneficial effect on the aquifer. Overall, Alternative 4 would have a negligible-beneficial effect on water quantity compared to Alternative 1.

## 4.2 Water Quality

The overall effect on water quality from operation of the 15 hatchery programs would be low-adverse under Alternative 1, Alternative 2, and Alternative 3 (Table 4-2). Relative to Alternative 1, effects would be negligible-beneficial under Alternative 4.

Table 4-2. Summary of effects on water quality.

Resource	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Water Quality	Low-adverse	Same as Alternative 1	Same as Alternative 1	Negligible-beneficial

### 4.2.1 Alternative 1

Under Alternative 1, the 15 hatchery programs would be operated the same as under current conditions, so no change in the discharge of water temperature, ammonia, organic nitrogen, total phosphorus, BOD, pH, and solids in receiving waters would be expected. Temporary and minor effects on sedimentation and dissolved gas supersaturation from adult collection and juvenile release activities would also be expected to remain similar to current conditions. All hatchery discharges are allowed, and most facilities are managed under NPDES permits (other than Oxbow Fish Hatchery, which does not require a permit) administered by the USEPA (Table 3-2). The pollutant loads associated with each respective hatchery (where applicable) have been permitted with conditions and wasteload allocations that protect the water quality of receiving waters. Currently, all 15 hatchery programs are in compliance with their NPDES discharge permits, although periodic effluence limit exceedances occur (Section 3.2, Water Quality).

Under Alternative 1, effluent discharged by hatchery facilities would be expected to continue contributing similar levels of pollutants to receiving waters, and periodic effluent permit-limit exceedances would be expected to occur at a similar frequency. However, water quality may improve in watersheds with TMDLs that are currently in place or will be developed or revised in the future. As NPDES permits are renewed, hatchery facilities in these watersheds would be required to comply with effluent limits that reflect current technologies and watershed conditions, likely resulting in lower pollutant discharge limits. Overall, Alternative 1 is expected to have a low-adverse effect on water quality.

### 4.2.2 Alternative 2

Under Alternative 2, the hatchery programs would be the same as under Alternative 1, with no change in effluent discharge, adult collection and juvenile release activities, and water quality. Therefore, this alternative would have the same low-adverse effect as Alternative 1.

### 4.2.3 Alternative 3

Under Alternative 3, the 15 hatchery programs would operate at half the capacity of Alternative 1 and Alternative 2. Reducing hatchery production may improve water quality in receiving waters downstream of wastewater discharge. The effect of hatchery effluent on the water quality of receiving waters is, in part, a function of fish production levels. Decreasing fish production in the 15 hatchery programs would decrease the quantity of heat, nutrients, BOD, sediment, therapeutics (e.g., antibiotics), fungicides, disinfectants, steroid hormones, anesthetics, pesticides, herbicides, and pathogens discharged to receiving waters. Although the pollutant loading would be less than for Alternative 1 and Alternative 2, there would still be a pollutant load to receiving waters. For those watersheds with TMDLs that are currently in place or will be developed or revised in the future, compliance with the NPDES permit would help improve the water quality; a reduction in production level may further help improve the water quality if these facilities discharge effluent at a level much lower than the limit provided in the permit.

Reduced broodstock collection may reduce in-stream disturbance, although disturbance would still occur because of broodstock collection for other programs. Fish release would also be reduced; however, fish release would still occur and would potentially disturb the streambed and shoreline at release locations and temporarily affect dissolved gas levels. Because broodstock collection, holding, incubation and rearing, and release would still occur, Alternative 3 would have a similar low-adverse effect as Alternative 1 and Alternative 2.

### 4.2.4 Alternative 4

As described in Section 4.1, Water Quantity, even with immediate termination of all 15 hatchery programs under Alternative 4, many facilities would remain in operation for different programs described by NMFS (2014a) and USFWS (2017a, 2017b). Facilities that would still be operating to support other programs would have a reduced pollutant load to their respective receiving waters that would result in a small and incremental improvement in water quality.

Facilities that may cease to operate because they are dedicated to programs considered in this EA would include the Hells Canyon Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon River Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon River Satellite, Niagara Springs Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries. Closing Rapid River, McCall, and Niagara Springs fish hatcheries would result in a small reduction in heat, nutrients, BOD, sediment, therapeutics (e.g., antibiotics), fungicides, disinfectants, steroid hormones, anesthetics, pesticides, herbicides, and pathogens discharged to receiving waters because these hatcheries hold large numbers of fish for a longer period of time than the other facilities. Therefore, closing these hatcheries would result in a small improvement in water quality, while closing other traps, satellites, and weirs is not likely to have a detectable effect.

Niagara Springs Fish Hatchery currently discharges to Niagara Springs Creek and a reach of the Snake River that are currently impaired for flow alteration, total phosphorus, and total suspended solids. An approved TMDL is in place that addresses these impairments and provides wasteload allocations to Niagara Springs Fish Hatchery for total phosphorus and total suspended solids. These wasteload allocations are intended to bring these parameters into compliance with water quality standards. However, closing Niagara Springs Fish Hatchery would further reduce the cumulative total phosphorus and total suspended solids wasteload to Niagara Springs Creek and the Snake River.

Discontinuing broodstock collection and juvenile releases may eliminate temporary stream bottom and shoreline disturbances and effects on dissolved gas. Among the broodstock collection facilities and juvenile release sites that would no longer be in use, the South Fork Salmon River Satellite is located on a waterbody that is impaired for sedimentation. However, the temporary and small-scale nature of

1 sediment disturbance from broodstock collection and juvenile releases would likely result in a very small  
 2 difference in sediment loading to the South Fork Salmon River. Overall, Alternative 4 would have a  
 3 negligible-beneficial effect on water quality compared to Alternative 1.

### 4 4.3 Salmon and Steelhead

5 Natural-origin salmon and steelhead populations in the Snake River Basin could be affected by hatchery  
 6 programs through various effect pathways (Table 3-3). In this subsection, the hatchery program effects on  
 7 natural salmon and steelhead populations in the study area are described for each alternative. Effects of  
 8 each alternative vary among the pathways considered, and even among species for some pathways;  
 9 therefore, it is difficult to postulate an overall effect of the alternatives on salmon and steelhead. In  
 10 general, slightly more pathways would be adversely affected than beneficially affected under Alternative 1  
 11 and Alternative 2. Under Alternative 3 and Alternative 4, more pathways would be beneficially affected  
 12 than adversely affected.

#### 13 4.3.1 Genetics

14 As discussed in Section 3.3.5.1, Genetics, natural-origin fish from the Snake River Spring/Summer  
 15 Chinook Salmon ESU and Snake River Steelhead DPS would likely be genetically affected by the No  
 16 Action and Proposed Action alternatives (Table 4-3). In addition, although native coho salmon are  
 17 extirpated from the study area, natural-origin coho salmon from reintroduction efforts in the Clearwater  
 18 River Subbasin may be genetically affected in the natural environment through interbreeding with  
 19 hatchery-origin counterparts.

20 Table 4-3. Summary of effects on salmon and steelhead genetics.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Snake River Spring/Summer Chinook Salmon ESU	Low-adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial
Snake River Steelhead DPS	Low-adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial
Clearwater River Coho (Reintroduced)	Negligible-adverse	Same as Alternative 1	Low-adverse	Moderate-adverse

#### 21 4.3.1.1 Spring/Summer Chinook Salmon

##### 22 Alternative 1

23 Under Alternative 1, all proposed hatchery programs pose genetic risks to natural-origin Chinook salmon  
 24 from the Snake River Spring/Summer Chinook Salmon ESU. For all programs, the net effect on the  
 25 Snake River Spring/Summer Chinook Salmon ESU would be low-adverse because PNI levels for most of  
 26 the programs are designed to have natural selection be equal to or dominant over hatchery selection.

##### 27 *Little Salmon/Rapid River and Hells Canyon Programs*

28 Under Alternative 1, these segregated programs are operated to limit stray rates of hatchery  
 29 spring/summer Chinook salmon escapement. The proportion of hatchery-origin fish on spawning grounds  
 30 from the segregated Little Salmon/Rapid River Spring Chinook Salmon and Hells Canyon Snake River  
 31 Spring Chinook Salmon programs is currently unknown. Natural- and hatchery-origin spawning in the

1 Little Salmon River population is not well documented; therefore, it is difficult to estimate pHOS levels.  
2 However, because the Little Salmon River population only plays a maintained role in current recovery  
3 scenarios (NMFS 2017a), as well as proposed recovery scenarios under the final recovery plan (NMFS  
4 2017g), PNI and pHOS calculations are not anticipated to be a concern under Alternative 1.

#### 5 ***South Fork Salmon River, South Fork Chinook Eggboxes, and Johnson Creek Programs***

6 Under Alternative 1, hatchery operators intend to phase into having higher levels of integration, which  
7 would result in higher PNI values using the sliding-scale approach for future broodstock management. If  
8 the natural population size increases, the total pHOS level would be reduced to maintain the basin-wide  
9 PNI of 0.5 or higher, meaning that natural selection would be equal to or prevalent over hatchery  
10 selection. Using the sliding-scale management approach, the South Fork Salmon River summer Chinook  
11 salmon population is projected to have future PNI values that approach or exceed 0.67 (NMFS 2017a).  
12 These PNI values are acceptable because they indicate that the natural environment is driving selection  
13 of the population, which minimizes adverse genetic effects of operating hatchery programs, particularly in  
14 populations considered viable for recovery of the ESU (e.g., South Fork Salmon River). Further, the  
15 JCAPE program produces Chinook salmon that are genetically similar enough to the natural population to  
16 be listed within the same ESU (i.e., Snake River spring/summer Chinook salmon ESU). Although PNI  
17 values for the South Fork Salmon River Chinook Salmon and SFCEP programs might fall below a value  
18 of 0.54 in years when natural-origin returns are poor, this lower PNI value would have negligibly negative  
19 affect on genetics, because on balance, at this minimal level of natural-origin returns, meeting a minimum  
20 level population abundance is more critical than the potential adverse hatchery-influenced selection  
21 effects (NMFS 2017a).

#### 22 ***Pahsimeroi and Upper Salmon Programs***

23 For the Upper Salmon River Spring Chinook Salmon program, hatchery operators intend to phase into  
24 having higher levels of integration in the future, which would result in higher PNI values using the sliding  
25 scale approach for future broodstock management. Applying the sliding scale to the natural-origin returns  
26 from 2014 through 2016 would result in PNI levels ranging from 0.51 to 0.56 (Pahsimeroi), and 0.45 to  
27 0.62 (Upper Salmon River). NMFS believes that the steps in the sliding scale proposed by hatchery  
28 operators would continue to improve the PNI into the future as long as natural-origin returns increase  
29 (NMFS 2017b).

30 In general, NMFS believes a PNI of 0.5 is adequate for maintaining the population's genetic structure and  
31 productivity because the natural-origin influence is not dominated by hatchery influence. However, a PNI  
32 slightly less than 0.5 may be acceptable (despite the prevalence of hatchery-influenced selection), on  
33 balance, when natural-origin abundance is low to ensure enough fish are available to spawn regardless of  
34 fish origin. The Pahsimeroi program would be operated to achieve a PNI exceeding 0.5, whereas the  
35 Upper Salmon program would be operated to achieve a PNI exceeding 0.67 (NMFS 2017b). Although a  
36 PNI exceeding 0.5 indicates that natural selection outweighs hatchery-influenced selection, the current  
37 recovery scenario (NMFS 2017g) for the Salmon River spring/summer Chinook salmon MPG calls for  
38 high viability of the Upper Salmon River Mainstem population. Therefore, NMFS believes a more  
39 aggressive PNI than that considered for the Pahsimeroi River population (which is targeted to achieve  
40 viability) puts the Upper Salmon River population on a trajectory to achieve high viability under the current  
41 recovery approach. NMFS believes a PNI of at least 0.67 is a reasonable metric for a highly viable  
42 population when natural-origin returns are high (i.e., >1,000). Recent data suggests that the Upper  
43 Salmon River Mainstem population is likely to obtain a PNI exceeding 0.67 when the abundance exceeds  
44 1,000 natural-origin fish, and PNI exceeding 0.6 when natural-origin returns exceed 350 fish.

1 Finally, the Pahsimeroi Summer Chinook Salmon and Upper Salmon Spring Chinook Salmon programs  
2 produce Chinook salmon that are genetically similar enough to the natural population to be listed within  
3 the same ESU (i.e., Snake River Spring/Summer Chinook Salmon ESU).

#### 4 **Alternative 2**

5 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
6 with no change in effects on natural spring/summer Chinook salmon genetics. Therefore, this alternative  
7 would also have the same, low-adverse effect as Alternative 1.

#### 8 **Alternative 3**

9 Reduction of hatchery programs by 50 percent under Alternative 3 would reduce the hatchery-influenced  
10 selection from all programs, resulting in no more than a negligible-beneficial genetic effect compared to  
11 Alternative 1. Although several integrated programs are part of the Snake River Spring/Summer Chinook  
12 Salmon ESU (JCAPE, Pahsimeroi Summer Chinook Salmon, and Upper Salmon Spring Chinook  
13 Salmon), these programs are not intended to maintain or contribute to genetic diversity of natural-origin  
14 fish. Although integrated programs can contribute to genetic diversity if NORs are low, hatchery-origin  
15 production in the natural environment is generally considered adverse.

#### 16 **Alternative 4**

17 With immediate termination of the hatchery programs under Alternative 4, hatchery-origin fish that have  
18 already been released would return to the Snake River Basin for 4 or 5 years and would continue to be  
19 removed if encountered through another program, but the removal would not take place at the levels  
20 described in the HGMPs. Therefore, hatchery-influenced selection may temporarily increase, but would  
21 decrease as the hatchery-origin adults cease to return.

22 Elimination of all hatchery programs would have a low-beneficial effect on Snake River Spring/Summer  
23 Chinook Salmon ESU genetics within the Snake River Basin compared to Alternative 1. Similar to  
24 Alternative 3, although several integrated programs are part of the Snake River Spring/Summer Chinook  
25 Salmon ESU (JCAPE, Pahsimeroi Summer Chinook Salmon, and Upper Salmon Spring Chinook  
26 Salmon), these programs are not intended to maintain or contribute to genetic diversity of natural-origin  
27 fish. Thus, hatchery-origin production in the natural environment is considered adverse.

### 28 **4.3.1.2 Steelhead**

#### 29 **Alternative 1**

30 Under Alternative 1, the proposed hatchery programs pose genetic risks to natural-origin steelhead from  
31 the Snake River DPS, although there is some benefit to the species from the integrated program  
32 designed to supplement the East Fork Salmon River population. Considering the relatively small size of  
33 the East Fork Salmon River Natural A-run program compared to the overall genetic risks, the net effect on  
34 steelhead under Alternative 1 would be low-adverse.

35 With the exception of the East Fork Salmon River Natural A-run Steelhead program, all of the steelhead  
36 hatchery programs under Alternative 1 are operated as segregated programs. As discussed in Section  
37 3.3.5.1, Genetics, segregated hatchery programs under the Proposed Action pose a risk of genetic  
38 impacts to the receiving South Fork Salmon River, Little Salmon River, Pahsimeroi River, and Upper  
39 Salmon River populations, all of which are designated as maintained (NMFS 2017g).

40 Despite the indication that straying is low for hatchery fish from these segregated programs (Section  
41 3.3.5.1, Genetics), Alternative 1 includes ongoing coordination with the Steelhead Workgroup to address

1 uncertainties in the future that are related to the broader workgroup objectives of determining (1)  
2 appropriate methodologies for assessing hatchery-origin steelhead composition in receiving populations  
3 throughout the study area, and (2) target levels at which hatchery program modifications might be  
4 triggered (NMFS 2017c).

5 Under Alternative 1, the integrated East Fork Salmon River Natural A-run Steelhead Program would  
6 continue to use natural-origin broodstock, and would be operated to obtain a PNI exceeding 0.5, meaning  
7 that natural selection would be equal to or prevalent over hatchery selection and the net genetic effect on  
8 natural populations would be minimal. Best available data suggests that the East Fork Salmon River  
9 Natural program is likely to obtain a PNI of > 0.5 (NMFS 2017c). NMFS (2017c) anticipates that the PNI  
10 would continue to increase in the future as long as returns of natural-origin fish increase. Therefore, under  
11 Alternative 1, NMFS anticipates that going forward, natural selection would be equal to or prevalent over  
12 hatchery selection. In addition, this program produces steelhead that are genetically similar enough to the  
13 natural population to be listed within the same DPS (i.e., Snake River Steelhead DPS). In addition, in the  
14 current recovery scenario, this population is not targeted for viability or high viability, but for maintained  
15 status (NMFS 2017c, 2017g). Thus, NMFS believes a PNI of 0.5 is adequate for maintaining the  
16 population, and a PNI less than 0.5 is acceptable when natural-origin abundance is low (i.e. < 250 fish), to  
17 ensure enough fish are available to spawn regardless of fish origin (NMFS 2017c).

#### 18 **Alternative 2**

19 Under Alternative 2, the operation of all steelhead hatchery programs would be the same as under  
20 Alternative 1, with no change in effects on natural steelhead genetics. Therefore, this alternative would  
21 also have the same, low-adverse effect on genetics as Alternative 1.

#### 22 **Alternative 3**

23 Reduction of hatchery programs by 50 percent under Alternative 3 would reduce hatchery-influenced  
24 selection from those hatchery programs intended to support recreational and tribal harvest, resulting in no  
25 more than a negligible-beneficial effect compared to Alternative 1, which has a low-adverse genetic  
26 impact. Genetic diversity would still be maintained through reduced operation of the East Fork Salmon  
27 River Natural A-run Program, whose purpose is to supplement natural populations through integrated  
28 recovery. The negative effects of using fewer broodstock under this alternative for the East Fork Salmon  
29 River Natural A-run program would not outweigh the beneficial effect of reducing the genetic risk of  
30 hatchery selection from the remainder of the steelhead programs under Alternative 3.

#### 31 **Alternative 4**

32 With immediate termination of the hatchery programs under Alternative 4, hatchery-origin fish that have  
33 already been released would return to the Snake River Basin for 4 or 5 years and would continue to be  
34 removed if encountered through another program, but the removal would not take place at the levels  
35 described in the HGMPs. Therefore, hatchery-influenced selection may temporarily increase, but would  
36 decrease over time as the hatchery-origin adults from both programs cease to return. The East Fork  
37 Salmon River Program is included in the Snake River Steelhead DPS and serves to maintain some  
38 genetic diversity. Therefore, termination of this integrated program may reduce the support for genetic  
39 diversity within the DPS. Still, if hatchery-origin fish from any of the programs spawn in the natural  
40 environment, hatchery-influenced selection is considered an adverse effect on natural-origin steelhead  
41 genetics. Under this alternative, fewer segregated steelhead hatchery programs would exist in the Snake  
42 River Basin to affect natural steelhead genetics, and therefore, elimination of all programs would have a  
43 low-beneficial effect on Snake River Steelhead DPS genetics compared to Alternative 1.

