FINAL

Environmental Assessment

Yankee Fork and Panther Creek Chinook Salmon hatchery programs

Upper Salmon River Basin

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Yankee Fork and Panther Creek Chinook Salmon Hatchery Programs
Draft Environmental Assessment

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Acronym List

BMP	Best Management Practice
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
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEIS	Final Environmental Impact Statement
FR	Federal Register
FRTA	Forest Roads and Trails Act
HGMP	Hatchery Genetics Management Plan
HSRG	Hatchery Scientific Review Group
ICTRT	Interior Columbia Technical Recovery Team
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
ISAB	Independent Scientific Advisory Board
ISRP	Independent Science Review Panel
LRMP	Land and Resource Management Plan
LSRCP	Lower Snake River Compensation Plan
MPG	Major population group
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OHWM	Ordinary high water mark
PCE	Primary Constituent Element
pHOS	Proportion of hatchery-origin fish on spawning grounds

BMP	Best Management Practice
PIT	Passive Integrated Transponder
PNI	proportionate natural influence
RM&E	Research, monitoring, and evaluation
SBT	Shoshone-Bannock Tribe
TMDL	Total Maximum Daily Load
USBR	U.S. Bureau of Reclamation
USGS	United States Geologic Service
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
WDFW	Washington Department of Fish and Wildlife

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)—specifically, pursuant to the 4(d) rule for salmon and steelhead , specific criteria (under 50 CFR 223.203) must be met—for the approval, and continued operation and maintenance of 2 hatchery programs in the Snake River Basin in Idaho. Each program includes the collection and spawning of adult salmon, incubation of eggs, and rearing and release of juveniles (or eggs for two programs) as described in Hatchery and Genetic Management Plans (HGMPS). As part of the 4(d) determination, an ESA section 7 consultation has been completed that affirmed that the programs as proposed would 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 Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), and may also impact Snake River steelhead (*O. mykiss*), and Snake River sockeye salmon (*O. nerka*). The hatchery programs under consideration are:

- Yankee Fork Chinook Salmon Program
- Panther Creek Chinook Salmon Program

The programs included in this EA are operated by SBT in collaboration with the IDFG as part of either the Lower Snake River Compensation Plan (LSRCP) or are funded directly by the BPA. The ESA §4(d) limit applications submitted to NMFS by the Shoshone-Bannock Tribe (SBT) and Idaho Department of Fish and Game (IDFG) consist of the two above-named HGMPs that outline the rearing and release of Snake River spring/summer Chinook salmon using existing facilities. The SBT has future plans to operate the program using a dedicated hatchery and permanent weir structures, but those proposed structures are not yet funded. In the interim, the programs will be implemented using existing infrastructure in coordination with IDFG. If the structures get funded, a separate NEPA analysis will be completed by the funding agency (Bonneville Power Administration (BPA)). NMFS is likely to be a cooperating agency with BPA on the NEPA analysis of any new structures used for the program. At that time, NMFS would revisit the proposed action to ensure that it either remains as described in this document or is described fully in the new NEPA document.

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). Under this Proposed Action, NMFS would make a determination that the submitted HGMPs meet the requirements of Limit 6 of the 4(d) Rule, and is the purpose of this environmental assessment (EA) review.

NMFS is choosing to evaluate the continued funding and operation of these programs under the HGMPs as the Proposed Action in one NEPA analysis because many overlaps and links exist among the programs. Both programs would be implemented in the Snake River Basin during the

same time and include the same or similar activities that lead to the release of spring/summer Chinook salmon.

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

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

These activities may include the operation and maintenance of temporary adult Chinook salmon traps and weirs; adult holding and spawning; egg incubation and juvenile rearing of fish at Sawtooth Hatchery for Yankee Fork and Pahsimeroi Hatchery for Panther Creek. There will be transportation of broodstock, eggs, and smolts between facilities; and the direct release of smolts into Yankee Fork and Panther Creek. In years that production is in excess of capacity for rearing at Sawtooth or Pahsimeroi, egg boxes may be used in both Yankee Fork and Panther Creek to allow full program production even when rearing space is limited.

To inform these hatchery actions, RM&E activities—such as fish tagging and marking, spawning ground surveys, and fish capture, including rotary screw trap collection—may also occur. The hatchery programs help supplement the Yankee Fork and Panther Creek Chinook salmon populations, both of which have low natural abundance and productivity.

1.1 Purpose and Need

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

> Evaluate the proposed hatchery programs' HGMPs to make a determination under Limit 6 of the ESA section 4(d) Rule to ensure the sustainability of Snake River salmon and steelhead by supporting naturally spawning populations of Chinook salmon by conserving the productivity, abundance, diversity, and distribution of listed species of salmon and steelhead in the Upper Salmon River basin (Figure 1). The Upper Salmon River basin is occupied by SR Chinook salmon, SR basin steelhead, and SR sockeye.

1.2 Project Area and Analysis Area

The project area is the geographic area where the Proposed Action would take place. It includes the fish traps and collection sites, hatchery facilities, and release locations as described in the HGMPs. It also includes the broader area where direct and indirect impacts of the program operations could affect environmental and human resources. As such, the project area includes the Salmon River Subbasin (Figure 1). It also includes the mainstem Snake River downstream from the confluence of the Salmon River to Ice Harbor Dam.

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

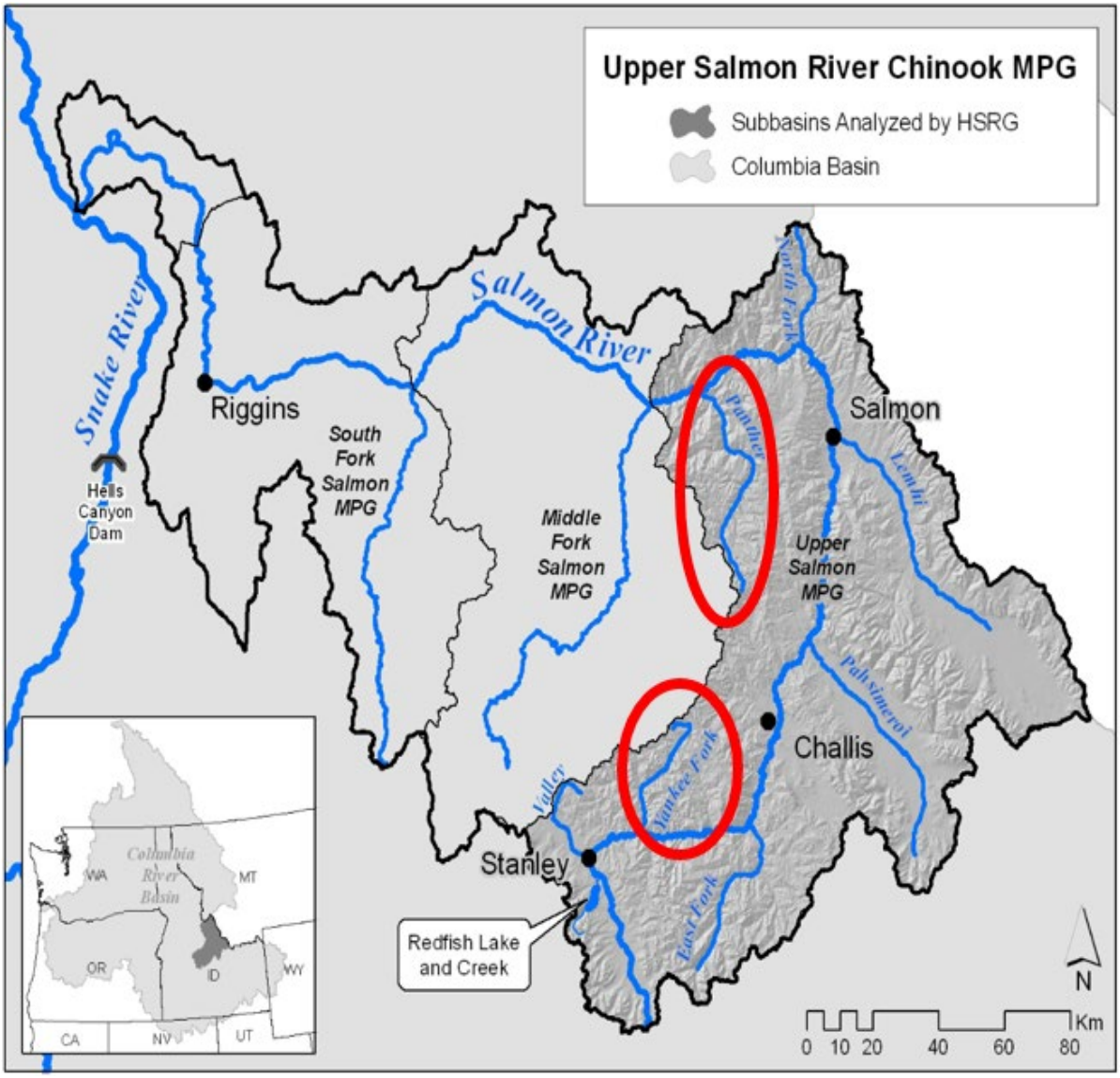

Figure 1. Map of the location of Yankee Fork and Panther Creek in the Upper Salmon River, Idaho.

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

1.3.1 Tribal Trust Responsibility under the Endangered Species Act

The United States government has a trust or special relationship with tribes. The unique and distinctive political relationship between the United States and tribes is defined by statutes, executive orders, judicial decisions, and agreements, and differentiates tribes from other entities that deal with, or are affected by the Federal government. When the United States government undertakes an action such as this, it must consider secretarial orders related to tribal responsibilities. In this case, the programs are operated by the Shoshone-Bannock Tribes, and will directly impact the availability of fish for harvest.

Secretarial Order 3206, *American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the ESA* (Secretarial Order), clarifies the responsibilities of the agencies when actions are taken under the ESA (USFWS and NMFS 1997). Specifically, USFWS and NMFS shall, among other things:

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

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

1.3.2 U.S. v. Oregon

Because the production in these programs is part of a larger *U.S. v. Oregon* agreement, and may impact parties to the agreement, NMFS must consider the relationship to the agreement (see subsection 4.6, below). The court in *U.S. v. Oregon,* 302 F.Supp. 899 (D. Or. 1969), ruled that state regulatory power over Indian fishing is limited because the 1855 treaties between the United States and the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes preserved the tribes' right to fish at all usual and accustomed places, whether on or off reservation. Because of this decision, fisheries in the Columbia River Basin, including the Snake River Basin, are governed through the Columbia River Fish Management Agreement (Management Agreement; *U.S. v. Oregon* 2018*)*, which was carefully negotiated by the Federal and state governments and the involved treaty Indian tribes. The most recent Management Agreement, entered as a court order in 2018 and set to expire on December 31, 2027, provides the current framework for managing fisheries and hatchery programs in much of the Columbia River Basin. The agreement

includes a list of hatchery programs with stipulated production levels, and a list of tribal and non-tribal salmonid fisheries in the Columbia River Basin, including designated off-channel sites that are intended to: (1) ensure fair sharing of harvestable fish between tribal and non-tribal fisheries in accordance with Treaty fishing rights standards and *U.S. v. Oregon*, and (2) be responsive to the needs of ESA-listed species. For more details about the history of the Management Agreement, see the Mitchell Act Final Environmental Impact Statement (FEIS) Subsection 1.7.4 (NMFS 2014).

1.3.3 Northwest Power Act/Council's Fish and Wildlife Program

The action under consideration is funded by the BPA, and therefore subject to the Northwest Power Act, which directs BPA to protect, mitigate, and enhance fish and wildlife affected by the development and operation of federal hydroelectric facilities on the Columbia River and its tributaries. To assist in accomplishing this, the Northwest Power and Conservation Council makes recommendations to BPA concerning which fish and wildlife projects to fund. The Council gives deference to project proposals developed by state and tribal fishery managers.

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

2 Description of Alternatives

Four alternatives are considered in this EA: (1) No Action—NMFS would not make ESA section 4(d) determinations, but the programs would continue as currently operated without ESA coverage; (2) Proposed Action—NMFS would make section 4(d) determinations consistent with the HGMPs and the programs would continue as currently operated; (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 (4) NMFS would not make ESA section 4(d) determinations and the programs would terminate.

2.1 Alternative 1, No Action

Under this alternative, NMFS would not make a 4(d) determination. For analysis purposes, NMFS has defined the No Action Alternative as the choice by the applicants to continue to operate those portions of the programs that are currently operating despite NMFS not making a 4(d) determination. Therefore, the No-Action Alternative would continue the status quo for hatchery production, as well as for RM&E, and operations and maintenance (Subsection 2.2.4, Research Monitoring, and Evaluation; Subsection 2.2.5, Operation and Maintenance); however, the programs would be operated without ESA authorization.