### 4.3.1.3 Coho Salmon

#### Alternative 1

Although natural and hatchery-origin coho are genetically linked through the reintroduction program, hatchery broodstock sources have changed over the years, and as a result, the genetic profile of the natural-origin population likely differs from hatchery-origin genetics at some level. The genetic effect of hatchery-influenced selection on natural-origin coho is likely minimal considering that these fish share a genetic lineage. Under Alternative 1, the effect on natural-origin coho salmon genetics would be negligible adverse.

#### Alternative 2

Under Alternative 2, the operation of the Clearwater River coho hatchery program would be the same as under Alternative 1, with no change in effects on natural-origin coho genetics. Therefore, this alternative would also have the same, negligible-adverse effect on genetics as Alternative 1.

#### Alternative 3

Reduction of hatchery programs by 50 percent under Alternative 3 would decrease hatchery-influenced selection from harvest programs; however, reduction of the hatchery program could increase harvest pressure on the natural-origin population. This program is intended to reintroduce and restore coho salmon to the Clearwater River Subbasin at levels of abundance and productivity sufficient to support sustainable runs and annual harvest. All natural-origin coho in the study area are genetically linked to hatchery counterparts through the reintroduction program. Although a reduction of the hatchery program would reduce hatchery-influence selection, it would also increase harvest pressure on the recently-reintroduced natural population. Because the program is intended to supplement the natural population as well as provide harvest opportunities, and because hatchery- and natural-origin fish are genetically linked through the reintroduction program, this alternative would result in a low-adverse effect on genetic diversity in the natural population.

Based on results from the Clearwater River Subbasin coho reintroduction program to date and experience in managing anadromous fish populations in the Snake River Basin, the Nez Perce Tribe believes this program will require a substantial hatchery production component and the establishment of highly productive naturally spawning coho salmon aggregates (Nez Perce Tribe 2016).

#### Alternative 4

Native Clearwater coho salmon are extirpated from the study area. Natural production of coho salmon is the result of re-introduction; they are not ESA-listed. Therefore, with immediate termination of the hatchery program under Alternative 4, although genetic risks associated with hatchery-origin selection would decrease, harvest pressure would increase on natural-origin coho. As discussed for Alternative 3, because the Clearwater River coho program is intended to supplement the recently-reintroduced natural population as well as provide harvest opportunities, and because hatchery fish and natural-origin fish are genetically linked through the reintroduction program, complete elimination of this program would result in a moderate-adverse effect on genetic diversity in the natural population. Until there exists a viable, self-sustaining population of coho salmon in the Clearwater River Basin, genetic effects from hatchery-influenced selection are outweighed by population rebuilding efforts.

### 4.3.2 Masking

Most smolts from spring/summer Chinook salmon, steelhead, and coho hatchery programs would continue to be marked (Table 2-2; Table 2-3; Table 2-4; Table 2-6); therefore, masking is unlikely to occur under any alternative for natural spring Chinook salmon, steelhead, or coho. Retention rate of CWT generally exceeds 97 percent (Hand et al. 2007; Nandor et al. 2009). The 3 percent of fish that are mismarked or lose tags is not likely to have a discernible effect on assessing the status of the natural population, especially because PBT is an effective tool to alleviate the effects of masking even for non-externally marked fish and gives NMFS significant confidence in the estimates for these programs. Similarly, although the steelhead and Chinook salmon eggbox programs use only PBT marking, the relatively limited contribution of fish from eggbox programs compared to overall hatchery program production in the study area is not likely to result in detectable effects on assessing the status of natural populations.

### 4.3.3 Competition and Predation

The overall competition and predation effects from hatchery-origin Chinook salmon, coho salmon, and steelhead on natural-origin salmon and steelhead would range from negligible-adverse to low-adverse under Alternative 1 and Alternative 2 (Table 4-4). Relative to Alternative 1, effects would range from negligible-beneficial to low-beneficial under Alternative 3 and Alternative 4.

Table 4-4. Summary of effects on natural-origin salmon and steelhead from competition and predation with hatchery-origin fish.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Spring/summer Chinook salmon	Low-adverse	Same as Alternative 1	Low-beneficial	Low-beneficial
Steelhead	Low-adverse	Same as Alternative 1	Low-beneficial	Low-beneficial
Fall Chinook salmon	Negligible-adverse	Same as Alternative 1	Low-beneficial	Negligible-beneficial
Sockeye salmon	Negligible-adverse	Same as Alternative 1	Low-beneficial	Negligible-beneficial
Coho salmon	Negligible-adverse	Same as Alternative 1	Low-beneficial	Negligible-beneficial

#### 4.3.3.1 Alternative 1

Under Alternative 1, with the exception of the JCAPE program, all hatchery programs would be operated the same as under current conditions. As such, there would be no expected change in the competition and predation effects from Chinook salmon, coho salmon, and steelhead smolts released from the programs compared to those described in Section 3.3.5.3, Competition and Predation. The JCAPE currently releases 100,000 smolts under the 2008-2017 *U.S. v Oregon* Management Agreement, but proposes a release of 150,000 smolts moving forward. This is a relatively minor increase in the total number of spring/summer Chinook salmon smolts released into the study area under current conditions because of other smolts released in the Salmon River subbasin (Table 2-1), and additive effects would be negligible.



## 1 **Spring/Summer Chinook Salmon**

2 Competition and predation effects from all programs would be low-adverse for the Snake River  
3 Spring/Summer Chinook Salmon ESU. Chinook salmon smolts from the programs may outcompete or  
4 prey on up to 2.2 percent of the natural-origin spring Chinook salmon population (NMFS 2017a, 2017b).  
5 Hatchery spring Chinook salmon smolts migrate out of the study area soon after release, with median  
6 travel times to Ice Harbor Dam ranging from 29 total days for Pahsimeroi Summer Chinook salmon  
7 releases, to 61 days for Johnson Creek releases (NMFS 2017a, 2017b). Steelhead smolts from the  
8 programs may outcompete or prey on up to 1.8 percent of the natural-origin Chinook salmon population.  
9 Hatchery steelhead smolts migrate out of the study area soon after release, with median travel times to  
10 Lower Granite Dam ranging from 12 days for steelhead from several programs, to 35 days for the Hells  
11 Canyon Snake River A-run summer steelhead (NMFS 2017c). Travel to Ice Harbor Dam requires an  
12 additional 3 days. The maximum estimated numbers of Chinook salmon lost from competition and  
13 predation with Clearwater River coho salmon equates to 51-53 adult Chinook salmon (all runs)  
14 (NMFS 2017d), which equates to less than 0.2 percent of the natural-origin Chinook populations  
15 (Reynolds 2017). The total number of Chinook salmon lost to competition and predation with all hatchery  
16 species would be very small.

17 Adults from the spring/summer Chinook salmon hatchery programs may compete for spawning sites and  
18 potentially superimpose natural-origin spring Chinook salmon redds in the study area. The likelihood is  
19 low; however, because the proportion of hatchery-origin fish on spawning grounds would continue to be  
20 reduced under Alternative 1 as part of ongoing monitoring of pHOS levels to determine if they are in line  
21 with recommendations by HSRG (NMFS 2017a). Because adults from the JCAPE program and portions  
22 of the South Fork Salmon River Summer Chinook Salmon, Pahsimeroi Summer Chinook Salmon, and  
23 Upper Salmon Spring Chinook Salmon programs produce hatchery-origin fish that are intended to spawn  
24 with natural-origin fish to supplement the natural-origin population, competition for spawning sites and  
25 redd superimposition would continue to occur at levels similar to current conditions. Competition between  
26 natural-origin Chinook salmon and adult steelhead and coho salmon from hatchery programs under  
27 Alternative 1 would be negligible due to differences in run timing, holding, and spawn timing.

## 28 **Steelhead**

29 Competition and predation effects from all programs would also be low-adverse for the Snake River  
30 Steelhead DPS. Chinook salmon smolts from the programs may prey on up to 1.6 percent of the natural-  
31 origin steelhead population (NMFS 2017a, 2017b). Steelhead smolts from the programs may compete  
32 with or prey on up to 4.6 percent of the natural-origin steelhead population (2017c). The maximum  
33 estimated number of steelhead lost from competition and predation with Clearwater River coho equates  
34 to 51 adult steelhead (NMFS 2017d), which is about 0.2 percent of the natural-origin steelhead population  
35 (Reynolds 2017). None of the hatchery smolt releases (spring/summer Chinook salmon, steelhead, or  
36 coho salmon) should affect age-0 steelhead because of lack of temporal overlap with spring smolt  
37 releases.

38 Naturally spawning hatchery-origin steelhead may compete with natural-origin steelhead adults for  
39 spawning sites due to similar spring spawn times and habitat requirements; however, considering low  
40 stray rates, this would primarily occur within populations that are not targeted as viable or highly viable  
41 populations in the DPS. Thus, competition with natural-origin steelhead may occur, but is likely to have a  
42 negligible effect on the recovery of the Snake River steelhead populations. Spawning site competition or  
43 redd superimposition is unlikely between spring/summer Chinook salmon and coho salmon hatchery  
44 program adults and Snake River steelhead because of the difference in spawning time.

### 1 **Fall Chinook Salmon**

2 Competition and predation effects from all programs would be negligible-adverse for the Snake River Fall  
3 Chinook Salmon ESU. Spring/summer Chinook salmon smolts released from the programs under  
4 Alternative 1 have the potential to prey on, and to compete with, natural-origin fall Chinook salmon fry and  
5 parr, though the likelihood is less than the 0.8 to 2.2 percent range presented for spring Chinook salmon,  
6 because natural-origin fall Chinook salmon smolts would have less geographic and temporal overlap with  
7 the hatchery-origin fish. Steelhead smolts from the programs may compete with or prey on up to  
8 1.8 percent of the natural-origin Chinook salmon population (NMFS 2017c). The maximum estimated  
9 numbers of fall Chinook salmon lost from competition and predation with Clearwater River coho salmon  
10 equates to 51 to 53 adult Chinook salmon (all runs) (NMFS 2017d), which equates to less than 0.2  
11 percent of the natural-origin Chinook populations (Reynolds 2017).

12 Spawning site competition or redd superimposition is unlikely between steelhead and coho salmon  
13 hatchery smolts and Snake River fall Chinook salmon because of the difference in spawn timing and  
14 location. As described in Section 3.3.5.3, Competition and Predation, it is possible that hatchery-origin  
15 spring/summer Chinook salmon adults might compete with natural-origin fall Chinook salmon because of  
16 a slight overlap in spawn timings in late-September. However, NMFS expects these effects are negligible  
17 because the overlap is geographically small and temporally short (NMFS 2017a, 2017b).

### 18 **Sockeye Salmon**

19 Competition and predation effects from all programs would also be negligible-adverse for the Snake River  
20 Sockeye Salmon ESU. Chinook salmon smolts from the programs may prey on up to 2.0 percent of the  
21 natural-origin sockeye population (NMFS 2017a, 2017b), and steelhead smolts from the programs may  
22 compete with or prey on up to 2.6 percent (NMFS 2017c). The maximum estimated number of sockeye  
23 salmon lost from competition and predation with Clearwater River coho salmon from Lower Granite Dam  
24 upstream to the confluence of the Clearwater and Snake rivers equates to two adults (NMFS 2017d),  
25 which is less than 0.3 percent of the natural-origin sockeye salmon population. A lack of geographic  
26 overlap prevents Chinook salmon, steelhead, and coho salmon hatchery releases from interacting with  
27 age-0 sockeye in Redfish, Pettit, and Alturas lakes. Adult competition for spawning grounds and redd  
28 superimpositions would not occur because of differences in spawn timing and location.

### 29 **Coho Salmon**

30 Competition and predation effects from all programs would also be negligible-adverse for coho salmon.  
31 Chinook salmon, steelhead, and coho salmon smolts from all hatchery programs have the potential to  
32 prey on, and to compete with, coho salmon juveniles in the study area. However, because native coho  
33 salmon are extirpated from the Snake River Basin, and any natural-origin coho in the study area  
34 originated from reintroduction efforts using hatchery broodstock, NMFS has not modeled the equivalent  
35 adult loss of coho salmon from competition and predation with any of the hatchery program smolt  
36 releases. The potential for hatchery program smolts to compete with or prey upon coho salmon would be  
37 limited to reintroduced populations in the Clearwater River Subbasin and the mainstem of the Snake  
38 River downstream of the confluence with the Clearwater River. Considering the low number of hatchery-  
39 origin coho returning to the study area (6,500; NMFS 2017d), redd superimposition on natural-origin  
40 coho, though possible, is likely minimal.

### 41 **4.3.3.2 Alternative 2**

42 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
43 with no change in competition and predation effects on other salmon and steelhead species. Therefore,  
44 this alternative would have the same effects as Alternative 1.

### 4.3.3.3 Alternative 3

The 50-percent reduction in hatchery production under Alternative 3 would theoretically result in similar reductions to harvest and a corresponding reduction in the number of hatchery-origin spring/summer Chinook salmon, steelhead, or coho salmon adults returning to the Snake River Basin. Therefore, the competitive and predatory effects of hatchery-origin smolts and returning adults would be reduced compared to Alternative 1.

The competition and predation effects would be low-beneficial relative to Alternative 1 for the Snake River Spring/Summer Chinook Salmon ESU. Reductions in smolt numbers from all spring/summer Chinook salmon, steelhead, and coho salmon hatchery programs would reduce the potential for competition with or predation on natural-origin parr, and competition with juvenile spring Chinook salmon compared to Alternative 1. Similarly, reduced numbers of adults from the spring/summer Chinook salmon hatchery programs under Alternative 1 would compete for spawning grounds, resulting in less redd superimposition.

The competition and predation effects would also be low-beneficial relative to Alternative 1 for the Snake River Steelhead DPS. Reductions in smolt numbers from all spring/summer Chinook salmon, steelhead, and coho salmon hatchery programs would reduce the potential for competition with or predation on natural-origin parr, and competition with juvenile steelhead compared to Alternative 1. Similarly, reduced numbers of adults from the steelhead hatchery programs under Alternative 1 would compete for spawning grounds, resulting in less redd superimposition.

The competition and predation effects would be negligible-beneficial relative to Alternative 1 for the Snake River Fall Chinook Salmon ESU. Reductions in smolt number from all spring/summer Chinook salmon, steelhead, and coho salmon hatchery programs would reduce potential predation on natural-origin fry and parr, and competition with juvenile summer/fall Chinook salmon compared to Alternative 1. Subsequent reductions in the number of spring/summer Chinook salmon hatchery program adults would decrease the already limited potential for spawning ground competition and redd superimpositions with fall Chinook salmon.

The competition and predation effects would also be negligible-beneficial relative to Alternative 1 for sockeye salmon. Reduction in smolt numbers from all spring/summer Chinook salmon, steelhead, and coho salmon hatchery programs would reduce the potential predation on natural-origin parr, and competition with juvenile sockeye salmon in the Snake River Basin compared to Alternative 1. Due to a lack of temporal and geographic overlap, no adult competition for spawning grounds and redd superimpositions would occur between sockeye salmon and hatchery program adults in the study area.

The competition and predation effects would also be negligible-beneficial relative to Alternative 1 for coho salmon. Reductions in the number of smolts from all spring/summer Chinook salmon, steelhead, and Coho salmon programs would decrease the potential for competition and predation effects on natural-origin juvenile coho salmon compared to Alternative 1. Due to limited temporal, geographic, and spawning habitat overlap, no adult competition for spawning grounds and redd superimpositions would occur between coho salmon and hatchery program adults in the study area.

### 4.3.3.4 Alternative 4

As described in Section 4.1, Water Quantity, with the complete termination of hatchery programs under Alternative 4, facilities would not be used for these programs, but many would continue to operate for other salmon or steelhead programs described by NMFS (2014a) and USFWS (2017a, 2017b). Facilities that may cease to operate because they are dedicated to programs considered in this EA would include the Hells Canyon Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon River

1 Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon River Satellite, Niagara Springs  
2 Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries.

3 Because there would be a reduction in the overall spring/summer Chinook salmon, steelhead, and coho  
4 salmon hatchery-origin smolts (and eggs), and a subsequent reduction in returning adults in the study  
5 area over time, the hatchery programs' competitive and predatory effects would eventually subside.  
6 Therefore, the effects would be low-beneficial to all species relative to Alternative 1. Ecological effects of  
7 program termination would be most substantial in the Hells Canyon Reach of the Snake River, the Little  
8 Salmon River, and the South Fork Salmon River. Effects may be less in the East Fork Salmon River  
9 because the East Fork Salmon River Natural A-run Steelhead Program is integrated and uses only  
10 natural-origin broodstock. No fish are collected at or released from Niagara Springs Fish Hatchery;  
11 therefore no additional effects would be realized.

#### 12 4.3.4 Prey Enhancement

13 Because adult spring/summer Chinook salmon do not typically eat after entering freshwater (Quinn 2005)  
14 and steelhead are the only species likely to be present and feeding as adults when hatchery subyearlings  
15 and yearlings are released from all programs in the spring (Section 3.3.5.4, Prey Enhancement), or when  
16 fish from eggbox programs are rearing in the natural environment, the effects of prey enhancement are  
17 analyzed only for steelhead (Table 4-5).

18 Table 4-5. Summary of prey enhancement effect on steelhead.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Steelhead	Low-beneficial	Same as Alternative 1	Negligible-adverse	Negligible-adverse

##### 19 4.3.4.1 Alternative 1

20 Under Alternative 1, with the exception of the JCAPE program, all hatchery programs would be operated  
21 the same as under current conditions. As such, no change would be expected in the prey enhancement  
22 effects from Chinook salmon, coho salmon, and steelhead smolts or eggs released from the programs  
23 compared to those described in Section 3.3.5.4, Prey Enhancement. The JCAPE Program currently  
24 releases 100,000 smolts under the 2008-2017 *U.S. v Oregon* Management Agreement, but proposes a  
25 release of 150,000 smolts moving forward. This is a relatively minor increase in the total number of  
26 spring/summer Chinook salmon smolts released into the study area under current conditions, and  
27 additive effects on prey enhancement would be undetectable on top of the low-beneficial effect of prey  
28 enhancement under Alternative 1. Similarly, negligible additive effects would be realized if steelhead  
29 adults preyed upon age-0 spring Chinook salmon or steelhead fry or parr from the eggbox programs.

##### 30 4.3.4.2 Alternative 2

31 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
32 with no change in prey enhancement effects on steelhead. Therefore, this alternative would also have the  
33 same, low-beneficial effect as Alternative 1.

#### 4.3.4.3 Alternative 3

Under Alternative 3, the total number of smolts released would be reduced to 3.5 million spring/summer Chinook salmon, 2.5 million steelhead, and 250,000 coho salmon. Steelhead would have a smaller number of smolts to prey on compared to Alternative 1, and the difference in effects would likely be negligible-adverse, especially because steelhead do not rely on the smolts from the programs and would find other sources of food.

#### 4.3.4.4 Alternative 4

Under Alternative 4, no program-related smolts would be available as a prey source for adult steelhead, though these fish are likely to find other sources of food. Therefore, this alternative would have a negligible-adverse effect compared to Alternative 1. A reduction in prey enhancement would be most substantial in reaches adjacent to and downstream of facilities that would likely cease to operate completely under Alternative 4, as described in Section 4.1, Water Quantity.

### 4.3.5 Diseases

The overall disease effects from hatchery-origin Chinook salmon, coho salmon, and steelhead on natural-origin salmon and steelhead would be negligible-adverse under Alternative 1 and Alternative 2. Relative to Alternative 1, effects would be negligible-beneficial under Alternative 3 and Alternative 4 (Table 4-6). NMFS (2017a, b) determined that the risk of pathogen transmission to natural-origin salmon and steelhead is negligible for programs under the Proposed Action.

1 Table 4-6. Summary of disease effects on salmon and steelhead.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Spring/Summer Chinook salmon	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Steelhead	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Fall Chinook salmon	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Sockeye salmon	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Coho salmon	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial

2 **4.3.5.1 Alternative 1**

3 Under Alternative 1, the hatchery programs would be operated with the same disease management  
4 protocols as under current conditions, so no change in disease effects on other salmon and steelhead  
5 species would be expected. Although pathogens can be passed to natural-origin salmon and steelhead  
6 species that occupy rivers near hatchery facilities, several factors reduce the likelihood of disease and  
7 pathogen transmission between hatchery and natural fish. First, the proportion of facility surface water  
8 withdrawal and subsequent discharge at most sites represents only a portion of the total streamflow  
9 (Section 3.1, Water Quantity). This reduces, via dilution, the potential for transmission of pathogens from  
10 effluent (Section 3.2, Water Quality). Second, smolt release strategies typically promote distribution of  
11 hatchery fish throughout the system and rapid outmigration, which reduces the concentration of hatchery-  
12 released fish, and therefore, the potential for a diseased hatchery fish to encounter natural-origin salmon  
13 and steelhead. Finally, standard fish health protocols minimize the potential for disease and pathogen  
14 effects on natural-origin salmon and steelhead (USFWS 2017a). In Idaho, recommendations for treating  
15 specific disease agents comes from the Idaho Department of Fish and Game Fish Health Laboratory in  
16 Eagle, ID (IDFG 2016b) and from USFWS's Pacific Region Fish Health Program office located at Kooskia  
17 National Fish Hatchery.

18 Because few major outbreaks have occurred for any of the programs and management protocols have  
19 limited the extent and duration of any outbreaks, production of all salmon and steelhead species  
20 discussed here would have a negligible-adverse effect.

21 **4.3.5.2 Alternative 2**

22 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
23 with no change in disease effects on other salmon and steelhead species. Therefore, this alternative  
24 would also have the same, negligible-adverse effect as Alternative 1.

25 **4.3.5.3 Alternative 3**

26 The 50 -percent reduction in total quantity of smolts under Alternative 3 would result in a  
27 negligible-beneficial effect on the potential for pathogen transmission to natural-origin fish associated with  
28 the hatchery programs compared to Alternative 1 because the reduction would reduce the number of  
29 hatchery fish that can potentially transfer diseases to natural-origin fish. Although a slight beneficial effect  
30 might be realized, most facilities that propagate fish from these programs would continue to operate for

1 other nonproject programs that would have similar disease effects on natural salmon and steelhead  
2 species. This minimizes any beneficial effect compared to Alternative 1.

#### 3 **4.3.5.4 Alternative 4**

4 Similar to Alternative 3, given the quantity of smolts that would be eliminated from the Snake River Basin,  
5 terminated production under Alternative 4 would result in a negligible-beneficial effect on the potential for  
6 pathogen transmission to natural-origin fish associated with the hatchery programs compared to  
7 Alternative 1. Although a slight beneficial effect might be realized, as discussed in Section 2.4, Alternative  
8 4, with the exception of the Hells Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery,  
9 South Fork Salmon Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite,  
10 Niagara Springs Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries,  
11 facilities that propagate fish from these programs would continue to operate for other nonproject  
12 programs that would have similar disease effects on natural salmon and steelhead species. This  
13 minimizes any beneficial effect compared to Alternative 1. Relative disease effects of program termination  
14 may, be most substantial in the Rapid River, Little Salmon River, and South Fork Salmon River.

#### 15 **4.3.6 Population Viability**

16 As discussed in Section 3.3.5.6, Population Viability, and in Appendix A, the discussion herein is limited  
17 to the Snake River Spring/Summer Chinook Salmon ESU and the Snake River Steelhead DPS because  
18 these are the only species that have negatively affected population viability in addition to effects  
19 discussed in Section 3.3.5.3.. Spring/summer Chinook salmon and coho salmon hatchery programs  
20 considered in this EA would have no effect on population viability for the Snake River Steelhead DPS.  
21 Similarly, coho salmon and steelhead hatchery programs considered in this EA would have no effects on  
22 population viability of the Snake River Spring/Summer Chinook Salmon ESU. Effects on population  
23 viability consider abundance, productivity, spatial structure and diversity. Effects from same-species  
24 hatchery programs (i.e., conspecifics) on the Snake River Spring/Summer Chinook Salmon ESU and  
25 Snake River Steelhead DPS are summarized below (Table 4-7).

26 Table 4-7. Summary of population viability effects of Chinook salmon hatchery programs on natural-  
27 origin Chinook salmon and steelhead hatchery programs on natural-origin steelhead.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Snake River Spring/Summer Chinook Salmon ESU	Low adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial
Snake River Steelhead DPS	Low adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial

#### 28 **4.3.6.1 Spring/Summer Chinook Salmon Programs**

##### 29 **Alternative 1**

30 Under Alternative 1, hatchery programs would release the number of smolts and eggs as proposed in the  
31 HGMPs.

1 Hatchery programs contribute differently to abundance based on the program's intent for the returning  
2 adults. Fish from segregated hatchery programs (Table 2-2, Table 2-3, Table 2-4, Table 2-6) are not  
3 intended to contribute to natural population abundance. However, under this alternative, hatchery  
4 programs that are designed to have hatchery-origin fish spawn naturally would increase abundance and  
5 provide a benefit to population viability via that parameter; for those programs, moreover, the spatial  
6 structure would potentially be maintained or enhanced through the use of various acclimation sites that  
7 encourage hatchery-origin adults to return to rivers into which they are released. The program also  
8 minimizes the impacts of broodstock mining through the use of abundance based scales for broodstock  
9 selection.

10 Regardless of whether hatchery fish are intended to spawn naturally or not, hatchery programs would  
11 increase risks to natural-origin fish diversity from hatchery-influenced selection. Further, if hatchery and  
12 natural-origin fish interbreed in the natural environment, productivity could be negatively affected  
13 compared to production by two natural origin parents<sup>8</sup>.

14 Because the genetic risks are present for all programs, while the benefit of supplementing abundance is  
15 present for integrated programs, the overall effect of hatchery programs on natural-origin fish from the  
16 Snake River Spring/Summer Chinook Salmon ESU would be low-adverse.

## 17 **Alternative 2**

18 Under Alternative 2, the operation of all spring/summer Chinook salmon hatchery programs would be the  
19 same as under Alternative 1, with no change in population viability of the Snake River Spring/Summer  
20 Chinook Salmon ESU and the Snake River Steelhead DPS compared to Alternative 1. Therefore, this  
21 alternative would also have the same effect as Alternative 1 for both species.

## 22 **Alternative 3**

23 Although the 50 percent reduction in hatchery production under Alternative 3 would reduce the small  
24 benefits to abundance relative to Alternative 1, it would decrease risks to genetics (diversity) and  
25 productivity from hatchery-influenced selection. For those programs that are part of the Snake River  
26 Spring/Summer Chinook Salmon ESU (JCAPE, Pahsimeroi Summer Chinook Salmon, Upper Salmon  
27 Spring Chinook Salmon), benefits to abundance may outweigh the genetic risks to ensure spatial  
28 structure throughout the ESU, so a reduction in production for those programs may be a slight negative  
29 effect relative to Alternative 1. Overall, however, effects on population viability under Alternative 3 would  
30 be negligible-beneficial for the Snake River Spring/Summer Chinook Salmon ESU relative to Alternative 1  
31 because genetic risks are reduced for all programs by the reduction in production.

## 32 **Alternative 4**

33 With immediate termination of all hatchery programs under Alternative 4, hatchery-origin fish that have  
34 already been released would continue to be removed if encountered through another program, but the  
35 removal would not take place at the levels described in the HGMPs because adult removal would not  
36 occur as described in the HGMP. Returning adults from previous releases for the integrated program

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<sup>8</sup> This statement is regarding all hatchery programs, combined. However, it does not apply equally to all programs in the proposed action. For example, JCAPE uses 100% natural-origin broodstock and only releases 150,000 yearlings into Johnson Creek, thus the impacts to diversity and productivity are likely to be minimal from this program. Moreover, there is some benefit to species population viability from the integrated JCAPE program, which is designed to supplement the natural population. Even though JCAPE uses exclusively native natural-origin broodstock, we still expect there to be some fitness effects from the program to the natural-origin population from naturally spawning hatchery program returnees.



1 would contribute to abundance for a short period, but the integrated programs will not contribute to  
2 abundance thereafter. Hatchery productions will not contribute to genetic diversity risks for all programs.  
3 Relative to Alternative 1, effects on population viability effects would be low-beneficial for the Snake River  
4 Spring/Summer Chinook Salmon ESU because genetic risks are eliminated for all programs by the  
5 termination of all hatchery programs<sup>9</sup>.

#### 6 **4.3.6.2 Steelhead Programs**

##### 7 **Alternative 1**

8 Under Alternative 1, steelhead hatchery programs would release the same number of smolts as under  
9 current conditions, and the same number of eggs would be placed into streamside incubators.

10 Effects on population viability would be low-adverse for the Snake River Steelhead DPS. The East Fork  
11 Salmon River Natural A-run Steelhead program, would continue to produce fish that are intended to  
12 spawn naturally and may increase abundance and productivity. The increases in abundance from the  
13 East Fork Salmon River Natural A-run Steelhead program may provide a benefit to population viability in  
14 this respect. Regarding effects to species diversity, best available data suggests that the East Fork  
15 Salmon River Natural program is likely to obtain a PNI exceeding 0.5 (NMFS 2017c). The program also  
16 reduces the likelihood of broodstock mining through the use of abundance based scales for broodstock  
17 selection. The East Fork Salmon River Natural A-run Steelhead program may contribute to spatial  
18 structure for the overall MPG by ensuring the existence of the East Fork Salmon population. Most other  
19 programs in the study area currently have infrastructure in place to remove hatchery steelhead from the  
20 natural environment, and NMFS expects no more than five percent of hatchery-origin steelhead straying  
21 to a non-target population, measured as a 5-year rolling average beginning in 2018. In addition, some  
22 hatchery fish may be removed through fisheries in the area, and NMFS (2019a) concluded that current  
23 and proposed fisheries are not likely to reduce the likelihood of survival and recovery of the DPS. Limited  
24 straying and hatchery-fish removal will minimize genetic risks from programs that are not intended for  
25 natural population supplementation because fish that have some hatchery influence may be less fit than  
26 natural-origin fish and could reduce the productivity of natural-origin fish if they spawn in the wild. In  
27 addition, the spatial structure would be maintained or enhanced through the use of various acclimation  
28 sites that encourage hatchery-origin adults to return to rivers into which they are released. Over time,  
29 other viability factors, such as genetic diversity and spatial structure, would increase as natural-origin  
30 returns increase.

##### 31 **Alternative 2**

32 Under Alternative 2, the operation of all steelhead hatchery programs would be the same as under  
33 Alternative 1, with no change in population viability of the Snake River Spring/Summer Chinook Salmon  
34 ESU and the Snake River Steelhead DPS compared to Alternative 1. Therefore, this alternative would  
35 also have the same effect as Alternative 1.

##### 36 **Alternative 3**

37 The 50 percent reduction under Alternative 3, would reduce abundance relative to Alternative 1. The  
38 effects on population viability of the Snake River Steelhead DPS would be negligible-beneficial compared  
39 to Alternative 1. Although Alternative 3 would reduce abundance slightly, it would decrease the genetic  
40 risks to natural-origin population diversity, despite inclusion of the East Fork Salmon River Natural A-run  
41 Program as part of the Snake River Steelhead DPS. Overall, the reduced production under this  
42 alternative would reduce the risks to productivity and spatial structure of natural-origin fish compared to  
43 Alternative 1. However, East Fork Salmon River Natural A-run Program reducing its production by 50

1 percent is likely to increase risks to genetic diversity, productivity, spatial structure, and abundance of  
 2 the East Fork Salmon population compared to Alternative 1 because the benefits from this program  
 3 described in Alternative 1 would be decreased.

#### 4 **Alternative 4**

5 With termination of all hatchery programs under Alternative 4, hatchery-origin fish that have already been  
 6 released would continue to be removed if encountered through another program, but removal would not  
 7 take place at the levels described in the HGMPs. Under this alternative, the East Fork Salmon River  
 8 Natural A-run Steelhead program would no longer contribute to abundance, productivity, spatial structure,  
 9 and genetic diversity. However, the risks from all other programs would be reduced and possibly  
 10 eliminated, which would benefit diversity and productivity of the listed species. Therefore, relative to  
 11 Alternative 1, the population viability effects would be low-beneficial for the Snake River Steelhead DPS.

### 12 **4.3.7 Nutrient Cycling**

13 The overall effects of nutrient contribution in the form of marine-derived nutrients on natural-origin salmon  
 14 and steelhead would be low-beneficial for Alternative 1 and Alternative 2 (Table 4-8). Relative to  
 15 Alternative 1, effects would be negligible-adverse under Alternative 3 and low-adverse under Alternative  
 16 4.

17 Table 4-8. Summary of nutrient cycling effects on salmon and steelhead.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Spring/summer Chinook salmon	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Steelhead	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Fall Chinook salmon	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Sockeye salmon	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Coho salmon	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse

#### 18 **4.3.7.1 Alternative 1**

19 Under Alternative 1, NMFS expects undetectable change in nutrient cycling effects on other salmon and  
 20 steelhead species while all hatchery programs operate as described in the HGMPs<sup>9</sup>. All the salmon and  
 21 steelhead species discussed here benefit equally from additional nutrients provided by hatchery fish  
 22 carcasses. Because some hatchery-origin fish from all programs die in the Snake River Basin, the  
 23 programs would provide a low-beneficial effect on salmon and steelhead species that exist in the basin  
 24 through nutrient cycling. The number of hatchery-origin fish that would be allowed to spawn naturally is  
 25 undetermined because the number would depend on how many natural-origin fish are on the spawning  
 26 ground. However, a portion of hatchery-origin adult returns would be expected to spawn naturally and

<sup>9</sup> Although JCAPE would increase broodstock collection numbers and juvenile releases from 100,000 to 150,000 under a future operational scenario, this increase is not likely to amount to a detectable change in localized effect because an increase in 50,000 smolts is a small fraction compared to all of the other smolts released in the Salmon River Subbasin (Table 2-1).

1 thereby contribute nutrients to the environment. Further, nutrients would be contributed in Johnson Creek  
 2 through the placement of spawned adults as part of the nutrient enhancement actions. Under this  
 3 alternative, the estimated number of hatchery-origin Chinook salmon adult returns from all programs  
 4 would range from 168 from the SFCEP program to 15,900 from the Little Salmon/Rapid River Spring  
 5 Chinook program (NMFS 2017a, 2017b). The estimated number of hatchery-origin steelhead adult  
 6 returns would range from four for the SSI programs to 7,360 for the Pahsimeroi A-run Summer Steelhead  
 7 program (NMFS 2017c). The estimated number of coho salmon adult returns from that portion of the  
 8 Clearwater River program included under the Proposed Action would be 6,500 (NMFS 2017d). Over time,  
 9 returning hatchery fish that spawn naturally would contribute to marine-derived nutrients in the Snake  
 10 River Basin, increasing the overall benefit to the system.

#### 11 4.3.7.2 Alternative 2

12 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
 13 with no change in nutrient cycling effects on other salmon and steelhead species. Therefore, this  
 14 alternative would also have the same low-beneficial effect as Alternative 1.

#### 15 4.3.7.3 Alternative 3

16 With the 50 percent reduction in hatchery programs under Alternative 3, the total quantity of smolts  
 17 released in the Snake River Basin would be 3.5 million spring/summer Chinook salmon, 2.5 million  
 18 steelhead, and 250,000 coho salmon. Program hatchery-origin adults would still return to the Snake River  
 19 Basin, a portion of those adults would spawn in the natural environment and carcasses would  
 20 subsequently contribute to nutrient cycling. Therefore, with regard to nutrient cycling, this alternative  
 21 would have no more than a negligible-adverse effect compared to Alternative 1.

#### 22 4.3.7.4 Alternative 4

23 Cessation of all program smolt releases (currently 7 million spring/summer Chinook salmon, 5 million  
 24 steelhead, and 500,000 coho salmon) under Alternative 4 would reduce the quantity of adult returns.  
 25 Hatchery-origin smolts released prior to program termination would return to the Snake River Basin for  
 26 4 or 5 years, and would continue to contribute to nutrient cycling at reduced levels. Over time,  
 27 hatchery-origin adults from the project programs would no longer return to the Snake River Basin, and  
 28 marine-based nutrient contribution attributed to program adults would cease. Therefore, with regard to  
 29 nutrient cycling, this alternative would have a low-adverse effect compared to Alternative 1.

### 31 4.3.8 Facility Operations

32 The overall effects of facility operations on natural-origin salmon and steelhead would range from  
 33 low-adverse to negligible-adverse under Alternative 1 and Alternative 2. Relative to Alternative 1, effects  
 34 would be negligible-beneficial under Alternative 3 and Alternative 4 (Table 4-9).

35 Table 4-9. Summary of facility effects on salmon and steelhead.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Spring/summer Chinook salmon	Low-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial

Steelhead	Low-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Fall Chinook salmon	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Sockeye salmon	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Coho salmon	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial

#### 4.3.8.1 Alternative 1

Under Alternative 1, the hatchery programs would be operated the same as under current conditions<sup>10</sup>, so no change in effects on salmon and steelhead species from facility operations would be expected, including adult collection, surface water diversion, effluent discharge, and routine instream maintenance activities.

The intake facilities are likely to affect all the salmon and steelhead species discussed here in the same manner. Facility operations would have negligible-adverse effects on salmon and steelhead in the study area because the program facilities minimize any impediment of fish movement as discussed in Section 3.3.5.8, Facility Operations. Further, facility funders and/or operators have or would review all facilities for compliance with the current anadromous salmonid passage facility design criteria and guidelines (NMFS 2011a, or most current). These criteria ensure that the mesh or slot size in the screening material, and the approach velocity of water toward the intake screening, meet standards that reduce the risk of both entrainment and impingement of listed juvenile salmonids. Upon review of hatchery facilities, funders and operators would prioritize repairs and upgrades into the future. Moreover, facilities are routinely observed for any signs that screens are not effectively excluding fish from intakes.

Surface water withdrawals would not change from current operations; therefore, effects of water withdrawals and associated habitat degradation in diversion reaches assessed in Section 3.3.5.8, Facility Operations, are assumed into the future under Alternative 1. Note that because future climate change trends (Section 5.1, Past, Present, and Reasonably Foreseeable Actions) indicate that juveniles may outmigrate earlier, the risk of dewatering juvenile rearing habitat when flows are at their lowest would be reduced even further (Dittmer 2013).