The Yankee Fork and Panther Creek Chinook salmon hatchery programs are included in NMFS's biological opinion from 2017 (NMFS 2017a), and are described in detail in the HGMPs submitted to NMFS (SBT 2017a; 2017b). Both programs include collection and spawning of adults, and rearing, transport, and release of juveniles. As described in more detail in Alternative 2, because natural-origin returns to Yankee Fork and Panther Creek are small, taking fish out of these low populations for broodstock would leave few natural-origin fish for spawning. Consequently, a phased broodstock collection would be implemented under all alternatives (except Alternative 4 – Termination) (SBT 2017b; 2017a). Therefore, broodstock for each of the programs will be supplemented using Sawtooth hatchery stock (in Yankee Fork) and Pahsimeroi hatchery stock (in Panther Creek) until a full transition to localized brood can take place without limiting natural-origin returns from broodstock collection.

The programs included in this EA are operated in collaboration with the IDFG as part of either the Lower Snake River Compensation Plan (LSRCP) or are funded directly by the BPA. The LSRCP was authorized by the Water Resources Development Act of 1976 (Public Law 94-587) to mitigate salmon and steelhead losses caused by the construction and operation of the four Lower Snake River dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite).

In 2014, NMFS completed the Mitchell Act FEIS to assess Columbia River Basin hatchery operations and funding of the Mitchell Act hatchery programs (NMFS 2014). The Mitchell Act FEIS analyzed a wide range of hatchery programs throughout the Columbia River Basin across a suite of alternatives. These alternatives were related to how hatcheries might be operated to manage effects (negative and positive) on natural salmon and steelhead populations, both ESA-listed and non-listed. Although the Mitchell Act FEIS analyzed the likely comprehensive effects of hatchery production on broad scales, it did not include the two programs evaluated in this EA. A separate draft EA was also written for the IDFG programs (Sawtooth and Pahsimeroi) in the

Upper Salmon River Basin (NMFS and NOAA 2019); that draft EA included descriptions of the Sawtooth and Pahsimeroi facilities that are used to support the Yankee Fork and Panther Creek programs. Where relevant, the present EA identifies and uses the alternatives analyzed in the Mitchell Act FEIS and Snake Basin EA (NMFS and NOAA 2019) to inform the analysis of program effects relative to the range of alternatives analyzed in the Mitchell Act FEIS (NMFS 2014).

2.2 Alternative 2, Proposed Action

Under Alternative 2 (the Proposed Action), the Tribes' would continue operation of both programs to produce Snake River spring/summer Chinook salmon, and have approval under the ESA. The hatchery program would be consistent with, and has been developed from, the Tribes' Master Plan (SBT 2011). The hatchery program would include operation of two fish trapping weirs in the Salmon-Challis National Forest—one at the USFS Cobalt Work Center on Panther Creek (at approximately river mile 25 (a tributary of the Salmon River in Idaho)) and one at Pole Flat Campground (at approximately river mile 3) in the Yankee Fork (also a tributary to the Salmon River in Idaho) (see Figure ES-1). The hatchery programs would involve the collection of Chinook salmon broodstock at each of the weirs and production of up to 600,000 salmon smolts for release in Yankee Fork and up to 400,000 in Panther Creek to provide harvest opportunities for Tribal and non-tribal fishers in the basin, and to restore naturally spawning salmon populations. Spawning and rearing would take place at Sawtooth Hatchery for the Yankee Fork program, and at Pahsimeroi Hatchery for Panther Creek. In years that production is in excess of capacity[1] for rearing at Sawtooth or Pahsimeroi, egg boxes may be used in both Yankee Fork and Panther Creek to allow full program production even when rearing space is limited.

Because natural-origin returns to Yankee Fork and Panther Creek are small, taking fish out of these low populations for broodstock would leave few natural-origin fish for spawning. Consequently, a phased broodstock collection would be implemented under all alternatives (except Alternative 4 – Termination) (SBT 2017b; 2017a). Therefore, broodstock for each of the programs will be supplemented using Sawtooth hatchery stock (in Yankee Fork) and Pahsimeroi hatchery stock (in Panther Creek) until a full transition to localized brood can take place without limiting natural-origin returns from broodstock collection.

2.2.1 Yankee Fork Chinook Salmon

2.2.1.1 Yankee Fork Broodstock Development

The Yankee Fork Chinook salmon production would require time to transition from its current practice of using Sawtooth Hatchery stock to the use of Chinook salmon (both hatchery and natural) captured and spawned at the Yankee Fork in order to achieve the desired adult run size goal for the Yankee Fork. The goal of a locally adapted broodstock in Yankee Fork is to allow the use of locally returning adult salmon to propagate the hatchery program's smolt releases,

[1] Because of annual fluctuations in production for Sawtooth Hatchery, space available will fluctuate for Yankee Fork production. The target will be 200,000 smolts reared at Sawtooth Hatchery for Yankee Fork, but may be more whenever space is available.

ultimately restricting propagation in Yankee Fork to fish originating in that watershed and reducing or eliminating reliance on Sawtooth-specific brood. To reach this goal, an intermediate step is to use the Sawtooth stock to develop a supplemented population that begins with a genetically similar source; the proposed program then explicitly describes steps to move from that intermediate step to the final objective. In order to achieve this, a sliding scale was developed to integrate the broodstock (Table 1).