With the exception of the JCAPE program, all program broodstock collection would be identical to current operations. For the JCAPE program, NMFS assumes that the increase in broodstock needed to achieve a smolt release of 150,000 (up from 100,000 currently) would not change the average number of nontarget salmon and steelhead mortalities in the future.

Thus, weirs, ladders, and traps operated for spring/summer Chinook salmon, steelhead, and coho salmon broodstock collection would continue to operate as they currently do, and would, therefore, have the potential to capture both natural- and hatchery-origin salmon and steelhead. Broodstock collection timing, including angling for steelhead, would be the same under Alternative 1 as under current operations, and broodstock collection for each facility would have the greatest effect on species that overlap in run timing (i.e., spring/summer Chinook salmon run and some of the fall Chinook salmon and steelhead runs). Effects would range from migratory delay to mortality through stress from handling; expected handling mortality rates are provided for each species in Section 3.3.5.8, Facility Operations.

The spatial distribution of juvenile and adult salmon and steelhead is not expected to be affected by weir operation because weirs are designed to allow juvenile passage, and natural-origin adults are passed

<sup>10</sup> Although JCAPE would increase broodstock collection numbers and juvenile releases from 100,000 to 150,000 under a future operational scenario, no increase in surface water use is proposed.

1 upstream when not required for broodstock. At fixed volitional traps/ladders (i.e., not channel spanning)  
2 the intent is to collect broodstock via olfactory attraction to natal waters. These volitional traps are located  
3 along riverbanks and use attraction flow. Therefore, any fish, including nontarget fish, may enter the  
4 trapping facility. If nontarget fish enter the trap, staff would remove them from holding ponds within  
5 24 hours of capture, which could delay to short delays in upstream migration. Though fish that are not  
6 collected are passed upstream to spawn naturally, there is a slight risk that weir delay or avoidance could  
7 impact spawning distribution, though the impact would be small.

8 Broodstock collection currently has a low-adverse effect on Chinook salmon and steelhead, and a  
9 negligible-adverse effect on other salmon and steelhead. Similar effects would occur under Alternative 1.  
10 Sockeye and fall Chinook salmon are separated spatially and/or temporally from spring/summer Chinook  
11 salmon broodstock collection periods, and have not been encountered previously at program weirs  
12 (NMFS 2017a, 2017b). Similarly, Snake River sockeye salmon are and would continue to be rarely  
13 encountered during any steelhead broodstock collection facility (NMFS 2017c), and would not be  
14 encountered during coho salmon collection at Kooskia National Fish Hatchery (NMFS 2017d).

15 Operations would continue to include BMPs that limit the type, timing, and magnitude of allowable  
16 instream activities. In general, the measures would limit effects to short-term, sublethal effects such as  
17 fish displacement, and/or startling of fish, and would not result in any deviation beyond normal fish  
18 behavioral responses to environmental disturbances. Therefore, routine maintenance activities would not  
19 result in harm, harassment, or mortality of salmon and steelhead.

#### 20 **4.3.8.2 Alternative 2**

21 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
22 with no change in effects described above on salmon and steelhead species. Therefore, this alternative  
23 would also have the same, low-adverse effect as Alternative 1 for Chinook salmon and steelhead, and a  
24 negligible-adverse effect on other species.

#### 25 **4.3.8.3 Alternative 3**

26 The 50-percent reduction in hatchery production under Alternative 3 would reduce the required  
27 broodstock for collection and perhaps the duration of the collection period; however, many facilities would  
28 continue to operate for other nonproject programs. Similarly, although lower program production would  
29 likely require less surface water for operations, nonproject operations would likely continue to divert  
30 surface water from adjacent waterbodies at most facilities. Therefore, this alternative would have no more  
31 than a negligible-beneficial effect compared to Alternative 1.

#### 32 **4.3.8.4 Alternative 4**

33 With the complete termination of hatchery programs under Alternative 4, existing facilities would no longer  
34 be used to support these programs. As described in Section 4.1, Water Quantity, with the exception of the  
35 Hells Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite,  
36 Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery,  
37 and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries, facilities would continue to operate for  
38 other nonproject programs that would have similar operational effects on natural salmon and steelhead  
39 species. This minimizes any beneficial effect compared to Alternative 1 because, although the frequency  
40 at which salmon and steelhead species are encountered would be less and the likelihood of migratory  
41 delay, mortality, or changes to spawning distribution would be reduced, ongoing facility operations would  
42 continue at many sites, resulting in a negligible-beneficial effect on salmon and steelhead compared to  
43 Alternative 1.

### 4.3.9 Research, Monitoring, and Evaluation

The overall effects of RM&E on natural-origin salmon and steelhead would be negligible-adverse under Alternative 1, Alternative 2, and Alternative 3. Relative to Alternative 1, effects would range from negligible-adverse to negligible-beneficial under Alternative 4, depending on the species considered (Table 4-10).

Table 4-10. Summary of RM&E effects on salmon and steelhead.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Spring/summer Chinook salmon	Negligible-adverse	Same as Alternative 1	Same as Alternative 1	Negligible-beneficial
Steelhead	Negligible-adverse	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Fall Chinook salmon	Negligible-adverse	Same as Alternative 1	Same as Alternative 1	Negligible-beneficial
Sockeye salmon	Negligible-adverse	Same as Alternative 1	Same as Alternative 1	Negligible-beneficial
Coho salmon	Negligible-adverse	Same as Alternative 1	Same as Alternative 1	Negligible-beneficial

#### 4.3.9.1 Alternative 1

Under Alternative 1, RM&E activities that are currently part of the hatchery programs would be operated the same as under current conditions, so no change in effects on salmon and steelhead would be expected. Spawning ground surveys would continue to be performed during spring Chinook salmon spawning seasons (Table 2-9; Table 2-10; Table 2-11), screw traps in the South Fork Clearwater River, Johnson Creek, Sesech River, Rapid River, Panther Creek, and Yankee Fork Salmon River would continue to be operated the same as under current conditions (Table 2-9; Table 2-10; Table 2-11), and juvenile fish sampling and tagging would be performed the same way as under current conditions (Section 3.3.5.9, Research, Monitoring, and Evaluation). The effects of juvenile fish sampling would be minimized because smolt traps would have a negligible effect on migration, angling would be performed following sport fishing equipment rules for selective fisheries, and methods of electrofishing would be performed to minimize fish injury (Snow et al. 2014). All salmon and steelhead species are likely to be affected in a similar fashion, with the effects ranging from migratory delay to stress from handling (Section 3.3.5.9, Research, Monitoring, and Evaluation), leading to a negligible-adverse effect. Because smolt traps are checked daily, nontarget fish can be removed on a daily basis, though handling may cause stress or injury to the fish. Considering the low number of sockeye salmon, and limited occurrence in the study area, the potential for effects on sockeye salmon would be less than for other salmon and steelhead, though still negligible-adverse.

#### 4.3.9.2 Alternative 2

Under Alternative 2, the operation of hatchery programs would be the same as under Alternative 1, with no change in effects on salmon and steelhead species. Therefore, this alternative would have the same negligible-adverse effect as Alternative 1.

### 4.3.9.3 Alternative 3

Under Alternative 3, the RM&E for both hatchery programs would be the same as under Alternative 1; however, lower production would reduce the level of effort required for RM&E, and therefore, reduce the presence of researchers in the natural environment. Regardless, Alternative 3 would result in no detectable change in effects on salmon and steelhead species compared to Alternative 1. Therefore, this alternative would also have the same negligible-adverse effect as Alternative 1.

### 4.3.9.4 Alternative 4

With the termination of hatchery programs under Alternative 4, surveys would presumably continue until all adults from terminated programs have returned. Future surveys and smolt trapping would be reduced in duration and frequency until all program-related RM&E is discontinued. RM&E used to inform non-project hatchery and natural monitoring objectives would continue to operate. Effects on salmon and steelhead related to such RM&E would continue as under Alternative 1. Thus, in those waterbodies, RM&E effects would be negligible-beneficial for salmon and steelhead in the study area because of reduced effort associated with program-related RM&E.

As described in Section 4.1, Water Quantity, facilities that may cease operations because they are dedicated to programs considered in this EA include Hells Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries. If these facilities cease to operate entirely, hatchery-related RM&E effects on salmon and steelhead would be reduced, and could be terminated in the South Fork Salmon River and East Fork Salmon River subbasins because hatchery programs in these subbasins would be terminated.

## 4.3.10 Critical Habitat and Essential Fish Habitat

The overall effects of the alternatives on critical habitat and EFH for Chinook and coho salmon in the study area would be low-adverse for Alternative 1 and Alternative 2 (Table 4-11). Relative to Alternative 1, effects would be negligible-beneficial under Alternative 3, and low-beneficial under Alternative 4.

Table 4-11. Summary of program effects on critical habitat and EFH for Chinook and coho salmon.

Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Spring/summer Chinook salmon	Low-adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial
Fall Chinook salmon	Low-adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial
Coho salmon	Low-adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial

### 4.3.10.1 Alternative 1

Under Alternative 1, with the exception of the JCAPE program, all hatchery programs would be operated the same as under current conditions, with no change in water use or juvenile release strategies. Although JCAPE would increase broodstock collection numbers and juvenile releases from 100,000 to 150,000 under a future operational scenario, no increase in surface water use is proposed. Therefore, NMFS expects no change in effects on critical habitat or Chinook or coho salmon EFH compared to current conditions.

NMFS has determined that Alternative 1 would result in a low-adverse effect on critical habitat and EFH for Chinook and coho salmon, specifically through production of hatchery fish that may provide forage, through operation and existence of associated structures (e.g., weirs, water withdrawal structures, effluent, and maintenance and construction) and genetic and ecological interactions of the hatchery-reared fish with natural fish in the natural environment, affecting complex channels and floodplain habitat, thermal refugia, and spawning habitat.

#### 4.3.10.2 Alternative 2

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no change in effects on critical habitat and EFH for Chinook or coho salmon. Therefore, this alternative would have the same low-adverse effect as Alternative 1.

#### 4.3.10.3 Alternative 3

The 50 percent reduction in hatchery production under Alternative 3 would reduce the required broodstock for collection; however, many facilities would continue to operate for other nonproject programs. Similarly, although lower program production would likely require less surface water for operations, nonprogram operations would likely continue to divert surface water from adjacent waterbodies at most facilities. Therefore, this alternative would have no more than a negligible-beneficial effect on critical habitat and EFH compared to Alternative 1.

#### 4.3.10.4 Alternative 4

With the complete termination of hatchery programs under Alternative 4, existing facilities would no longer be used to support these programs. As described in Section 4.1, Water Quantity, with the exception of the Hells Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries, facilities would continue to operate for other programs that would have similar operational effects on critical habitat and EFH for Chinook and coho salmon. This would minimize any beneficial effect compared to Alternative 1 because, although the frequency at which salmon and steelhead species are encountered would be less and the likelihood of migratory delay or mortality would be reduced, ongoing facility operations would continue at many sites, resulting in a low-beneficial effect on critical habitat and EFH compared to Alternative 1.

### 4.4 Fisheries

The overall effects of the hatchery programs on salmon and steelhead fisheries in the study area would range from negligible-beneficial to low-beneficial for Alternative 1 and Alternative 2 (Table 4-12). Relative to Alternative 1, effects would range from undetectable to negligible-adverse under Alternative 3 and range from negligible-adverse to low-adverse under Alternative 4.

Table 4-12. Summary of effects on fisheries for Spring/Summer Chinook salmon, coho salmon, and steelhead.

Fishery	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Spring/summer Chinook salmon	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Steelhead	Low-beneficial	Same as Alternative 1	Negligible-adverse	Medium-adverse



Fishery	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Coho salmon	Negligible-beneficial	Same as Alternative 1	Undetectable	Negligible-adverse

#### 4.4.1 Alternative 1

Returning hatchery-origin adult salmon and steelhead provide both recreational and tribal fisheries opportunities. Selective fisheries, in which only hatchery-origin spring/summer Chinook salmon and steelhead with clipped adipose fins may be kept, are intended to increase fishing opportunities while also protecting natural-origin fish. All coho salmon may be kept because fish do not receive adipose fin clips. Because the hatchery programs play an important role in the implementation and management of fisheries, the programs would provide a low-beneficial effect on recreational and tribal fisheries for spring/summer Chinook salmon and steelhead. The Clearwater River Coho program included under the proposed action contributes to about half of the overall coho salmon production in the Clearwater River subbasin. Because coho salmon fisheries are so new and harvest is low relative to Chinook salmon and steelhead, the effect of the Clearwater River Coho Program on coho salmon fisheries would be negligible-beneficial.

#### 4.4.2 Alternative 2

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no change in effects on fisheries. Therefore, this alternative would also have the same low-beneficial effects on spring/summer Chinook salmon and steelhead fisheries, and the same negligible-beneficial effect on coho salmon fisheries as Alternative 1.

#### 4.4.3 Alternative 3

The 50 percent reduction in hatchery production under Alternative 3 would reduce abundance relative to Alternative 1, and would therefore reduce both recreational and tribal fishing opportunities. Although fishing opportunities from the programs included in this EA would be reduced, other programs would continue operating and provide fishing opportunities. Further reductions in harvest to protect natural-origin fish would therefore not be needed, with the possible exception of coho salmon. A small number of coho salmon are currently harvested; therefore the effect of a 50 percent reduction in the portion of the Clearwater Coho Salmon program included in this EA would be undetectable. The effect of reductions in production of spring/summer Chinook salmon and steelhead would be negligible-adverse, because the fisheries are larger and have a larger geographic scope than the coho salmon fishery.

#### 4.4.4 Alternative 4

Termination of hatchery programs would decrease recreational and tribal fishing opportunities in the study area because the number of hatchery-origin fish would decrease substantially. Recreational fisheries would likely be further reduced to protect natural-origin spring/summer Chinook salmon and steelhead. Production resulting from operation of the Hells Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries would cease entirely; therefore, recreational fishing for spring/summer Chinook salmon in at least the Snake River, Little Salmon River, and South Fork Salmon River would probably cease entirely. Elimination of Chinook salmon rearing at Sawtooth Fish Hatchery would probably also result in cessation

of Chinook salmon fishing in the upper Salmon River. Tribal fisheries may continue because those fisheries are non-selective, though the opportunities would also be reduced because hatchery-origin adults would no longer contribute to the fisheries. Although other facilities would continue to operate for other programs, recreational fishing for steelhead would be reduced throughout the study area, especially in the South Fork Clearwater River, Little Salmon River, and the Yankee Fork Salmon River. Fishing for coho salmon in the Clearwater River Subbasin would also be reduced until natural production and production from the component of the Coho Salmon program not included in this EA combine to replace lost production. Therefore, with regard to fisheries, this alternative would have low-adverse effects for spring/summer Chinook salmon, medium-adverse effects for steelhead, and negligible-adverse effects for coho salmon compared to Alternative 1.

#### 4.5 Other Fish Species

The overall effect on fish species other than salmon and steelhead would range from negligible-adverse to low-beneficial under Alternative 1 and Alternative 2 (Table 4-13). Relative to Alternative 1, effects would be generally negligible-beneficial or negligible-adverse under Alternative 3, and would range from low-beneficial to low-adverse under Alternative 4.

Table 4-13. Summary of effects on fish species other than salmon or steelhead.

Metric	Alternative 1 – No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 - Program Termination
Competition and Predation	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Low-beneficial
Prey Enhancement	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Diseases	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Nutrient Cycling	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Facility Operations	Negligible-adverse	Same as Alternative 1	Negligible-beneficial	Negligible-beneficial
Research Monitoring and Evaluation	Negligible-adverse	Same as Alternative 1	Same as Alternative 1	Negligible-beneficial

##### 4.5.1 Alternative 1

Because production of salmon and steelhead smolts and/or eggs and the estimated number of adult recruits under Alternative 1 would not change compared to current conditions, undetectable change in effects on other fish species is expected<sup>11</sup>. Competition and predation effects would continue to be negligible-adverse for many fish species in the study area, especially for salmonid species such as bull trout and westslope cutthroat trout that may compete for spawning grounds or experience redd superimposition with hatchery-origin salmonids. Effects would likely be less than those on natural-origin salmon and steelhead (Section 4.3.3, Competition and Predation) because of differences in spawn timing,

<sup>11</sup> Although JCAPE would increase broodstock collection numbers and juvenile releases from 100,000 to 150,000 under a future operational scenario, this increase is not likely to amount to a detectable change in localized effect because an increase in 50,000 smolts is a small fraction compared to all of the other smolts released in the Salmon River Subbasin (Table 2-1).

1 location, and habitat preference. Predation by hatchery fish on native species, such as leopard dace and  
2 Umatilla dace, would also remain similar to current levels.

3 Prey enhancement related to hatchery production of salmon and steelhead would continue to have a  
4 low-beneficial effect on fish species in the study area that could prey on smolts and/or eggs from the  
5 hatchery programs, though no fish species relies solely on salmon smolts and/or eggs. Available juvenile  
6 salmon and steelhead prey would remain similar to current numbers, and predation on hatchery-origin  
7 juvenile salmon and steelhead by bull trout would remain similar to current levels. Predation on hatchery-  
8 origin salmon and steelhead by Pacific lamprey and river lamprey would also likely be similar to current  
9 conditions, as would the potential for hatchery salmon and steelhead to buffer Pacific lamprey from  
10 predation by marine mammals.

11 Diseases that are endemic to many fish species would continue to have a negligible-adverse effect on  
12 fish species in the study area, though such incidences are not likely to occur with current ongoing  
13 hatchery programs. Diseases that pose particular risk to hatchery-origin salmonids (i.e., BKD and IHN)  
14 only affect salmonid species. Although other salmonid species such as bull trout, resident rainbow trout,  
15 and westslope cutthroat trout have the potential to occur near existing hatchery facilities and release  
16 sites, several factors such as the relatively low volume of discharge, smolt release strategies, and fish  
17 health protocols would continue to reduce the likelihood of disease and pathogen transmission between  
18 hatchery fish and other salmonids.

19 Most fish species in the study area would continue to indirectly benefit from nutrient cycling of carcasses  
20 from hatchery-origin fish through having enhanced nutrients available to their prey sources. Naturally  
21 spawning fish of hatchery origin or nutrient enhancement derived from fish spawned in hatcheries would  
22 continue to contribute to increased nutrient cycling in the natural environment.

23 Facility operations would continue to have negligible-adverse effects because the program facilities  
24 minimize any impediment to fish movement as discussed in Section 3.5, Other Fish Species. Upstream  
25 migration may be delayed slightly for fish trapped at collection facilities. Handling levels and potential for  
26 injury would remain unchanged from current conditions. Weirs may act as barriers that cause population  
27 subdivision if other fish species (e.g., small, non-game fish) are consistently not passed upstream. Effects  
28 of water diversions, intakes, effluent discharge, and maintenance activities would also remain unchanged.