Table 1. Yankee Fork and Panther Creek broodstock management sliding scale

						HOR Run Size at Weir								
						500			1,000			1,500		
Natural Origin Returns (NOR)	Max Proportion of Natural Run Collected	NORs Brood Stock	HORs Brood Stock	Total Brood Stock	pNOB	Total NOR+HOR Escapement	pHOS	PNI	Total NOR+HOR Escapement	pHOS	PNI	Total NOR+HOR Escapement	pHOS	PNI
100	35%	35	323	358	10%	242	73%	0.12	742	91%	0.10	1,242	95%	0.09
200	25%	50	308	358	14%	342	56%	0.20	842	82%	0.15	1,342	89%	0.14
300	25%	75	283	358	21%	442	49%	0.30	942	76%	0.22	1,442	84%	0.20
400	25%	100	258	358	28%	542	45%	0.38	1,042	71%	0.28	1,542	81%	0.26
500	25%	125	233	358	35%	642	42%	0.46	1,142	67%	0.34	1,642	77%	0.31
600	25%	150	208	358	42%	742	39%	0.52	1,242	64%	0.40	1,742	74%	0.36
700	25%	175	183	358	49%	842	38%	0.56	1,342	61%	0.45	1,842	71%	0.41
750	25%	188	171	358	52%	892	37%	0.59	1,392	60%	0.47	1,892	70%	0.43

In an effort to start production in Yankee Fork, the Tribes have been outplanting up to 1,500 surplus Sawtooth Hatchery adult Chinook salmon to the Yankee Fork until the total combined hatchery and natural-origin adult run size is greater than 1,000 adults. It is difficult to determine when run sizes would reach this goal due to the many factors that influence run size (i.e., ocean and river conditions), but it is anticipated that it would likely be a minimum of 10 years. When more than 1,000 total adults return, the hatchery program would use only locally returning adults for hatchery broodstock. The conservation objective, developed in coordination with NMFS, is to achieve a population with a minimum of 500 natural-origin spawning adults, which does not include hatchery returns. This population would be managed as a required population for a stable broodstock source in the Yankee Fork. The harvest and cultural objective is to produce 1,000 adults for harvest by Tribal fishers using traditional and modern harvest techniques. An outline of hatchery program components is presented below:

- Establish a minimum natural escapement objective of 500 Chinook salmon; however, broodstock collection would focus on adults returning to Yankee Fork, with backfilling occurring from Sawtooth Hatchery if needed to meet a minimum of 200,000 smolts.
- Terminate the outplanting of surplus Sawtooth Hatchery adults to the Yankee Fork and terminate the use of Sawtooth broodstock for the hatchery program when the natural-origin adult run size exceeds 1,000 adults.
- Collect all Yankee Fork broodstock at the Pole Flat weir. Collect up to 358 natural-origin adult males and hatchery-origin adults at random over the entire migration run. The number and proportion of natural- and hatchery-origin adults in the broodstock are guided by the sliding scale in Table 1. Fish will be imported from Sawtooth Hatchery for use as broodstock when NOR + HOR returns are fewer than 400 adults for two

consecutive return years. Based on returning adult numbers, it appears that natural-origin adults would be available for broodstock. During the run, the fish traps would be operated 24 hours per day. Jacks (male Chinook salmon that return to their freshwater stream one or two years earlier than their counterparts) would be incorporated into the broodstock at up to 10 percent as described in the HGMP (SBT 2017b). Spawned adult carcasses would be returned to the Yankee Fork River, and distributed throughout the basin as a nutrient source, based on expected juvenile use.

- Adults would be held at the existing IDFG-operated East Fork Salmon River facility, located 18 miles up the East Fork Salmon River from its confluence with the Salmon River, or at Sawtooth Hatchery depending on their availability to hold adults related to the hatchery program.

2.2.2 Yankee Fork Chinook Salmon Production

The proposed hatchery program would be implemented in two phases, with the possibility of a third phase if sufficient numbers of natural-origin adults return to Yankee Fork. The actions proposed in each phase are described below. Though described here in some detail, final hatchery operations are described in the HGMP for the Yankee Fork Chinook salmon program (SBT 2017b), associated consultation (NMFS 2017a), and through adaptive management.

Phase 1: Develop Local Broodstock.

Phase 1 of the program would emphasize the development of local broodstock. Specific adult management criteria and adult use priorities developed during the ESA review and consultation process or through adaptive management. Preliminary Phase 1 components are as follows:

- Outplant up to 1,500 surplus adults and release a minimum of 200,000 smolts from Sawtooth Hatchery into the Yankee Fork. Local broodstock (i.e., adults returning to Yankee Fork) would be used as broodstock, and adult returns to Sawtooth Hatchery would also be collected, as needed to supplement the Yankee Fork broodstock collection. Since Chinook salmon return to the Yankee Fork in a bi-modal run (i.e., two peaks each year, one in July, one in August), broodstock would be collected in proportion to their arrival timing at the weir so that the adult broodstock collected best represents all Chinook salmon returning to the Yankee Fork.
- Production may be scaled up to 600,000 smolts if sufficient local and Sawtooth Hatchery broodstock (up to 358 adults from the combined sources, based on the sliding scale in Table 1) is available, and if rearing space is available. Currently, 200,000 can be reared at the Sawtooth Hatchery. In the future, Crystal Springs hatchery will be used to rear the remaining 400,000 (BPA et al. 2017).
- No integrated hatchery program objectives would be applied at this phase. The contribution of straying hatchery-origin fish (all hatchery programs combined) to natural spawning populations outside of the Yankee Fork would be monitored, and expected to be at less than 5%, as proposed in the guidelines of the Hatchery Scientific Review Group (HSRG) (HSRG 2004)[2].

[2] Program fish and those released from other hatchery programs that are not integrated with a population must make up less than 5% of the natural spawning escapement, according to the HSRG recommendations (2004a). Because

- Escapement priorities are: (1) hatchery broodstock, and (2) Tribal harvest and natural spawning.
- The Tribal harvest rate would be up to 8% of adult returns in excess above broodstock needs. The harvest rate is guided by a sliding scale based on natural-origin adult returns to the Yankee Fork weir. These harvest rates were established for the Salmon River basin hatchery programs in the Shoshone-Bannock Tribal Resource Management Plan (Shoshone-Bannock Tribes 2010), and were approved by NMFS in its Biological Opinion (NMFS 2013a) on the Tribal Resource Management Plan (Appendix B). Harvest rate management included in the plan guides broodstock and escapement objectives for Chinook salmon in the analysis area.

Phase 2: Discontinue Use of Sawtooth Hatchery Smolts Adults and Use Locally Adapted Broodstock

Phase 2 would be triggered when the 5-year running geometric mean return to Yankee Fork increases to 1,000 Chinook salmon (natural-origin plus hatchery-origin). Adult run sizes would be monitored at the weir. In Phase 2, the program would shift to the use of only locally returning adults for hatchery broodstock. As in Phase 1, approximately 358 adults would be needed for hatchery broodstock to produce 600,000 smolts. Specific adult management criteria and adult use priorities were developed during ESA review and consultation process or through adaptive management. Phase 2 Chinook salmon program components would be as follows:

- Escapement priorities are as in Phase 1: (1) hatchery broodstock, and (2) Tribal harvest and natural spawning. Specific adult management criteria and adult use priorities would be developed during the future ESA review and consultation process or through adaptive management.
- Produce 1,000 Chinook salmon (natural-origin plus hatchery-origin) for Tribal harvest and 500 Chinook salmon (natural-origin plus hatchery-origin) for natural spawning. Terminate outplanting surplus Sawtooth Hatchery adults to the Yankee Fork and terminate the use of Sawtooth broodstock for this program if and when this goal is achieved. If adult returns are below 400 adults for two consecutive years, the program will return to Phase 1 management.
- A return to Phase 1 management allows for the use of Sawtooth Hatchery adults for broodstock for releases of juvenile Chinook salmon to the Yankee Fork.
- Collect all Yankee Fork broodstock at the Pole Flat weir. Collect natural-origin and hatchery-origin adults (358 needed) over the entire migration run in proportion to their arrival timing at the weir. Jacks would be incorporated into the broodstock at a rate not to exceed 10%, according to the HSRG guidelines (HSRG 2004).
- A sliding scale (Table 1) will be used to integrate this program with the fish that are returning to the basin naturally. The goal of the program is to achieve and maintain a

fish from multiple programs may contribute to escapement, coordination will be needed among hatchery programs to achieve the 5% stray rate criterion.

minimum of 0.5 PNI[3], though a higher PNI of 0.67 is the long-term aspiration for the population; a minimum of 25% of returning NORs will be incorporated into broodstock.

- The contribution of straying hatchery-origin fish (all hatchery releases combined) to natural spawning populations outside of Yankee Fork would be maintained at less than 5%, per HSRG guidelines(Paquet et al. 2011), through coordination with other hatchery programs.
- Harvest rates would be managed according to a set of decision rules to ensure that broodstock, harvest, and natural spawning objectives are met (NMFS 2013b).

Phase 3: Develop an Integrated Harvest Program.

Phase 3 is possible if habitat improvements proposed in the upper Salmon River and in the Columbia and Snake River basins result in substantially increased population productivity and abundance over time. While highly desirable, this is not deemed very likely in the foreseeable future. In Phase 3, the Yankee Fork program would be operated as an integrated harvest program consistent with HSRG guidelines for a contributing population (these guidelines reflect the conservation importance of a population within the evolutionarily significant unit [ESU], from most important [Primary], to moderately important [Contributing] to least important [Stabilizing]) (Paquet et al. 2011).

The trigger used to determine if Phase 3 would be implemented would be the 5-year running average (geometric mean) natural-origin returning adult escapement to the Yankee Fork. Phase 3 would be initiated when natural-origin returning adult escapement exceeded 750 adults.

Once this trigger is met, the Tribes would consult with NMFS to determine if managing Yankee Fork Chinook salmon as a Contributing population is needed to meet recovery objectives for the Snake River spring/summer-run Chinook salmon ESU. Regardless of the need to achieve ESU objectives, elimination of the hatchery program would be considered if the 5-year running average (geometric mean) natural-origin returning adult escapement to the Yankee Fork exceeded 2,000 adults.

With an average run-size of 2,000 natural-origin returning adults, the need for a hatchery program would be reconsidered because run-size would be sufficient to achieve all current conservation, harvest, and cultural objectives identified in the Tribes' Tribal Resource Management Plan (SBT 2017b). Continuation of the program might be warranted if harvest objectives are updated, particularly for Tribal communal and sport harvest.

The Chinook salmon hatchery program proposed for Yankee Fork would be implemented to achieve harvest and cultural objectives. Though harvest rates cannot be predicted without knowing the success of the program at returning adults, harvest rates are dependent on adult abundance, and would likely range from 1% to 8% when the total adult run size is less than 500 fish (hatchery plus natural-origin returns). Harvest rates would increase as run size exceeds 500 adults as described in the Tribal Resource Management Plan, which has been approved by

[3] Proportionate natural influence, a measure of selection pressure between natural and hatchery environments. See section 4.1.1.1, below.

NMFS, and is evaluated in its Biological Opinion (NMFS 2013b) for the plan. A primary objective is to maintain a minimum natural escapement of 500 adults whenever possible.

Yankee Fork Smolt Releases

Up to 600,000 yearling Chinook salmon smolts produced would be transported to the Pole Flat Campground area by a fish tanker truck, and held in acclimation ponds on site for volitional release in the spring. The smolts would be forced out after a minimum of 5 days of acclimation. On rare occasions, Chinook salmon smolts may be directly released into the river depending on conditions in the river at the time of release (e.g., presence of ice at the volitional release site).

Yankee Fork Broodstock Collection

The Yankee Fork weir would be operated in June through September, if conditions allow for safe operation, for Chinook salmon broodstock collection for the program. The Yankee Fork weir would be staffed by two individuals in the May to October period to operate the fish weir, evaluate redd counts and spawning activities, and support the evaluations of juveniles in the watershed.

Adult Outplants

The broodstock selection of Upper Salmon River stocks derived from the Sawtooth Fish Hatchery offers an opportunity to outplant adult, hatchery-origin Chinook into the upper reaches of the Yankee Fork Salmon River for volitional spawning. These outplants of hatchery stocks would only be performed when abundance at the Sawtooth Fish Hatchery exceeds the harvest and broodstock needs from the returning adults annually. The Yankee Fork is currently operating a temporary picket weir to collect returning adults. The Tribes have been performing ongoing genetic evaluations to determine the contribution of these volitionally released adults to the population in Yankee Fork.

2.2.3 Panther Creek Chinook Salmon

Panther Creek Broodstock Development

The initial Chinook salmon broodstock for the Panther Creek program would originate from the Pahsimeroi Hatchery on the Pahsimeroi River, north of Challis, Idaho. Pahsimeroi stock is within the same major population group (Upper Salmon spring/summer-run Chinook major population group) as Panther Creek. This facility is operated by IDFG. The program would begin converting to locally adapted broodstock when adult returns (both natural and hatchery) to Panther Creek average 1,000 fish over a 4- to 5-year period. At that time, surplus hatchery adults from outside the subbasin no longer would be stocked into the system unless average run size drops below 250 adults.