29 RM&E activities would continue to have a negligible-adverse effect on fish species other than salmon and  
30 steelhead. Individuals would continue to be incidentally collected in traps and during surveys, and may  
31 suffer increased stress and minimal mortality. However, guidelines in place to reduce impacts on salmon  
32 and steelhead (NMFS 2008b) would continue to reduce effects on other species. In addition, BMPs in  
33 place for salmon, steelhead, and bull trout (USFWS 2017a, 2017b) would also continue to reduce these  
34 effects.

#### 35 **4.5.2 Alternative 2**

36 Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1,  
37 with no change in effects on other fish species. Therefore, this alternative would have the same effects as  
38 Alternative 1 (Table 4-13).

#### 39 **4.5.3 Alternative 3**

40 Under Alternative 3, the 50 percent decrease in hatchery-origin salmon and steelhead smolt production  
41 would reduce competition and predation effects relative to Alternative 1. The change would be  
42 negligible-beneficial under Alternative 3 (Table 4-13) because fewer juvenile salmon and steelhead would

1 compete with juvenile bull trout and other fish species for prey, and fewer salmon and steelhead smolts  
2 would compete with bull trout and other salmonids for habitat space.

3 The decrease in hatchery-origin salmon and steelhead smolt production would also reduce the availability  
4 of an important prey resource of bull trout, and to a lesser extent of Pacific lamprey and river lamprey.  
5 Other food sources would remain available (e.g., insects, other fish species, frogs, snake, mice,  
6 waterfowl), because hatchery production and activities would not affect these resources. Therefore, the  
7 effect on prey enhancement on fish species other than salmon and steelhead would be  
8 negligible-adverse relative to Alternative 1.

9 Current rearing and release strategies and fish health protocols reduce the likelihood of disease and  
10 pathogen transmission between hatchery fish and other salmonids; however, reduction of hatchery  
11 production may further reduce the risk of disease amplification to salmonids other than salmon and  
12 steelhead. Reduction of hatchery production under Alternative 3 may, therefore, result in a  
13 negligible-beneficial effect on other fish species relative to Alternative 1.

14 The 50 percent reduction in hatchery production under Alternative 3 would result in fewer hatchery-origin  
15 salmon and steelhead contributing to nutrient cycling in the study area. The corresponding reduced intake  
16 of nutrients through prey sources would contribute to a negligible-adverse effect on other fish species  
17 relative to Alternative 1.

18 The 50 percent reduction in hatchery production under Alternative 3 would reduce the effort required to  
19 collect hatchery broodstock, which would in turn reduce the number of nontarget fish collected; however,  
20 all facilities would continue to operate for the 15 programs and for other programs described by NMFS  
21 (2014a) and USFWS (2017a, 2017b). Because all facilities would continue to operate similar to current  
22 conditions, though likely for shorter durations to meet reduced broodstock collection goals, the effect on  
23 fish species relative to Alternative 1 would be negligible-beneficial.

24 RM&E activities would also continue even with the 50 percent reduction in production under Alternative 3.  
25 Because all RM&E activities would continue similar to current conditions, the effect on fish species would  
26 be similar to Alternative 1.

#### 27 **4.5.4 Alternative 4**

28 With the complete termination of hatchery programs under Alternative 4, facilities would not be used for  
29 these programs, but many would continue to operate for other salmon or steelhead programs described  
30 by NMFS (2014a) and USFWS (2017a, 2017b). As described in Section 4.1, Water Quantity, facilities that  
31 may cease operations because they are dedicated to programs considered in this EA Hells Canyon Dam  
32 Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite, Johnson Creek  
33 Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery, and both Lower  
34 Pahsimeroi and Upper Pahsimeroi fish hatcheries. Relative effects of program termination, such as  
35 reduced incidental handling and migration delays at the traps, may, therefore, be most substantial in the  
36 Hells Canyon Reach of the Snake River, the Little Salmon River, and the South Fork Salmon River. No  
37 fish are collected at or released from Niagara Springs Fish Hatchery; therefore, any effects would be  
38 limited to elimination of effluent, which may result in negligible but beneficial effects on resident fish  
39 relative to Alternative 1.

40 Termination of the hatchery programs would reduce competition with and predation on other fish species,  
41 leading to an overall low-beneficial effect on other fish species relative to Alternative 1. Relative  
42 reductions would be negligible for many of the 15 programs, but would be more substantial in the Little  
43 Salmon River and in the South Fork Salmon River, where all hatchery production would cease.

1 The programs would not release smolts or eggs, eliminating one source of prey for some fish (especially  
2 bull trout) in the study area. This could result in a low-adverse effect on other fish species relative to  
3 Alternative 1. Relative effects would again be negligible for many of the 15 programs, but would be more  
4 substantial in the Little Salmon River and in the South Fork Salmon River, where all hatchery production  
5 would cease. Bull trout would be affected because they occur throughout the South Fork Salmon River  
6 watershed (USFWS 2017a) and a large population of bull trout inhabits the Rapid River (USFWS 2005).

7 Termination of hatchery programs would eliminate the risk of hatchery-related disease amplification to  
8 salmonids other than salmon and steelhead. Complete cessation of hatchery production in some  
9 watersheds would contribute to a negligible-beneficial effect on other fish species relative to Alternative 1.

10 Over time, as salmon and steelhead from terminated programs no longer return to the study area,  
11 hatchery-origin adults from the 15 programs would no longer contribute to nutrient cycling. Some  
12 hatchery-origin fish would successfully spawn in the natural environment, and therefore, add to future  
13 generations that would contribute to nutrient cycling. However, complete cessation of hatchery production  
14 in some watersheds, and corresponding reduced intake of nutrients through prey sources, would  
15 contribute to a low-adverse effect on other fish species relative to Alternative 1.

16 As previously noted, facilities would not be used for the 15 programs considered in this EA, but many  
17 would continue to operate for other salmon or steelhead programs. These facilities may operate with  
18 reduced intake and effluent discharge because of reduced production. Some facilities may cease  
19 operations because they are dedicated to programs considered in this EA. Reduced operation of some  
20 hatcheries and complete cessation of operations at other facilities would contribute to a  
21 negligible-beneficial effect on other fish species relative to Alternative 1.

22 RM&E would eventually terminate for these programs, but for the most part would likely continue to  
23 operate for other programs. The exception may be for programs in the Little Salmon River and the South  
24 Fork Salmon River, where all hatchery production facility operations would cease. Complete cessation of  
25 hatchery-related RM&E activities in these watersheds would contribute to a negligible-beneficial effect on  
26 other fish species relative to Alternative 1.

## 27 4.6 Wildlife

28 The overall effect on wildlife would range from negligible-adverse to low-beneficial under Alternative 1  
29 and Alternative 2 (Table 4-14). Relative to Alternative 1, effects would be generally negligible-beneficial or  
30 negligible-adverse under Alternative 3, and range from negligible-beneficial to low-adverse under  
31 Alternative 4.

32 Table 4-14. Summary of effects on wildlife.

Metric	Alternative 1 – No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 - Program Termination
Prey Enhancement	Low-beneficial	Same as Alternative 1	Negligible-adverse	Negligible-adverse
Diseases	Negligible-adverse	Same as Alternative 1	Undetectable	Negligible-beneficial
Nutrient Cycling	Low-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse
Facility Operations	Negligible-adverse	Same as Alternative 1	Negligible- beneficial	Negligible-beneficial

#### 4.6.1 Alternative 1

Because production of salmon and steelhead smolts and/or eggs, and the estimated number of adult recruits under Alternative 1 would not change compared to current conditions, undetectable change in effects on wildlife would be expected.

Prey enhancement related to hatchery production of salmon and steelhead would continue to have a low-beneficial effect on wildlife species in the study area that could prey on smolts and/or eggs from the hatchery programs, though no wildlife species relies solely on hatchery-origin salmon smolts, eggs, or adults.

Toxic contaminants and/or diseases that are found in hatchery-origin salmon and steelhead are unlikely to affect other wildlife species and would continue to have a negligible-adverse effect on wildlife species in the study area.

Most wildlife species in the study area (e.g., stream invertebrates, mammals, and birds) would continue to benefit from nutrient cycling of carcasses from hatchery-origin fish, either directly or indirectly. Naturally spawning fish of hatchery origin, or carcass placement of fish spawned in hatcheries, would continue to contribute to increased nutrient cycling in the natural environment.

Program facilities would continue to have negligible-adverse effects because only passive methods (i.e., netting and fencing around facilities) are used to deter predators such as great blue herons, and river otters at facilities. Program facilities minimize impediments to wildlife movement, and staff members who can remove nontarget species would be present at weirs and traps during trapping operations and routine maintenance activities. Handling levels and potential for injury would remain unchanged from current conditions.

Operation and maintenance at the hatchery, weir, and release location may cause temporary effects on wildlife, including various species of birds (BPA EGIS 2018), disturbance due to human presence and temporary elevated noise. The noise-sensitive wildlife are anticipated to temporarily relocate to adjacent habitats, which are abundant near the sites. Effects on bald eagles and osprey from elevated noise is also likely to be negligible because the number of sightings have been small (a few bald eagles around Kooskia National Fish Hatchery, and ospreys around Hagerman and Kooskia National fish hatcheries, and Sawtooth Fish Hatchery), and those sightings are in areas where human activity and disturbance is common (e.g., near highways). Effects from temporarily elevated noises are anticipated to remain unchanged from current conditions because no change in operation is proposed that would change the level of noise.

Operation and maintenance at Hagerman National, Niagara Springs, and Magic Valley fish hatcheries may have effects on Bliss Rapids snails and Snake River physa snails. Effects are likely to be negligible because management practices are in place to prevent impacts, and all effluent water is monitored regularly for compliance with NPDES standards.

#### 4.6.2 Alternative 2

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no change in effects on wildlife. Therefore, this alternative would have the same effects as Alternative 1 (Table 4-14).

#### 4.6.3 Alternative 3

Under Alternative 3, the geographic extent of effects of the hatchery programs on wildlife would be the same compared to Alternative 1.

1 The 50 percent decrease in hatchery-origin salmon and steelhead smolt production would reduce the  
2 availability of prey compared to Alternative 1, though no wildlife species relies solely on salmon smolts,  
3 eggs, or adults. Therefore, the effect on prey enhancement on wildlife would be negligible-adverse  
4 relative to Alternative 1.

5 Current rearing and release strategies and fish health protocols reduce the likelihood of toxic  
6 contaminants and pathogen transmission between hatchery fish and wildlife; however, reduction of  
7 hatchery programs may further reduce the risk of disease transmission to wildlife. Reduction of hatchery  
8 production under Alternative 3 may, therefore, result in an undetectable but beneficial effect on wildlife  
9 relative to Alternative 1.

10 The 50 percent reduction in hatchery production under Alternative 3 would result in fewer hatchery-origin  
11 and natural-origin salmon and steelhead contributing to nutrient cycling in the study area. The  
12 corresponding reduced intake of nutrients through prey sources would contribute to a negligible-adverse  
13 effect on wildlife species relative to Alternative 1.

14 The 50 percent reduction in hatchery production under Alternative 3 would further minimize the number of  
15 nontarget wildlife species collected, and potentially, the duration of the collection period; however, all  
16 facilities would continue to operate for the 15 programs and for other programs described by  
17 NMFS (2014a) and USFWS (2017a, 2017b). Because all facilities would continue to operate similar to  
18 current conditions, though likely for shorter durations to meet reduced broodstock collection goals, the  
19 effect of facility operations on wildlife relative to Alternative 1 would be negligible-beneficial.

#### 20 **4.6.4 Alternative 4**

21 With the complete termination of hatchery programs under Alternative 4, facilities would not be used for  
22 these programs, but many would continue to operate for other salmon or steelhead programs described  
23 by NMFS (2014a) and USFWS (2017a, 2017b). As described in Section 4.1, Water Quantity, facilities that  
24 may cease operations because they are dedicated to programs considered in this EA include Hells  
25 Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite,  
26 Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery,  
27 and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries. Relative effects of program  
28 termination may, therefore, be most substantial in the Hells Canyon Reach of the Snake River, the Little  
29 Salmon River, and the South Fork Salmon River. Relative effects may be less in the East Fork Salmon  
30 River because the East Fork Salmon River Natural A-run Steelhead Program is integrated and uses only  
31 natural-origin broodstock. No fish are collected at or released from Niagara Springs Fish Hatchery;  
32 therefore, any effects would likely be undetectable.

33 Termination of the hatchery programs would further reduce the availability of prey, which could increase  
34 competition among wildlife species with shared food preferences (e.g., among piscivorous avian species).  
35 This may shift predation pressure to other wildlife species to compensate for the loss in salmon, leading  
36 to a negligible-adverse effect on prey enhancement relative to Alternative 1. Relative reductions would be  
37 negligible for many of the 15 programs, but would be more substantial in the Little Salmon River and in  
38 the South Fork Salmon River, where all hatchery production would cease.

39 The programs would not release smolts or eggs, eliminating one source of prey for some wildlife species  
40 in the study area. This could result in a negligible-adverse effect to wildlife species relative to  
41 Alternative 1. Relative effects would again be undetectable for many of the 15 programs, but would be  
42 more substantial in the Little Salmon River and in the South Fork Salmon River, where all hatchery  
43 production would cease.

1 Termination of hatchery programs would eliminate the risk of the limited types of hatchery-related toxins  
 2 and pathogens that can be transferred to wildlife species. Complete cessation of hatchery production in  
 3 some watersheds would contribute to a negligible-beneficial effect on wildlife relative to Alternative 1.

4 Over time, as salmon and steelhead from terminated programs no longer return to the study area,  
 5 hatchery-origin adults from the 15 programs would no longer contribute to nutrient cycling. Some  
 6 hatchery-origin fish would successfully spawn in the natural environment, and therefore, contribute to  
 7 future generations that would contribute to nutrient cycling. However, complete cessation of hatchery  
 8 production in some watersheds, and corresponding reduced intake of nutrients through prey sources  
 9 would contribute to a low-adverse effect on wildlife species relative to Alternative 1.

10 As previously noted, facilities would not be used for the 15 programs considered in this EA, but many  
 11 would continue to operate for other salmon or steelhead programs. Some facilities may cease operations  
 12 because they are dedicated to programs considered in this EA. Complete cessation of these facility  
 13 operations, including the elimination of some weirs and traps that may impede wildlife movement, would  
 14 contribute to a negligible-beneficial effect on wildlife species relative to Alternative 1.

## 15 **4.7 Socioeconomics**

16 The overall effect on socioeconomics would be medium-beneficial under Alternative 1 and Alternative 2  
 17 (Table 4-15). Relative to Alternative 1, effects would be negligible-adverse under Alternative 3 and low-  
 18 adverse for Alternative 4.

19 Table 4-15. Summary of effects on socioeconomics.

Resource	Alternative 1 – No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 - Program Termination
Socioeconomics	Medium-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse

### 20 **4.7.1 Alternative 1**

21 Under Alternative 1, the hatchery programs would be operated in a similar manner as under current  
 22 conditions<sup>12</sup>, so recreational expenditures, employment opportunities, and the local procurement of goods  
 23 and services related to hatchery operations would remain the same. Thus, the contribution of over  
 24 \$13.4 million in recreational expenditures, \$9.4 million in personal income, and 358 jobs to the regional  
 25 economy would lead to a medium-beneficial effect of these hatchery programs, as seen under current  
 26 conditions.

### 27 **4.7.2 Alternative 2**

28 Under Alternative 2, the operation of hatchery programs would be the same as under Alternative 1, with  
 29 no change in recreational expenditures, employment opportunities, or the local procurement of goods and  
 30 services related to hatchery operations. Therefore, this alternative would also have the same  
 31 medium-beneficial effect as Alternative 1.

<sup>12</sup> Although JCAPE would increase broodstock collection numbers and juvenile releases from 100,000 to 150,000 under a future operational scenario, this increase is not likely to amount to a meaningful change in the operation of the program to affect socioeconomics.



### 4.7.3 Alternative 3

Under Alternative 3, all hatchery production would be reduced by 50 percent compared to Alternative 1. Some hatchery facilities would be operated at a reduced level. Decreasing hatchery production by 50 percent under Alternative 3 could result in a reduction of harvest and associated recreational expenditures within the study area, though recreational fisheries targeting fish from other productions would continue. However, many facilities would continue to operate at essentially the same levels because of other programs. Although possible, it is unclear whether staff reduction and impacts on personal income would occur. Therefore, this alternative would have no more than a negligible-adverse effect compared to Alternative 1.

### 4.7.4 Alternative 4

Under Alternative 4, operations of the hatchery programs described in the Proposed Action would no longer themselves contribute to recreational expenditures, jobs, or operational expenses for the regional economy, though recreational fisheries targeting fish from other productions would continue. As described in Section 4.1, Water Quantity, facilities that may cease operations and reduce the number of hatchery-related jobs available because they are dedicated specifically to the programs considered in the Proposed Action include the Hells Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries. However, other facilities such as Clearwater, Dworshak National and Kooskia National fish hatcheries would continue to operate at essentially current levels because of other programs. This alternative would have a low-adverse effect compared to Alternative 1 because of reduced expenditures, jobs, and operational expenses.

## 4.8 Cultural Resources

The overall effect on cultural resources would be low-beneficial under Alternative 1 and Alternative 2 (Table 4-16). Relative to Alternative 1, effects would be negligible-adverse under Alternative 3 and medium-adverse under Alternative 4.

Table 4-16. Summary of effects on cultural resources.

Resource	Alternative 1 – No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 - Program Termination
Cultural Resources	Medium-beneficial	Same as Alternative 1	Low-adverse	Medium--adverse

### 4.8.1 Alternative 1

Under Alternative 1, the hatchery programs would be operated the same as under current conditions, and the health and survival of fish would be the same relative to current conditions. Because the conservation programs currently in place would be expected to increase Chinook salmon, coho salmon, and steelhead abundance and productivity, the tribes would continue to receive the surplus of adult fish collected. In addition, the tribes would continue to harvest hatchery-origin fish, as well as benefit from increase in natural production through the non-selective fisheries. The tribes would benefit through the long-term potential for salmon and steelhead to continue existing and for their populations to increase in size in the Clearwater River Subbasin, the Hells Reach of the Snake River, and the Salmon River Subbasin, resulting in a medium-beneficial effect.

### 4.8.2 Alternative 2

Under Alternative 2, the operation of both hatchery programs would be the same as under Alternative 1, with no change in the survival and abundance of salmon and steelhead. Therefore, this alternative would have the same low-beneficial effect as Alternative 1.

### 4.8.3 Alternative 3

Under Alternative 3, the effects of the hatchery programs on cultural resources would be similar to those as under Alternative 1, but harvests would be reduced in the study area (see Section 4.7, Socioeconomics). Reduced returns of hatchery fish could reduce harvest opportunities and surplus fish received by tribes, though some opportunities would remain through the reduced hatchery production relative to Alternative 1. Therefore, this alternative would have a low-adverse effect compared to Alternative 1.