Approximately 214 adults would be needed for hatchery broodstock to ensure that the goal of releasing 400,000 smolts to Panther Creek is achieved. They would be collected randomly from Panther Creek throughout the entire adult migration period. The weir would be operated between the first week of June and the last week of August, 24 hours per day. Spawned adult carcasses

would be returned to the creek as a nutrient source. In addition, up to 800,000 certified disease-free eyed-eggs from Pahsimeroi Hatchery may be planted in remote egg incubators or egg-boxes spread throughout the Panther Creek drainage.

The conservation objective is to achieve a minimum natural escapement of 500 adults that would be managed for broodstock. The Tribal harvest objective is to achieve an annual harvest of 800 Chinook salmon adults.

Panther Creek Chinook Salmon Production

The Chinook salmon hatchery program proposed for Panther Creek would be implemented to accelerate re-colonization of habitat that was destroyed by historical mining activities in the basin.

Over time, Panther Creek has been the focus of habitat restoration, and an aggressive and closely monitored habitat improvement program (not funded under the Proposed Action) is continuing. In Panther Creek, the Tribes have actively protected over 5 miles of Chinook salmon spawning habitat as part of livestock fencing and restoration efforts from 2010 to 2012.

The hatchery program is designed to achieve Tribal conservation, harvest, and cultural goals in Panther Creek. The Tribes' conservation objective is to achieve a local population in Panther Creek. The harvest objective is to achieve an annual harvest rate of 500 Chinook salmon adults in Phase 1 and 800 adults in Phase 2. Though described here in some detail, final hatchery operations are described in full in the HGMP for the Panther Creek Chinook salmon program, and may be modified slightly during the ESA review and consultation process or through adaptive management.

Phase 1: Develop Local Broodstock

Phase 1 of the program would focus on developing local Chinook salmon broodstock. An outline of Phase 1 components is provided below:

- Escapement priorities are: (1) hatchery broodstock, and (2) Tribal harvest and natural spawning after broodstock needs have been met. Specific adult management criteria and adult use priorities were developed during the ESA review and consultation process and will be refined through adaptive management.
- Initially, up to 200,000 Chinook salmon smolts would be released annually into Panther Creek. Broodstock would be obtained from Pahsimeroi Hatchery, based on the recommendation from NMFS.
- In addition, up to 800,000 certified disease-free eyed-eggs from Pahsimeroi Hatchery may be planted in remote egg incubators or egg-boxes spread throughout Panther Creek. When the Crystal Springs Hatchery becomes operational, it would produce up to 400,000 smolts for release in Panther Creek. Any continuation of egg-plants following construction of the hatchery would be determined based on information collected by the monitoring and evaluation of stocking success.
- Local broodstock collection (i.e., adults returning to Panther Creek) would be initiated during this phase.

- No integrated hatchery program objectives would be applied during this phase. The contribution of straying hatchery-origin fish (all hatchery programs combined) to natural spawning populations outside of Panther Creek would be maintained at less than 5%, per HSRG guidelines (Paquet et al. 2011).
- The Tribal harvest rate would be up to 8% of adult returns when the run size is less than 108% of the broodstock target of 214 Chinook salmon. The harvest rate increases when the run size exceeds 108% of the broodstock target. A set of decision rules was developed based on the harvest rates established for the Salmon River subbasin hatchery programs in the Shoshone- Bannock Tribal Resource Management Plan (SBT 2017a) and was approved by NMFS in its Biological Opinion (NMFS 2013a) of the Tribal Resource Management Plan (SBT 2017a).

Phase 2: Discontinue Use of Pahsimeroi Hatchery Broodstock and Convert to Locally Adapted Broodstock

Phase 2 would be triggered when the 5-year running geometric mean return to Panther Creek increases to 1,000 Chinook salmon (hatchery-origin plus natural-origin returning adult). Adult run sizes would be monitored at the Panther Creek weir. Under this phase, local broodstock would be used. Specific adult management criteria and adult use priorities were developed during ESA review and consultation process or through adaptive management. A preliminary description of the Phase 2 program is as follows:

- Escapement priorities are: (1) hatchery broodstock (approximately 214 adults needed to produce 400,000 smolts), and (2) Tribal harvest and natural spawning.
- Collect 358 returning adults for broodstock. Achieve returns of 800 Chinook salmon (natural-origin plus hatchery-origin returning adults) for Tribal harvest and 500 Chinook salmon (natural-origin plus hatchery-origin returning adults) for natural spawning.
- Collect all Panther Creek broodstock at the weir. Collect natural-origin and hatchery-origin returning adults at random over the entire migration run. Jacks would be incorporated into the broodstock at a rate not to exceed 10%, according to the HSRG guidelines.
- A sliding scale (Table 1) will be used to integrate this program with the fish that are returning to the basin naturally or from adult produced by eggboxes. Fish will be imported from Pahsimeroi Hatchery for use as broodstock when NOR + HOR returns are fewer than 200 adults for two consecutive return years. Based on returning adult numbers, it appears that natural-origin adults would be available for broodstock. The goal of the program is to achieve and maintain a minimum of 0.5 PNI, though a higher PNI of 0.67 is the long-term aspiration for the population; a minimum of 25% of returning NORs will be incorporated into broodstock.
- The contribution of straying hatchery-origin fish (all hatchery releases combined) to natural spawning populations outside of Panther Creek would be maintained at less than 5% (HSRG 2004a).

- Harvest rates would be managed according to a set of decision rules set out in the Tribal Resource Management Plan (Appendix B) to ensure that broodstock, harvest, and spawning objectives are met, on average, over the long term.
- The program may return to Phase 1 management if adult returns to Panther Creek (natural-origin plus hatchery-origin returning adults) are less than 250 Chinook salmon for two years in a row. A return to Phase 1 management allows for the use of Pahsimeroi Hatchery adults for broodstock.

Program objectives may be revised in the future if a determination is made that an additional viable (Contributing) population is needed to recover the ESU. Such a decision would not affect the implementation of Phase 1 and Phase 2. Consultation with NMFS would be triggered when the 5-year running average (geometric mean) of natural-origin fish escapement in Panther Creek exceeds 750 adults. If and when this number is achieved, the Tribes would request a status review of the Panther Creek population to determine if the Panther Creek program could be converted to an integrated hatchery program designed to achieve criteria for a Contributing population as recommended by the HSRG[4] (HSRG 2004).

Panther Creek Smolt Releases

Approximately 400,000 yearling Chinook salmon smolts would be transported to Panther Creek in a fish tanker truck to an acclimation pond for volitional release in the spring. The smolts would be forced out after a minimum of five days of acclimation. On rare occasions, Chinook salmon smolts may be directly released into the river depending on conditions in the river at the time of release (presence of ice at the volitional release site).

Panther Creek Egg Boxes

Eggs are supplied by Pahsimeroi Hatchery (segregated brood) when a surplus exists, and the target will be 800,000 eggs. The egg box component is expected to continue for 5-8 years (up to 2022); however, effectiveness monitoring will determine if the eggbox component will continue or be modified during that time. Continued use of egg boxes will depend on whether the Panther Creek component of Crystal Springs Hatchery is operating at capacity as well as how effective the egg boxes are at returning adults. Locations of egg boxes will vary from year to year, in an effort to monitor survival by location and box type, dispersal from egg boxes, and rearing preferences.

Panther Creek Broodstock Collection

The Panther Creek weir would be operated from June through September for Chinook salmon broodstock collection for the Panther Creek Program. The Panther Creek weir would be staffed

[4] HSRG criteria for hatchery influence on Contributing populations: the proportion of effective hatchery-origin spawners should be less than 10% of the naturally spawning population, unless the hatchery population is integrated with the natural population; for integrated populations, the proportion of natural-origin adults in the broodstock should exceed the proportion of effective hatchery-origin spawners, corresponding to a proportionate natural influence value of 0.50 or greater and a proportion of effective hatchery-origin spawners less than 30%.

by two individuals in the May to October period to operate the fish weir, evaluate redd counts and spawning activities, and support the evaluations of juveniles in the watershed.

Panther Creek Adult Outplants

Until the pathogen risks of outplanting adults from an out-of-basin stock are adequately evaluated, all Chinook salmon stocking in Panther Creek would consist of egg outplants and smolt releases.

2.2.4 Research, Monitoring, and Evaluation

Surveying and sampling to assess program objectives and goals may increase the risk of injury and mortality to salmon and steelhead that are the focus of the actions, or that may be incidentally encountered. RM&E activities in the watersheds are either related directly to the hatchery programs described in this EA or may be for other programs in each watershed—only certain RM&E activities are part of the current proposed action. RM&E may include monitoring survival and growth within hatcheries and sampling outside of hatcheries, to assess the effects of hatchery fish on population, productivity, genetic diversity, run and spawn timing, spawning distribution, and age and size at maturity. This information may be collected from:

- Spawning ground surveys to assess distribution and origin (hatchery or natural) of spawners through marking (i.e., coded-wire tags [CWT] and adipose fin-clips)
- Stock composition sampling (genetics, disease) to determine population age, sex, and size distribution
- Juvenile sampling in the hatchery to determine smoltification status, size distribution, and precocial maturation
- Smolt trapping using screw traps in both Yankee Fork and Panther Creek to determine emigration timing, and size of juveniles
- Smolt trapping and tagging using seines, nets, or electrofishing to evaluate habitat use and population densities
- Passive integrated transponder (PIT) tagging to track downstream migration of juveniles and provide information on residualism rates of hatchery fish, and to determine emigration timing, population abundance, overwinter survival, and emigration survival of natural-origin fish.

2.2.5 Operation and Maintenance

The Sawtooth and Pahsimeroi hatcheries used for operation of programs included in this EA divert surface water and return it to the diverted waterbody (minus any leakage and evaporation). Both surface and groundwater used at all facilities are withdrawn in accordance with state-issued water rights. All facilities are being evaluated against the (NMFS 2011) screening and passage criteria. The proposed strategy to determine compliance and prioritize needs is based on entrainment risks and specific compliance concerns. Modifications and upgrades are based on the prioritized list and acted upon as funding becomes available.

For additional information regarding facility water sources for each program, refer to Subsection 3.9, Water Quality, Water Quantity, and Hydrology, of this EA, and to the Biological

Opinion recently issued for upper Salmon River Chinook salmon programs (NMFS 2017a) as well as the Environmental Assessment prepared for several programs in the Snake Basin, including Sawtooth and Pahsimeroi (NMFS and NOAA 2019). Programs that rear over 20,000 pounds of fish annually do not require an individual permit, but operate under applicable National Pollutant Discharge Elimination System (NPDES) general permits.

Several routine (and semi-routine) maintenance activities occur in or near water that could impact fish in the area including sediment/gravel removal/relocation from intake and/or outfall structures, pond cleaning, pump maintenance, debris removal from intake and outfall structures, and maintenance and stabilization of existing bank protection.

Routine maintenance activities occur at least annually and include pond cleaning, pump maintenance, minor debris removal from intake and outfall structures, ladders, and traps; building maintenance such as painting, roofing, and other repairs; grounds maintenance on already established grounds such as mowing, weed trimming, and herbicide application; road or driveway maintenance; equipment maintenance such as auto and tractor maintenance; and generator maintenance. All in-water maintenance activities considered routine are performed by the co-managers within existing structures or the footprint of areas that have already been impacted. Minor armoring rocks are also maintained as necessary at intake diversions, fish ladders, and outfalls. Best management practices (BMPs) are implemented to minimize effects on adjacent terrestrial habitats and waterbodies.

Semi-routine maintenance activities occur with a frequency of every 5 to 10 years. Examples include in-stream (below the ordinary high water mark [OHWM]) work such as clearing gravel and major debris blockages from water intakes and outfalls after larger flood events; minor bridge repairs; addressing equipment failures such as intake pumps and screening structures; and weir, ladder, and trap maintenance. Minor armoring is maintained at the intake diversions, fish ladders, and effluent outfall. All facilities are expected to conduct some form of semi-routine maintenance activity. When maintenance activities occur within active stream channels, they are implemented under the following conditions:

- In-water work:
  - Is done during the allowable freshwater work times established for each location, or complies with an approved variance of the allowable freshwater work times with IDFG, NMFS, and USFWS
  - Follows a pollution and erosion control plan that addresses equipment and materials storage sites, fueling operations, staging areas, cement mortars and bonding agents, hazardous materials, spill containment and notification, and debris management
  - Ceases if fish are observed in distress at any time as a result of the activities
  - Includes notification of NMFS staff
  - Is conducted using equipment retrofitted with vegetable-based synthetic fuel oil
- Equipment:
  - Is inspected daily, and is free of leaks before leaving the vehicle staging area
  - Works above OHWM or in the dry whenever possible
  - Is sized correctly for the work to be performed and has approved oils/lubricants when working below the OHWM