### 4.8.4 Alternative 4

Under Alternative 4, the hatchery programs would no longer contribute to tribal fisheries nor the tribes receiving surplus fish or to the abundance and productivity of salmon and steelhead in the Clearwater River Subbasin, the Hells Reach of the Snake River, and the Salmon River Subbasin, although natural-origin salmon and steelhead would continue to return to these areas. While the tribes may be able to continue their non-selective fisheries, a large portion of their harvest would be reduced because the hatchery productions would no longer contribute to returning fishable adults. As described in Section 4.1, Water Quantity, facilities that may cease operations because they are dedicated specifically to the programs considered in the Proposed Action include the Hells Canyon Dam Trap, Rapid River Fish Hatchery, Oxbow Fish Hatchery, South Fork Salmon Satellite, Johnson Creek Weir, McCall Fish Hatchery, East Fork Salmon Satellite, Niagara Springs Fish Hatchery, and both Lower Pahsimeroi and Upper Pahsimeroi fish hatcheries. All hatchery production in the Little Salmon River and South Fork Salmon River watersheds would cease, so the hatchery programs would no longer contribute to tribes receiving surplus fish or to tribal fisheries at any usual and accustomed places. However, other facilities such as Clearwater, Dworshak National and Kooskia National fish hatcheries would likely continue to operate at essentially current levels because of other hatchery programs being implemented. Because the tribes would lose a large portion of harvest and surplus fish, this alternative would have a medium-adverse effect compared to Alternative 1.

## 4.9 Environmental Justice

The overall effect on environmental justice would be medium-beneficial under Alternative 1 and Alternative 2 (Table 4-17). Relative to Alternative 1, effects would be negligible-adverse under Alternative 3 and low-adverse under Alternative 4.

Table 4-17. Summary of effects on environmental justice.

Resource	Alternative 1 – No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 - Program Termination
Environmental Justice	Medium-beneficial	Same as Alternative 1	Negligible-adverse	Low-adverse

### 4.9.1 Alternative 1

Under Alternative 1, the hatchery programs would continue to distribute fish collected for adult management to public entities (e.g., local food banks) and to local tribes for ceremonial and subsistence purposes. The environmental justice communities of concern (Section 3.9, Environmental Justice) would benefit from the distribution of fish to local food banks to the extent that these communities rely on these food banks. The programs would also continue to provide economic opportunities (Section 4.7, Socioeconomics) and fish of cultural importance to the tribes (Section 4.8, Cultural Resources). Therefore, this alternative would have a medium-beneficial effect.

### 4.9.2 Alternative 2

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no change in socioeconomics, tribal cultural resources, or fish distribution affecting the environmental justice communities of concern. Therefore, this alternative would have the same medium-beneficial effect as under Alternative 1.

### 4.9.3 Alternative 3

Decreasing hatchery production under Alternative 3 could result in a reduction of charitable harvest donations. However, tribes, food banks, and nontribal organizations would continue to benefit from receiving surplus fish for consumption and ceremonial purposes. It is likely that the 50 percent reduction in production of these programs under Alternative 3 would result in a negligible-adverse effect compared to Alternative 1.

### 4.9.4 Alternative 4

As previously described, termination of the hatchery programs under Alternative 4 would have a socioeconomic effect of negligible-adverse (Section 4.7, Socioeconomics) and a cultural resources effect of medium-adverse (Section 4.8, Cultural Resources). Fishing for subsistence purposes may be affected in the Little Salmon River and South Fork Salmon River, as all hatchery production would cease to exist with the termination of the programs. However, the Clearwater, Dworshak National and Kooskia National fish hatchery facilities are used for programs beyond those analyzed in this EA. These hatchery facilities would continue to operate and provide charitable harvest donations to tribes, food bank, and nontribal organizations for consumption, ceremonial, or subsistence purposes. Therefore, this alternative would have a low-adverse effect compared to Alternative 1.

## 4.10 Human Health and Safety

The overall effect on human health and safety would be low-adverse under Alternative 1, Alternative 2, and Alternative 3 (Table 4-18). Relative to Alternative 1, effects would be low-beneficial under Alternative 4.

Table 4-18. Summary of effects on human health and safety.

Resource	Alternative 1 – No Action	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 - Program Termination
Human Health and Safety	Low-adverse	Same as Alternative 1	Same as Alternative 1	Low-beneficial

#### 4.10.1 Alternative 1

Under Alternative 1, the hatchery programs would be operated the same as under current conditions, so the level of risks to hatchery facility and weir operators remain the same. However, the continued use and discharge of chemicals from the hatchery programs may lead to increased accumulation of these chemicals in the environment. Although consumption of hatchery fish may increase health risks for consumers, hatchery fish are likely to continue to serve as a source of food for humans. Risks associated with handling infected fish would continue to be a potential human health risk among hatchery personnel. However, continued best safety practices and use of personal protective equipment will minimize this potential risk. Therefore, this alternative is likely to have a low-adverse effect.

#### 4.10.2 Alternative 2

Under Alternative 2, the operation of the hatchery programs would be the same as under Alternative 1, resulting in no change in effects on human health and safety. Therefore, this alternative would have the same low-adverse effect as Alternative 1.

#### 4.10.3 Alternative 3

Under Alternative 3, the effects of the hatchery programs would be the same as under Alternative 1. It is unlikely that the 50 percent reduction in production of these programs would result in much, if any, change to human health and safety. Decreasing hatchery production under Alternative 3 could result in a reduction of harvest in the study area, which could result in reduced consumption. However, hatchery facilities would continue to operate for other programs, having the same level of hatchery operation effects on hatchery facility and weir operators and human health. Risks associated with handling infected fish would continue to be a potential human health risk among hatchery personnel. However, continued best safety practices and use of personal protective equipment will minimize this potential risk. Therefore, this alternative would likely have the same effect as Alternative 1.

#### 4.10.4 Alternative 4

Under Alternative 4, the termination of hatchery programs would reduce any potentially harmful effects associated with hatchery operations on hatchery facility and weir operators and human health and safety after the last adults return. The number of fish available for consumption could decrease, and the effects of hatchery operations on health risks (e.g., effects of chemicals in effluent) would also be reduced because only the facilities used for other programs would continue to operate. Risks associated with handling infected fish would continue to be a potential human health risk among remaining hatchery personnel. However, continued best safety practices and use of personal protective equipment will minimize this potential risk. Therefore, this alternative would have a low-beneficial effect relative to Alternative 1.

## 5 Cumulative Impacts

Cumulative impacts were assessed by combining the effects of each alternative with the effects of other past, present, and reasonably foreseeable future actions that are impacting or will impact the same resources potentially affected by each alternative. Actions are included only if they are tangible and specific, and if effects overlap temporally and geographically with the Proposed Action.

The temporal boundary for this cumulative impacts analysis extends from the construction of the Hells Canyon Complex of dams (opened from 1959 through 1967) and the four lower Snake River dams (opened from 1962 through 1975) until the ESA section 4(d) determinations are no longer in effect. The ESA section 4(d) determinations have no expiration date, but would be subject to agency verification if the hatchery programs are changed such that HGMPs need to be revised. The programs would be periodically reviewed by NMFS and the operators to assess success in meeting purpose and needs as described in Section 1.1, Purpose and Need.

The geographic area for the cumulative impacts analysis related to physical resources, such as water quantity and water quality, is limited to stream reaches directly affected by water withdrawals and other disturbances, such as effluent discharge. The geographic area for the cumulative impacts analysis related to fish and wildlife includes locations where hatchery fish are captured, reared, and released, areas that are accessible from release sites such as migration corridors and rearing habitats downstream to Ice Harbor Dam, and areas where they may be monitored or stray downstream to Ice Harbor Dam (i.e., Ice Harbor Dam is the downstream limit because effects of the Proposed Action would not be detectable or measurable downstream of Ice Harbor Dam). The cumulative impacts for socioeconomic, cultural resources, environmental justice, and human health and safety were assessed over a large geographic area to account for the contribution of project effects on communities and regions.

Finally, the cumulative impacts associated with the proposed action were largely addressed by previous environmental impact statements, including NMFS (2014a, 2017e), as well as the recent environmental assessment for the Idaho steelhead fisheries (NMFS 2019b). These reviews looked primarily at the impacts to the human environment from a broader set of fishery or hatchery operations, as described in section 5.2 below. Consequently, this assessment focuses on looking at any changes to those impacts or new information within the project area, particularly (in many cases) the extent to which it modifies the information presented in the Mitchell Act FEIS.

### 5.1 Past, Present, and Reasonably Foreseeable Future Actions

The effects of past and present actions on resources potentially affected by the Proposed Action are recognized as current conditions described in Chapter 3, Affected Environment. Historical development of the Columbia and Snake River basins for electrical power, flood control, navigation, and agricultural needs has influenced the existing condition of the resources in the study area. This development, along with other factors such as historic harvest, has led to the implementation of management and recovery actions, including numerous hatchery programs.

The expected impacts of the alternatives on all of the resources are described in Chapter 4. Reasonably foreseeable future actions with the potential to have cumulative impacts with the alternatives described in this EA include operation of hatchery programs as described in the Mitchell Act FEIS (NMFS 2014a). Climate change may also contribute to effects of the alternatives and is considered a reasonably

1 foreseeable future condition<sup>13</sup> for purposes of this cumulative impacts analysis. The project area is in the  
2 Pacific Northwest where the effects of climate change are affecting hydrologic patterns and water  
3 temperatures. Climate change impacts to the regional hydrologic cycle and ESA-listed salmon and  
4 steelhead populations, as well as their habitats, have been evaluated extensively across the Columbia  
5 River Basin (Mote 2003; ISAB 2007; Karl et al. 2009, Dittmer 2013; USBR 2016). Evidence of climate  
6 change includes increased average annual air temperatures and water temperatures over the past  
7 century. Recently researchers examined data from 1990 through 2009 and found that temperatures in the  
8 Snake River Basin are increasing, while average streamflows are slightly decreasing (NMFS 2017a,  
9 2017b, 2017c, 2017d).

10 According to the Independent Scientific Advisory Board (ISAB), average annual temperatures in the  
11 Northwest have increased by approximately 1.8°F since 1900, or about 50 percent more than the global  
12 average evaluated over the same period of time (ISAB 2007). Earlier climate investigations have  
13 estimated that the mean annual temperature in the Columbia River Basin has increased by approximately  
14 3.6°F since the late 1800s (USBR 2016). The latest climate models project a warming of 0.2°F to 1.1°F  
15 per decade over the next century (NMFS 2017a, 2017b, 2017c, 2017d).

16 In general, warming air temperature in winter and spring will lead to more precipitation falling as rain,  
17 rather than snow. At elevations within the Snake River Basin along the transient snow zone, even a small  
18 amount of warming in winter may cause substantial shifts in the accumulated rainfall versus snowfall  
19 during the cool months (October through March); alternatively, locations at higher elevations typically  
20 experience winter temperatures far below freezing, so a slight increase in temperature may not initiate a  
21 shift from snow to rain (ISAB 2007). In watersheds that historically develop a seasonal snow pack,  
22 warmer temperatures will likely lead to a reduced snowpack depth and cause a temporal shift in snowmelt  
23 runoff.

24 Reduction in snowpack depth is attributed to both warming surface air temperatures and reduction of  
25 precipitation falling as snow (ISAB 2007). Annual snowpack measurements taken throughout the region  
26 on April 1 are considered a prime indicator of natural water storage available as runoff during the warmer  
27 months of the year. These measurements indicate a substantial snowpack reduction across the  
28 Northwest (Karl et al. 2009). For example, the average snowpack decline in the Cascade Mountains was  
29 about 25 percent over the past 40 to 70 years, and is projected to decline by as much as 40 percent by  
30 the 2040s (Karl et al. 2009). In general, declines in the Northwest snowpack are projected to continue  
31 over this century, varying with latitude, elevation, and proximity to the coastal regions.

32 Flow timing has shifted over the past 50 years, with the peak of spring runoff shifting from a few days  
33 earlier in some places to as much as 25 to 30 days earlier in others (Karl et al. 2009). Throughout the  
34 region, shifts in the timing and magnitude of snowmelt runoff increase the winter flood risk and summer  
35 drought risk in more sensitive watersheds. Increased winter temperatures and reduced snowpack would  
36 likely increase winter runoff, causing peak flows along rivers and large streams to increase and causing  
37 diminished runoff earlier in the season (ISAB 2007). Reductions in warm season (April through  
38 September) runoff in the region are expected to reach approximately 10 percent by mid-century (Karl et  
39 al. 2009). Impacts caused by shifts in flow timing range from lower streamflows to drought in the warmer  
40 months (June through September; ISAB 2007).

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<sup>13</sup> Climate change is not an “action” but a condition which affects both the proposed action and the past, present, and future actions discussed here.

## 5.2 Cumulative Impacts Analysis

This subsection will discuss the cumulative impacts for all of the resources analyzed in Chapter 4. Of note, analysis from Mitchell Act FEIS is used, where relevant, because the effects of the 15 programs included in this EA were included in the Mitchell Act FEIS (NMFS 2014a) as part of a broader analysis of 49 hatchery programs in the Snake River Basin and 117 hatchery programs in the Columbia River Basin. That is, the cumulative impacts of these programs with other hatchery programs in the Columbia River Basin was analyzed in the Mitchell Act FEIS. As previously noted, the relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs (Table 2-1), but hatchery salmon and steelhead production for programs under the Proposed Action in this EA (Alternative 2) fall generally in the range between various Mitchell Act FEIS alternatives.

### 5.2.1 Water Quantity

Successful operation of hatcheries depends on reliable supplies of surface, spring, or groundwater that is subsequently discharged to receiving waterbodies (Section 3.1, Water Quantity). Changes in production levels have the potential to affect water quantity by changing the amount of water withdrawn from a surface water body or groundwater for hatchery operations.

As previously noted, the relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs assessed in this EA (Table 2-1). NMFS (2014a, Section 4.6.4, Water Quantity) determined that use of surface, spring, and groundwater would remain similar to current conditions for Mitchell Act FEIS Alternative 1, but that reduced production could result in decreased water use for Mitchell Act FEIS Alternative 2 through Alternative 6. Production (and presumably water use) would be lowest under Mitchell Act FEIS Alternative 2, and the smallest decrease in water use would be under Mitchell Act FEIS Alternative 6. For those programs that have production numbers slightly higher than what was analyzed in the Mitchell Act FEIS alternatives, water use in those programs are not likely to be different than that analyzed in the Mitchell Act FEIS because the differences in smolt production levels are small.

Continued use of surface and groundwater through other development, such as irrigation, in the area has been contributing to reduced water availability. Of note, the aquifer water levels of ESPA could drop 15 feet over the next 20 years from decreased recharge incidental to irrigation conveyance and application, increased use of groundwater for irrigation and domestic use, and conversion of land from irrigated agriculture to urban and suburban uses (SPF Water Engineering, 2010).

Climate change may affect water quantity by changing seasonal river flows. Some areas may experience reduced flows, increased flows, or a change in flow timing. Shifts in the timing and magnitude of snowmelt runoff may increase winter flows and increase the risk of summer drought. Increased winter temperatures and reduced snowpack could cause peak flows to increase and result in diminished runoff earlier in the season than under current conditions (ISAB 2007).

Under Alternatives 1 and 2 of this EA, the 15 hatchery programs are expected to have measurable, but low-adverse effects on water quantity. The effects on water quantity are due primarily to a small number of facilities diverting a relatively large proportion of streamflow over relatively short diversion reaches for a limited time during low-flow periods (Section 4.1, Water Quantity). Hatchery needs are likely to remain somewhat stable; therefore any reductions in water quantity because of climate change would have greater effects than considered in Section 4.1, Water Quantity. Effects under Alternative 3 would be similar to those under Alternative 1 and Alternative 2 because even with reduced production, all facilities would continue operating. Under Alternative 4, a number of the hatcheries would cease operations entirely; therefore, cumulative impacts would be similar to the effects considered in Section 4.1, Water Quantity.

## 5.2.2 Water Quality

Successful operation of hatcheries requires water of consistently high quality. As previously noted, the relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs assessed in this EA (Table 2-1). NMFS (2014a, Section 4.6.3, Water Quality) determined that reductions in hatchery production for Mitchell Act FEIS Alternative 2 through Alternative 6 could improve water quality compared to current conditions (Mitchell Act FEIS Alternative 1) through reductions in temperature, ammonia, nutrients (e.g., nitrogen), BOD, pH, sediment levels, antibiotics, fungicides, disinfectants, steroid hormones, and pathogens. Improvements to water quality would be greatest under Mitchell Act FEIS Alternative 2, and minimal under Mitchell Act FEIS Alternative 6. For those programs that have production numbers slightly higher than what was analyzed in the Mitchell Act FEIS alternatives, water quality effects from those programs are not likely to be different than the closest alternative analyzed in the Mitchell Act FEIS because the differences in smolt production levels are small. Therefore, the programs analyzed in this EA are likely to continue improving water quality, along with the other hatchery programs in the Columbia River Basin.

Continued discharge of effluent through other development, such as agriculture, is likely to continue affecting water quality. For those watersheds with established TMDLs, the water quality is expected to improve because the effluent should meet federal standards designed to improve water quality.

Given the close correspondence between surface air temperature and surface water temperature for many streams, climate change may affect water quality by increasing water temperatures and changing seasonal river flows. As a result, water quality may be degraded further relative to current conditions.

Under Alternatives 1 and 2 of this EA, the 15 hatchery programs are expected to have measurable, but low-adverse effects on water quality. The effects on water quality are due primarily to minor changes in water temperature, BOD, pH, and various nutrients and pollutants in receiving waters (Section 4.1, Water Quantity). Hatchery needs are likely to remain somewhat stable; therefore any reductions in water quality because of climate change would have greater effects than considered in Section 4.2, Water Quality. Although decreased fish production in the 15 hatchery programs would slightly decrease the pollutant load discharged to receiving waters, all facilities would remain in operation. Pollutants would still be discharged to receiving waters; therefore, effects under Alternative 3 would be similar to those under Alternative 1 and Alternative 2. Under Alternative 4, a number of the hatcheries would cease operations entirely; therefore, cumulative impacts would be similar to the effects considered in Section 4.2, Water Quality.

## 5.2.3 Salmon and Steelhead

Cumulative impacts of hatchery production in the Snake River Basin may benefit salmon and steelhead but can also pose risks (Section 4.3, Salmon and Steelhead). As previously noted, the relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs assessed in this EA (Table 2-1).

In the Mitchell Act FEIS, NMFS (2014a) concluded that hatchery programs would:

- Affect natural-origin abundance where hatchery broodstock is collected from the natural-origin population
- Pose genetic risks to salmon and steelhead, affecting productivity and diversity at numerous hatcheries across the basin
- Employ weirs, which can impede spatial structure
- Pose risks of effects related to operation of hatchery facilities, such as blocked passage, reduced habitat, entrainment, and diminished water quality



- 1 • Pose competition and predation risks to natural-origin salmon and steelhead
- 2 • Pose a risk of masking hatchery effects without adequate marking and sampling
- 3 • Pose a risk of disease transfer to natural-origin populations

4 NMFS (2014a, Section 4.2.3, Effects on Salmon and Steelhead) determined that natural-origin  
5 abundance of Snake River salmon and steelhead would generally increase under all programs covered  
6 by the Mitchell Act FEIS alternatives relative to current conditions (Alternative 1), with the largest increase  
7 occurring under Alternative 5 and the smallest under Alternative 2 and Alternative 3. Genetic diversity  
8 would also likely increase under all alternatives relative to current conditions, with changes being similar  
9 under all alternatives compared to current conditions. New weirs would be installed only under Alternative  
10 3 through Alternative 5. Hatchery facility risks would be decreased equally from current conditions under  
11 Alternative 2 through Alternative 6. Competition with and predation on natural-origin juvenile salmonids  
12 would be reduced with decreases in hatchery production; therefore, Alternative 2 would result in the  
13 largest decreases in competition and predation, and Alternative 6 would result in the smallest decreases.  
14 Risks of masking and disease transfer may also be reduced through reduced hatchery production,  
15 therefore relative effects would be similar to those for competition and predation. For those programs in  
16 this EA that have production numbers slightly higher than what was analyzed in the Mitchell Act FEIS  
17 alternatives, the effects on salmon and steelhead from those programs are not likely to be different than  
18 the closest alternative analyzed in the Mitchell Act FEIS because the differences in smolt production  
19 levels are small.

20 Climate change, particularly changes in streamflow and water temperatures, would likely impact natural-  
21 origin salmon and steelhead life stages in various ways. The effects of climate change on salmon and  
22 steelhead would vary among species and among life history stages (ISAB 2007). Effects of climate  
23 change may affect every species and life history in every type of salmon and steelhead in the cumulative  
24 impacts study area (Glick et al. 2007; Mantua et al. 2009) (Table 5-1).

25 It is likely that, as climate change affects ocean conditions, abundances of salmon and steelhead would  
26 change accordingly, resulting in changes in abundance of adults returning to freshwater to spawn.  
27 Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of  
28 salmon and steelhead, whereas cooler ocean periods have coincided with relatively high abundances  
29 (Karl et al. 2009).

30 If climate change reduces the water volumes and increases the water temperatures in the analysis area,  
31 it will likely reduce the suitable habitat for spring and summer Chinook salmon, coho salmon, and  
32 steelhead rearing, potentially decreasing their abundance. Effects would likely be less on fish that migrate  
33 as subyearlings, and therefore do not rear during summer low flows. Lower summer flows and increased  
34 water temperatures may lead to an increase in the abundance of nonnative warm water species that can  
35 compete and prey on listed salmon and steelhead. Warmer water temperatures may also increase the  
36 incidence of disease outbreaks and pathogen virulence in both the natural population and  
37 hatchery-produced juveniles. On the other hand, warmer water temperature may also shift pathogen  
38 composition through increase in pathogens that thrive in warmer waters and decrease in pathogens that  
39 are susceptible to warmer waters.

40 Although climate change may well have impacts on the abundance and/or distribution of salmonids and  
41 steelhead populations that are considered under all of the alternatives in this EA, the proposed hatchery  
42 management described in the HGMPs and the associated monitoring provides the ability to evaluate  
43 hatchery program impacts as abundances change, making appropriate adjustments feasible and timely.

1 Table 5-1. Examples of potential impacts of climate change by salmon and steelhead life stage  
2 under all alternatives.

Life Stage	Effects
Egg	Increased water temperatures and decreased flows during spawning migrations would increase pre-spawn mortality and reduce egg deposition for some species. Increased maintenance metabolism would lead to smaller fry. Faster embryonic development would lead to earlier hatching. Increased mortality for some species because of more frequent winter flood flows. Lower flows would decrease access to or availability of spawning areas.
Spring and Summer Rearing	Faster yolk utilization may lead to early emergence. Smaller fry are expected to have lower survival rates. Growth rates would be slower if food is limited or temperature increases exceed optimal levels. Growth could increase where food is available, and temperatures are below stressful levels. Lower flows would decrease habitat capacity. Sea level rise would eliminate or diminish the tidal wetland capacity.
Overwinter Rearing	Smaller size at start of winter is expected to result in lower winter survival. Mortality would increase because of more frequent floods. Warmer winter temperatures would lead to higher metabolic demands, which may decrease winter survival if food is limited, or increase winter survival if growth and size are enhanced. Warmer winters may increase predator activity/hunger, which can decrease winter survival.
Out-Migration	Earlier snowmelt and warmer temperatures may cause earlier emigration to the estuary and ocean either during favorable upwelling conditions, or prior to the period of favorable ocean upwelling. Increased predation risk in the mainstem because of higher consumption rates by predators at the elevated spring water temperatures.
Adult	Increased water temperatures may delay fish migration. Increased water temperature may also lead to more frequent disease outbreaks as fish become stressed and crowded.

3  
4 Although climate change will likely have impacts on the abundance and/or distribution of salmon and  
5 steelhead, proposed hatchery management actions and associated monitoring provide the ability to make  
6 appropriate adjustments. However, the cumulative impacts on salmon and steelhead under Alternative 1  
7 and Alternative 2 of this EA may extend beyond that considered in Section 4.3, Salmon and Steelhead,  
8 because of the potential changes in natural production and distribution, and changes in hatchery  
9 production and operations that may be required. Moreover, climate change may exacerbate some effects  
10 from hatchery programs under Alternatives 1 and 2, as described in the eight bullet points above from the  
11 Mitchell Act FEIS. For example, as previously noted, warmer water temperatures caused by climate  
12 change may increase the incidence of disease outbreaks and pathogen virulence in both the natural  
13 population and hatchery-produced juveniles. Thus we would expect these effects from Alternatives 1 and  
14 2 to compound with those described in the Mitchell Act FEIS.

15 Under Alternative 3 and Alternative 4 of this EA, the number of smolts released would decrease; effects  
16 on salmon and steelhead would range from low-beneficial to low-adverse (Section 4.3, Salmon and  
17 Steelhead). However, similar to Alternative 1 and Alternative 2 of this EA, the cumulative impacts on  
18 salmon and steelhead when including climate change may extend beyond that considered in Section 4.3,  
19 Salmon and Steelhead, though to a lesser degree because of the reduction or termination of these  
20 programs analyzed in this EA.

## 21 5.2.4 Fisheries

22 As described above, climate change will likely have impacts on the abundance and/or distribution of  
23 salmon and steelhead. These impacts would likely result in changes to management actions such as  
24 regulation of fisheries to make appropriate adjustments. The cumulative impacts on fisheries under all  
25 alternatives of this EA may extend beyond that considered in Section 4.4, Fisheries, because of the

1 potential changes in natural production and distribution, and changes in hatchery production and  
2 operations.

### 3 **5.2.5 Other Fish Species**

4 As previously noted, the relationship to specific Mitchell Act FEIS alternatives varies among the 15  
5 programs assessed in this EA (Table 2-1). NMFS (2014a, Section 4.2.4, Effects on Other Fish Species  
6 that Have a Relationship to Salmon and Steelhead) determined that reductions in hatchery production for  
7 Mitchell Act FEIS Alternative 2 through Alternative 6 would likely result in a reduction in competition and  
8 predation for bull trout, Pacific lamprey, and other fish species, but also a reduction in prey resources  
9 compared to current conditions (Alternative 1). The greatest effect would be under Alternative 2, with  
10 Alternative 6 having the least change compared to current conditions. For those programs that have  
11 production numbers slightly higher than what was analyzed in the Mitchell Act FEIS alternatives, effects  
12 on other fish species from those programs are not likely to be different than the closest alternative  
13 analyzed in the Mitchell Act FEIS because the differences in smolt production levels are small.

14 Other fish species would likely respond to climate change in similar ways as salmon and steelhead.  
15 Habitat may be affected by future changes in water temperatures, precipitation, and extreme events,  
16 which can occur from climate changes. Fish that are more adaptable to warmer aquatic conditions could  
17 ultimately replace cold-water fish as the dominant species as previously noted, the mitigated benefits  
18 from habitat restoration actions are difficult to predict.

19 Under Alternative 1 and Alternative 2 of this EA, hatchery juveniles and adults would continue to either be  
20 prey for other fish species, prey upon other fish species, and/or compete for resources with the other fish  
21 species. However, because climate change may favor introduced warmer water fish over native cold-  
22 water fish, the cumulative impacts on other fish species may be greater than those described in Section  
23 4.5, Other Fish Species.

24 Under Alternative 3 and Alternative 4 of this EA, the number of smolts released would decrease; effects  
25 on other fish species would range from negligible-beneficial to negligible-adverse (Section 4.5, Other Fish  
26 Species). However, because climate change may favor introduced warmer water fish over native cold-  
27 water fish, the cumulative impacts on other fish species may be greater than those described in Section  
28 4.5, Other Fish Species.

### 29 **5.2.6 Wildlife**

30 As previously noted, the relationship to specific Mitchell Act FEIS alternatives varies among the 15  
31 programs assessed in this EA (Table 2-1). NMFS (2014a, Section 4.5.4, Wildlife Species Effects)  
32 determined that reductions in hatchery production for Mitchell Act FEIS Alternative 2 and Alternative 3  
33 could result in potential reductions in wildlife abundance, distribution and fitness compared to current  
34 conditions (Alternative 1). Wildlife populations would be expected to increase under Alternative 1 and  
35 Alternative 4 through Alternative 6. For those programs that have production numbers slightly higher than  
36 what was analyzed in the Mitchell Act FEIS alternatives, effects on wildlife from those programs are not  
37 likely to be different than the closest analyzed in the Mitchell Act FEIS because the differences in smolt  
38 production levels are small.

39 The effects of climate change on wildlife could include decreased distribution because of warmer summer  
40 temperatures and loss of insulating snow cover for mammals in winter, or reductions in food availability  
41 through effects on prey species such as salmon and steelhead. Reduction in salmon and steelhead  
42 carcasses would decrease nutrients available to wildlife, and reduction in the number of live fish could  
43 affect predators such as bald eagles and golden eagles.

1 Under Alternative 1 and Alternative 2 of this EA, hatchery juveniles and adults would continue to either be  
2 prey for wildlife or provide nutrients. Although climate change may have negative effects on salmon and  
3 steelhead, hatchery production would continue; therefore, the cumulative impacts on wildlife would likely  
4 be similar to those described in Section 4.6, Wildlife.

5 Under Alternative 3 and Alternative 4 of this EA, the cumulative impacts on wildlife may differ from those  
6 under Alternatives 1 and 2 because the number of smolts released would decrease; however, effects on  
7 wildlife would range from negligible-beneficial to low-adverse (Section 4.6, Wildlife). The cumulative  
8 impacts on wildlife would likely be similar to those described in Section 4.6, Wildlife.

### 9 **5.2.7 Socioeconomics**

10 Socioeconomic conditions represent effects from many years of development and attempts to mitigate for  
11 that development through hatchery programs and other restoration actions. As previously noted, the  
12 relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs assessed in this EA  
13 (Table 2-1). NMFS (2014a, Section 4.3.4, Harvest and Economic Values) determined that economic  
14 benefits of hatchery programs, including income, number of jobs, and recreational expenditures, would be  
15 reduced under Mitchell Act FEIS Alternative 2 through Alternative 5 compared to current conditions  
16 (Alternative 1). Reductions would be greatest under Alternative 2. Only under Alternative 6 would  
17 economic benefits be increased. Climate change could possibly have indirect effects through potential  
18 changes in hatchery operations in response to changes in water quantity and quality. For those programs  
19 that have production numbers slightly higher than what was analyzed in the Mitchell Act FEIS  
20 alternatives, socioeconomic effects from those programs are not likely to be different than the closest  
21 alternative analyzed in the Mitchell Act FEIS because the differences in smolt production levels are small.

22 Although the relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs  
23 assessed in this EA (Table 2-1), under Alternative 1 and Alternative 2 of this EA, the total number of  
24 juvenile salmon and steelhead released would fall between releases for Mitchell Act FEIS Alternative 5  
25 and Alternative 6 for the 15 hatchery programs and would have similar contributions to or reductions in  
26 total harvest, total economic benefit to income, jobs, and recreational expenditures. The cumulative  
27 impacts on socioeconomics would likely be similar to those described in Section 4.7, Socioeconomics.

28 Under Alternative 3 and Alternative 4 of this EA, the cumulative impacts on socioeconomics may differ  
29 than those under Alternatives 1 and 2 because the number of smolts released and returning adults would  
30 decrease; however, any decreases in total harvest, total economic benefit to income, jobs, and  
31 recreational expenditures would be negligible to low (Section 4.7, Socioeconomics). The cumulative  
32 impacts under Alternative 3 and Alternative 4 would not be measurable beyond that analyzed in the  
33 Mitchell Act FEIS. The cumulative impacts on socioeconomics would likely be similar to those described  
34 in Section 4.7, Socioeconomics.

### 35 **5.2.8 Cultural Resources**

36 Tribal harvest conditions also represent effects from many years of development and attempts to mitigate  
37 for that development through hatchery programs and other restoration actions. However, future climate  
38 change could possibly reduce the number of salmon and steelhead available for harvest.

39 As noted above, the relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs  
40 assessed in this EA (Table 2-1); however, under Alternative 1 and Alternative 2 of this EA, the number of  
41 juvenile salmon released, and therefore the number of adult salmon available for tribal harvest would fall  
42 between those for Mitchell Act FEIS Alternative 5 and Alternative 6. Cumulative impacts are therefore  
43 unlikely to change substantially from those considered in Section 4.8, Cultural Resources.

1 Under Alternative 3 and Alternative 4 of this EA, the number of juvenile salmon released, and therefore  
2 the number of adult salmon available for tribal harvest or as surplus (Section 4.7, Socioeconomics) could  
3 be less than under Alternative 1 and Alternative 2. However, the cumulative impacts under Alternative 3  
4 and Alternative 4 would not be measurable beyond that analyzed in the Mitchell Act FEIS. The cumulative  
5 impacts on cultural resources would likely be similar to those described in Section 4.8, Cultural  
6 Resources.

7 For those programs that have production numbers slightly higher than what was analyzed in the Mitchell  
8 Act FEIS alternatives, cultural resources effects from those programs are not likely to be different than the  
9 closest alternative analyzed in the Mitchell Act FEIS because the differences in smolt production levels  
10 are small.

## 11 **5.2.9 Environmental Justice**

12 Distribution of surplus fish from hatchery programs is dependent on availability of fish, and therefore at  
13 least indirectly affected by levels of hatchery production and harvest policies. As previously noted, the  
14 relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs assessed in this EA  
15 (Table 2-1). NMFS (2014a, Section 4.4.4, Analysis of Environmental Justice Effects) determined that  
16 tribal harvests would be reduced under Mitchell Act FEIS Alternative 2 through Alternative 5 compared to  
17 current conditions (Alternative 1). Reductions would be greatest under Alternative 2. Only under  
18 Alternative 6 would harvest increase. For those programs that have production numbers slightly higher  
19 than what was analyzed in the Mitchell Act FEIS alternatives, environmental justice effects from those  
20 programs are not likely to be different than the closest alternative analyzed in the Mitchell Act FEIS  
21 because the differences in smolt production levels are small. Future climate change could possibly  
22 reduce the number of hatchery-origin salmon and steelhead available for harvest and distribution.

23 Although the relationship to specific Mitchell Act FEIS alternatives varies among the 15 programs  
24 assessed in this EA (Table 2-1), under Alternative 1 and Alternative 2 of this EA, the number of adult  
25 salmon available for distribution would fall between those for Mitchell Act FEIS Alternative 5 and  
26 Alternative 6. Reductions in the number of fish available because of climate change may result in  
27 cumulative impacts being greater than those considered in Section 4.8, Environmental Justice.

28 Under Alternative 3 and Alternative 4 of this EA, the number of adult salmon available for harvest or  
29 distribution may be less than under Alternative 1 or Alternative 2 (Section 4.9, Environmental Justice).  
30 Further reductions in the number of fish available because of climate change may result in cumulative  
31 impacts being greater than those considered in Section 4.9, Environmental Justice.

## 32 **5.2.10 Human Health and Safety**

33 Future hatchery operations and climate change could affect the use of chemicals in hatchery facilities,  
34 discharge of chemicals into the environment, and consumption of hatchery-produced fish. Changes in  
35 chemical use at hatcheries could be made in response to changing environmental conditions or new  
36 management protocols based on new techniques or chemical products to support fish health. Hatchery  
37 operation may also change to reduce injured through various incidents, such as slipping, getting cuts, and  
38 getting electrocuted. Such changes are difficult to predict; however, hatcheries would continue to  
39 implement safe handling and storage procedures to support human health and safety.

40 The 15 hatchery programs under Alternative 1 and Alternative 2 of this EA would not contribute to a  
41 measurable cumulative impact beyond that analyzed in the Mitchell Act FEIS on human health and safety  
42 within the Snake River Basin because the hatchery operations minimize risks through compliance with  
43 safety programs, rules, and regulations, as well as through the use of protective equipment (Section 4.10,  
44 Human Health and Safety). Also, the risk to human health through consumption is directly associated with

1 frequency of consuming fish, regardless of whether the fish are natural- or hatchery-origin, and the risk to  
2 human health through consumption is not measurable beyond that considered in the Mitchell Act FEIS.  
3 Therefore no cumulative impacts would be expected beyond those already discussed in Section 4.10,  
4 Human Health and Safety.

5 Similar to Alternative 1 and Alternative 2, operation of the 15 hatchery programs under Alternative 3, and  
6 termination of the programs under Alternative 4 of this EA would not contribute to a measurable  
7 cumulative impact beyond that analyzed in the Mitchell Act FEIS on human health and safety within the  
8 Snake River Basin. The risk to human health through consumption is not measurable beyond that  
9 considered in the Mitchell Act FEIS. Therefore no cumulative impacts would be expected beyond those  
10 already discussed in Section 4.10, Human Health and Safety.

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- 3 Sarah Biegel, NEPA Compliance Officer, Bonneville Power Administration
- 4 Rebecca Guiao, Office of General Counsel, Bonneville Power Administration
- 5 Mark Robertson, Lower Snake River Compensation Plan Office, U.S. Fish and Wildlife Service
- 6 Douglas Nemeth, Supervisor, Idaho Fish and Wildlife Conservation Office, U.S. Fish and Wildlife Service
- 7 Lytle Denny, Anadromous Fish Program Manager, Shoshone-Bannock Tribes
- 8 Brian Leth, Fisheries Biologist, Idaho Department of Fish and Game
- 9 Christine Kozfkay, Natural Resource Program Coordinator, Idaho Department of Fish and Game
- 10 Rebecca Johnson, Division Director, Nez Perce Tribe

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1 Appendix A. Population Viability of Salmon and Steelhead  
2 in the Study Area  
3

## Snake River Spring/Summer Chinook Salmon ESU

Snake River spring/summer Chinook salmon are listed as threatened under the ESA. The ESU consists of five MPGs composed of twenty-eight historical populations, of which four are extirpated (Table A-1).

Within the study area, populations from two MPGs have the potential to be genetically affected by hatchery programs included in this EA. Three populations in the South Fork Salmon River MPG and two populations in the Upper Salmon River MPG are likely to receive hatchery-origin spawners (NMFS 2017a; Table A-2). Other populations in the ESU may be subject to ecological (predation/competition) effects along migratory corridors, or genetically via straying.

Adult returns have increased dramatically within the ESU since 2000; however, increases are due primarily to hatchery returns. In 2001, only 10 percent of the returns were fish of natural-origin (NMFS 2012). Natural-origin abundance in most populations in the ESU has increased in recent years, but the increases have not been substantial enough to change current viability ratings (NMFS 2017f). Data from 2005 to 2014 indicate that most populations affected by programs included in this EA have indeed increased in abundance; however, all affected populations remain at high viability risk and returns are below minimum spawner thresholds. The productivity value for four of the five populations receiving hatchery fish is greater than the replacement value of 1.0 (Table A-2). Abundance and productivity data for the Little Salmon River are insufficient to estimate abundance and productivity trends. Spatial structure ratings indicate low or moderate risk for all populations except the Pahsimeroi River, which has a high risk.

For those integrated programs that collect natural-origin Chinook salmon for broodstock, NMFS expects that diversity and abundance impacts are minimal. This is because many of the natural-origin returns may be offspring from hatchery programs. For those populations that currently meet abundance thresholds for a “large” population (Table A-2), it is unlikely that broodstock collection of natural-origin adults has a negative impact on abundance.

Table A-1. Snake River Spring/Summer Chinook salmon ESU components.

ESU Components	
<b>Natural Production</b>	
Major Population Group	Populations
Lower Snake River	Tucannon River
Grande Ronde/Imnaha	Wenaha, Lostine/Wallowa, Minam, Catherine Creek, Upper Grande Ronde, Imnaha
South Fork Salmon River	Secesh, East Fork/Johnson Creek, South Fork Salmon River Mainstem, Little Salmon River
Middle Fork Salmon River	Bear Valley, Marsh Creek, Sulphur Creek, Loon Creek, Camas Creek, Big Creek, Chamberlain Creek, Lower Middle Fork (MF) Salmon, Upper MF Salmon
Upper Salmon River	Lower Salmon Mainstem, Lemhi River, Pahsimeroi River, Upper Salmon Mainstem, East Fork Salmon, Valley Creek, Yankee Fork, North Fork Salmon
<b>Artificial Production</b>	
Hatchery programs included in ESU (11)	Tucannon River Spr/Sum, Lostine River Spr/Sum, Catherine Creek Spr/Sum, Looking glass Hatchery Reintroduction Spr/Sum, Upper Grande Ronde Spr/Sum, Imnaha River Spr/Sum, Big Sheep Creek-Adult Spr/Sum out planting from Imnaha program, McCall Hatchery summer, Johnson Creek Artificial Propagation Enhancement summer, Pahsimeroi Hatchery summer, Sawtooth Hatchery spring.

Source: Jones Jr. (2015); NWFSC (2015)

1 Table A-2. Measures of viability and overall viability rating for Snake River Spring/Summer Chinook salmon populations.

Major Population Group, Population	Abundance and Productivity <sup>1</sup>				Spatial Structure and Diversity			Overall Viability Rating <sup>2</sup>	Proposed Recovery Status <sup>3</sup> (NMFS 2017f)
	ICTRT Minimum Spawner Threshold	Natural Spawning Abundance	ICTRT Productivity	Integrated Risk	Natural Processes Risk	Diversity Risk	Integrated Risk		
<b>Lower Snake River</b>									
Tucannon River	750	↑ 267 (.19)	↓ .69	High	Low	Moderate	Moderate	High Risk	Highly Viable <sup>4</sup>
Asotin Creek	500	--	--	--	--	--	--	Extirpated	
<b>Grande Ronde/Imnaha</b>									
Wenaha River	750	↓ 399 (.12)	↑ .93	High	Low	Moderate	Moderate	High Risk	Viable or Highly Viable
Lostine/Wallowa	1,000	↑ 332 (.24)	↑ .98	High	Low	Moderate	Moderate	High Risk	Viable or Highly Viable
Lookingglass Creek.	500	--	--	--	--	--	--	Extirpated	
Minam River	750	↑ 475 (.12)	↑ .94	High	Low	Moderate	Moderate	High Risk	Viable or Highly Viable
Catherine Creek	1,000	↑ 110 (.31)	↑ .95	High	High	Moderate	High	High Risk	Viable or Highly Viable
Upper Grande Ronde River	1,000	↑ 43 (.26)	↑ .59	High	High	Moderate	High	High Risk	Viable or maintained
Imnaha River	750	↑ 328 (.21)	↑ 1.20	High	Low	Moderate	Moderate	High Risk	Viable or Highly Viable
<b>South Fork Salmon River</b>									
<b>South Fork Mainstem<sup>4</sup></b>	<b>1,000</b>	<b>↑ 791 (.18)</b>	<b>↓ 1.21</b>	<b>High</b>	<b>Low</b>	<b>Moderate</b>	<b>Moderate</b>	<b>High Risk</b>	<b>Viable</b>
Secesh River	750	↑ 472 (.18)	1.25	High	Low	Low	Low	High Risk	Highly Viable
<b>East Fork/Johnson Creek</b>	<b>1,000</b>	<b>↑ 208 (.24)</b>	<b>↓ 1.15</b>	<b>High</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>High Risk</b>	<b>Maintained</b>
<b>Little Salmon River</b>	<b>750</b>	<b>Insufficient data</b>			<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>High Risk</b>	<b>Maintained</b>
<b>Middle Fork Salmon River</b>									
Chamberlain Creek	750	↑ 641 (.17)	↓ 2.26	Moderate	Low	Low	Low	Maintained	Viable
Big Creek	1,000	↑ 164 (.23)	↓ 1.10	<b>High</b>	Very low	Moderate	Moderate	High Risk	Highly viable

Major Population Group, Population	Abundance and Productivity <sup>1</sup>				Spatial Structure and Diversity			Overall Viability Rating <sup>2</sup>	Proposed Recovery Status <sup>3</sup> (NMFS 2017f)
	ICTRT Minimum Spawner Threshold	Natural Spawning Abundance	ICTRT Productivity	Integrated Risk	Natural Processes Risk	Diversity Risk	Integrated Risk		
Loon Creek	500	54 (.10)	↓.98	High	Low	Moderate	Moderate	High Risk	Viable
Camas Creek	500	↑38 (.20)	↓.80	High	Low	Moderate	Moderate	High Risk	Maintained
Lower Middle Fork	500	Insufficient data	Insufficient data	--	Moderate	Moderate	Moderate	High Risk	Maintained
Upper Middle Fork	750	↑71 (.18)	↓0.50	High	Low	Moderate	Moderate	High Risk	Maintained
Sulpher Creek	500	↑67 (.99)	↑.92	High	Low	Moderate	Moderate	High Risk	Maintained
Marsh Creek	500	↑253 (.27)	↓1.21	High	Low	Moderate	Moderate	High Risk	Viable
Bear Valley Creek	750	↑474 (.27)	↓1.37	High	Very low	Moderate	Moderate	High Risk	Viable
<b>Upper Salmon River</b>									
Salmon Lower Mainstem	2,000	↓108 (.18)	↑1.18	High	Low	Low	Low	High Risk	Maintained
<b>Salmon Upper Mainstem<sup>4</sup></b>	<b>1,000</b>	<b>↑411 (.14)</b>	<b>↑1.22</b>	<b>High</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>High Risk</b>	<b>Viable or highly viable</b>
<b>Pahsimeroi River</b>	<b>1,000</b>	<b>↑267 (.16)</b>	<b>↑1.37</b>	<b>High</b>	<b>Moderate</b>	<b>High</b>	<b>High</b>	<b>High Risk</b>	<b>Viable</b>
Lemhi River	2,000	↑143 (.23)	↑1.30	High	High	High	High	High Risk	Viable
Valley Creek	500	↑121 (.20)	↑1.45	High	Low	Moderate	Moderate	High Risk	Viable
East Fork Salmon River	1,000	↑347 (.22)	↑1.08	High	Low	High	High	High Risk	Viable
Yankee Fork	500	↑44 (.45)	↓.72	High	Moderate	High	High	High Risk	Maintained
North Fork Salmon River	500	Insufficient data	Insufficient data	--	Low	Low	Low	High Risk	Maintained
Panther Creek	750	Insufficient data	Insufficient data	--	--	--	--	Extirpated	

1 Source: NWFSC (2015), NMFS (2017f)

2 1Upwards arrow=improved since prior review. Downwards arrow=decreased since prior review. Current abundance and productivity estimates are expressed as geometric means with (standard error) for abundance.

4 2Highly viable/Very Low risk = less than 1 percent risk of extinction over 100 years; Viable/Low risk = less than 5 percent risk of extinction over 100 years.

5 3Maintained/Moderate = 6 to 25 percent risk of extinction over 100 years; High Risk = does not meet viability criteria, greater than 25 percent risk of extinction over 100 years.

6 4Bolded cells indicate populations whose viability may be affected by hatchery programs

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## Snake River Fall Chinook Salmon ESU

The Snake River Fall Chinook Salmon ESU includes naturally spawned fish in the lower mainstem of the Snake River and the lower reaches of several of the associated major tributaries below Hells Canyon Dam, including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers, along with four artificial propagation programs (Jones Jr. 2015; NWFSC 2015). A single extant population spawns and rears in the mainstem Snake River and its tributaries below Hells Canyon Dam.

This ESU has been reduced to the Lower Mainstem Snake River fall Chinook salmon population that is viable, but has a narrow range of available habitat. The Draft Snake River Fall Chinook Recovery Plan (NMFS 2015a) reports that a single population viability scenario could be possible given the unique spatial complexity of the population. All of the hatchery programs are included in the ESU along with the natural-origin population that is at moderate risk, with a low risk for abundance/productivity and a moderate risk for spatial structure and diversity (NMFS 2017c). Best available information indicates that the ESU remains threatened, which is based on the low risk for abundance/productivity and moderate risk for spatial structure/diversity (NWFSC 2015; NMFS 2017f).

## Snake River Steelhead DPS

The Snake River Basin Steelhead DPS includes all naturally spawned anadromous *O. mykiss* originating below natural and man-made impassable barriers in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (NWFSC 2015). The Interior Columbia Technical Recovery Team (ICTRT) identified six MPGs in the Snake River Steelhead DPS: Clearwater River, Salmon River, Grande Ronde River, Imnaha River, Lower Snake River, and Hells Canyon Tributaries (ICTRT 2007). The Hells Canyon Tributaries MPG is extirpated, leaving five extant MPGs. Nine hatchery steelhead programs are included in the DPS (Table A-3). This DPS consists of A-run steelhead, which primarily return to spawning areas in the summer, and B-run steelhead, which exhibit a larger body size and begin their migration in the fall (NMFS 2011c).

The Snake River Steelhead DPS has a moderate to high risk of extinction and remains threatened. Four of the five extant MPGs are not meeting recovery objectives in the draft recovery plan, and the status of many individual populations remains uncertain. Still, the most recent status review suggests that populations in the Salmon and Clearwater subbasins are doing relatively well (Table A-4). For example, the minimum abundance threshold for the lower mainstem Clearwater population is 1,500, and abundance was most recently estimated at 2,099. In addition, the productivity value for a number of populations is greater than the replacement value of 1.0 (NMFS 2017d).

Within the study area hatchery programs included in this EA directly affect the South Fork Clearwater River population in the Clearwater River MPG and the Little Salmon River, Pahsimeroi River, East Fork Salmon River, and Upper Salmon River populations in the Salmon River MPG (Table A-4). Because the Hells Canyon Tributaries MPG is extirpated, fish released from the Hells Canyon Snake River A-run Summer Steelhead Program do not affect that population. Other populations in the DPS may be subject to ecological (predation/competition) effects along migratory corridors, or genetically via straying.

1 Table A-3. Snake River Basin steelhead DPS components.

<b>DPS Components<sup>1</sup></b>	
<b>Natural Production</b>	
<b>Major Population Group</b>	<b>Populations</b>
Grande Ronde River	Joseph Creek, Upper Mainstem, Lower Mainstem, Wallowa River
Imnaha River	Imnaha River
Clearwater River	Lower Mainstem River, North Fork Clearwater, Lolo Creek, Lochsa River, Selway River, South Fork Clearwater
Salmon River	Little Salmon/Rapid, Chamberlain Creek, Secesh River, South Fork Salmon, Panther Creek, Lower MF, Upper MF, North Fork, Lemhi River, Pahsimeroi River, East Fork Salmon, Upper Mainstem
Lower Snake	Tucannon River, Asotin Creek
Hells Canyon Tributaries	Extirpated
<b>Artificial Production</b>	
Hatchery programs included in DPS (7)	Tucannon River summer, Little Sheep Creek summer, EF Salmon River A, Dworshak NFH B, Lolo Creek B, Clearwater Hatchery B, SF Clearwater (localized) B

2 Source: 79 FR 20802; NMFS (2012); Jones Jr. (2015); NWFSC (2015)

3 1 Note: The DPS listing is updated in the FR every five years and the last update was on April 14, 2014. NMFS is currently  
4 developing an updated DPS listing.

1 Table A-4. Measures of viability and overall viability rating for Snake River steelhead MPG.

Major Population Group, Population	Abundance and Productivity <sup>1</sup>				Spatial Structure and Diversity			Overall Viability Rating <sup>2</sup>	Proposed Recovery Status <sup>3</sup> (NMFS 2017f)
	ICTRT Minimum Threshold	Natural Spawning Abundance	ICTRT Productivity	Integrated Risk	Natural Processes Risk	Diversity Risk	Integrated Risk		
<b>Lower Snake River</b>									
Tucannon River	1,000	NA	NA	High (?)	Low	Moderate	Moderate	High Risk	Viable or Highly Viable
Asotin Creek	500		NA	Moderate (?)	Low	Moderate	Moderate	Maintained (?)	Viable or Highly Viable
<b>Grande Ronde River</b>									
Lower Grande Ronde	1,000	NA	NA		Low	Moderate Moderate	Moderate	Maintained	Viable or highly Viable
Joseph Creek	500	1,839	1.86	Very low	Very low	Low	Low	Highly Viable	Highly Viable
Upper Grande Ronde	1,500	1,649 (.21)	3.15	Viable (moderate)	Very low	Moderate	Moderate	Viable	Viable or Highly Viable
Wallowa River	1,000	NA	NA	High	Very low	Low	Low	Moderate?	Viable or Highly Viable
<b>Imnaha River</b>									
Imnaha River	1,000	NA	NA	Moderate	Very low	Moderate	Moderate	Moderate	Highly Viable
<b>Clearwater River</b>									
Lower Mainstem Clearwater River	1,500	2,099 (.15)	2.36	Moderate	Very low	Low	Low	Maintained (?)	Viable
<b>South Fork Clearwater River<sup>4</sup></b>	<b>1,000</b>	<b>NA</b>	<b>NA</b>	<b>High</b>	<b>Low</b>	<b>Moderate</b>	<b>Moderate</b>	<b>Maintained or High Risk (?)</b>	<b>Maintained</b>
Lolo Creek	500	NA	NA	High	Low	Moderate	Moderate	Maintained (?)	Maintained
Selway River	1,000	1,650 (.17)	2.33	Moderate (?)	Very low	Low	Low	Maintained (?)	Viable
Lochsa River	1,000			Moderate (?)	Very low	Low	Low	Maintained (?)	Highly Viable
North Fork Clearwater River	--	--	--	--	--	--	--	Extirpated	

Major Population Group, Population	Abundance and Productivity <sup>1</sup>				Spatial Structure and Diversity			Overall Viability Rating <sup>2</sup>	Proposed Recovery Status <sup>3</sup> (NMFS 2017f)
	ICTRT Minimum Threshold	Natural Spawning Abundance	ICTRT Productivity	Integrated Risk	Natural Processes Risk	Diversity Risk	Integrated Risk		
<b>Salmon River</b>									
Little Salmon River	500	NA	NA	Moderate (?)	Low	Moderate	Moderate	Maintained (?)	Maintained
South Fork Salmon River.	1,000	1,028 (.17)	1.80	Moderate (?)	Very low	Low	Low	Maintained (?)	Viable
Secesh River	500			Moderate (?)	Low	Low	Low	Maintained (?)	Maintained
Chamberlain Creek	500	2,213 (.16)	2.38	Moderate (?)	Low	Low	Low	Maintained (?)	Viable
Lower Middle Fork Salmon River	1,000			Moderate (?)	Very low	Low	Low	Maintained (?)	Highly Viable
Upper Middle Fork Salmon River	1,000			Moderate (?)	Very low	Low	Low	Maintained (?)	Viable
Panther Creek	500	NA	NA	Moderate	High	Moderate	High	High Risk	Viable
North Fork Salmon River	500	NA	NA	Moderate	Low	Moderate	Moderate	Maintained (?)	Maintained
Lemhi River	1,000	Insufficient data	Insufficient data	Moderate	Insufficient data	Insufficient data	Moderate	Maintained (?)	Viable
Pahsimeroi River	1,000	NA	NA	Moderate	Moderate	Moderate	Moderate	Maintained (?)	Maintained
East Fork Salmon River	1,000	NA	NA	Moderate	Very low	Moderate	Moderate	Maintained (?)	Maintained
Upper Salmon River	1,000	NA	NA	Moderate	Very low	Moderate	Moderate	Maintained (?)	Maintained
<b>Hells Canyon Tributaries</b>									
Lower Hells Canyon Tributaries	--	--	--	--	--	--	--	Extirpated	

1 Source: NWFSC (2015); NMFS (2017f)

2 1 Current abundance and productivity estimates are expressed as geometric means with (standard error) for abundance.



- 1 2 Highly viable/Very Low risk = less than 1 percent risk of extinction over 100 years; Viable/Low risk = less than 5 percent risk of extinction over 100 years; ratings with (?) are based
- 2 on imitated or provisional data.
- 3 3 Maintained/Moderate = 6 to 25 percent risk of extinction over 100 years; High Risk = does not meet viability criteria, greater than 25 percent risk of extinction over 100 years.
- 4 4 Bolded cells indicate populations whose viability may be affected by hatchery programs.

## 1 **Snake River Sockeye Salmon ESU**

2 The Snake River Sockeye Salmon ESU includes naturally spawned anadromous and residual sockeye  
3 salmon originating from the Snake River Basin in Idaho, as well as artificially propagated sockeye salmon  
4 from the Redfish Lake captive propagation program (Jones Jr. 2015). The ICTRT treats Sawtooth Valley  
5 sockeye salmon as the single MPG within the ESU. The MPG contains one extant population (Redfish  
6 Lake) (NMFS 2015b).

7 The Snake River Sockeye Salmon ESU does not meet biological viability criteria (i.e., indication that the  
8 ESU is self-sustaining and naturally producing, and no longer qualifies as an endangered species), and  
9 likely will not for some time. However, annual returns of sockeye salmon through 2013 show that more  
10 fish are returning to the basin than before initiation of the captive broodstock program, which began after  
11 listing of the ESU. The ongoing reintroduction program is still in the phase of building sufficient returns to  
12 allow for large-scale reintroduction into Redfish Lake, the initial target for restoration (NMFS 2015b). In  
13 the 2015 status update, NMFS determined that the ESU remains at high risk for spatial structure,  
14 diversity, abundance, and productivity (NWFSC 2015). At present, anadromous returns are dominated by  
15 production from the captive spawning component.