- Is staged and fueled in appropriate areas 150 feet from any waterbody
- Is cleaned and free of vegetation before it is brought to the site and prior to removal from the project area

2.3 Alternative 3, Reduced Production

A second option (Alternative 3) has been developed that considers a 50 percent reduced production of Chinook salmon alternative for both the Yankee Fork and the Panther Creek programs. This alternative would operate identically to Alternative 2 except that the Yankee Fork program releases would be reduced to around 300,000 smolts, and the Panther Creek program would be reduced to releasing around 200,000 smolts. Under this alternative, broodstock collection levels would also be reduced by half to reflect the lower production targets, but all other aspects of the programs described above would be similar. By reducing production by 50%, the number of returning adults would be reduced as well. The primary purpose for engaging in production actions in both Yankee Fork and Panther Creek watersheds is to increase abundance to support Tribal treaty harvest. Nonetheless, NMFS will analyze this alternative to assist with a full understanding of potential effects on the human environment under various management scenarios.

2.4 Alternative 4, Program Termination/No production

Under this alternative, NMFS would determine that the hatchery programs described in the HGMPs do not meet the criteria for 4(d) determinations and all actions related to those programs would be terminated. This termination would occur whether or not those actions may already have existing ESA authorizations. Neither of the hatchery programs would operate under this alternative, and would not produce Chinook salmon smolts for the Yankee Fork or Panther Creek.

With the complete termination of hatchery programs, facilities would not be used for these programs, though they may continue to operate for other salmon or steelhead programs described by NMFS (2014) and USFWS (NMFS 2017d; 2017b; 2017c; 2017a).

This alternative would not provide sufficient hatchery production to contribute to the survival and recovery of the ESA-listed Chinook salmon or steelhead in the Snake river Basin. Tribal reserved fishing rights would not be fulfilled, and requirements to mitigate for lost natural-origin salmon production under *U.S. v Oregon* for the Snake River Basin would not be met. Further, production and adult return goals for the LSRCP would not be met. Nonetheless, NMFS will analyze this alternative to assist with a full understanding of potential effects on the human environment under various management scenarios.

2.5 Alternatives Considered but not Analyzed in Detail

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

2.5.1 Hatchery Programs with Increased Production Levels

Under this alternative, NMFS would issue an ESA 4(d) determination for increased production levels associated with the hatchery programs, as compared to the level described in the HGMPs. This alternative is not analyzed in detail because substantially higher production levels may have a higher level of adverse impacts outside of the hatchery facility (e.g., competition and predation on other fish species). Additionally, it is unlikely that increased production for these programs could occur without major construction of new facilities that would be beyond the scope of the action considered. Thus, this alternative may result in adverse impacts and would not meet NMFS's purpose and need to protect and conserve listed species.

2.5.2 Hatchery Programs with Other Decreased Production Levels

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

2.5.3 Increased Harvest to Reduce Hatchery Fish on Spawning Grounds

Fishery harvest could be increased in the Salmon River subbasins to reduce the number of hatchery-origin adults on spawning grounds to reduce genetic and ecological risks of hatchery-origin fish interacting with natural-origin fish. However, this is likely not possible without also increasing impacts on ESA-listed fish in the project area that are incidentally taken while removing the hatchery-origin adults, which may require an ESA consultation. A harvest fishery is not a necessary component of the proposed programs, and other methods of reducing the number of hatchery-origin adults on the spawning ground are considered under Alternative 1 and Alternative 2.

3 Affected Environment

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

- Listed Species – Subsection 3.1
- Non-listed Species – Subsection 3.2
- Fish Habitat – Subsection 3.3
- Tourism and recreation – Subsection 3.4
- Environmental Justice – Subsection 3.5
- Cultural Resources – Subsection 3.6
- Socioeconomics – Subsection 3.7
- Human Health and Safety – Subsection 3.8
- Water Quality, Water Quantity, and Hydrology – Subsection 3.9
- Land Use and Ownership – Subsection 3.10
- Transportation – Subsection 3.11

Internal scoping identified no other resources that would potentially be impacted by current operation, the Proposed Action, or other alternatives. Production and operation details are included in this EA. As previously noted in Subection 1.2, Project Area and Analysis Area, the geographic scope of the analysis area is specific to each resource being analyzed. For some resources, the analysis 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 Listed Species

3.1.1 ESA-Listed Salmon and Steelhead Populations

The Yankee Fork and its tributaries are known to support three listed fish species: Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), and bull trout (*Salvelinus confluentus*)(Gamett and Bartel (2008) as cited in BPA et al. (2017)). These three species are present in the Salmon River basin, where they may be impacted by the Yankee Fork and Panther Creek weir facilities.

Table 2. Federal Register Notices for Endangered Species Act-Listed Fish Species in the Yankee Fork and Panther Creek Analysis Areas

Species	Listing	Critical Habitat Designation	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Snake River Spring/Summer	Threatened, 57 FR 29542 (April 22, 1992), 123 FR	64 FR 57399 (Oct. 25, 1999)	70 FR 37160

	37192 (June 28, 2005), 79 FR 20802 (April 14, 2014)		
Steelhead (*Oncorhynchus mykiss*)			
Snake River Basin	Threatened, 71 FR 834 (Jan. 5, 2005), updated 79 FR 20802 (April 14, 2014)	70 FR 52630 (Sept. 2, 2005)	70 FR 37160
Bull Trout (*Salvelinus confluentus*)			
Coterminous United States Distinct Population Segment	Threatened, 64 FR 58910 (November 1, 1999)	75 FR 63898	63 FR 31647

The Snake River Spring/summer-run Chinook Salmon ESU includes all naturally spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins, as well as 11 artificial propagation programs (Jones Jr. 2015; NWFSC 2015). Twenty-eight historical populations (4 extirpated) within five Major Population Groups (MPGs) comprise the Snake River Spring/summer-run Chinook Salmon ESU. The natural populations are aggregated into the five extant MPGs based on genetic, environmental, and life history characteristics. The Upper Salmon River MPG includes nine historical populations one of which, Panther Creek and Yankee Fork are included.

The Yankee Fork has had various levels of hatchery influence since 1966 (SBT 2017b). In early years, predominantly Rapid River broodstock were used for releases in the Yankee Fork between 1966 and 1989 (Kiefer et al. 1992) but Sawtooth broodstock were also used. More recently, both Sawtooth and Pahsimeroi adults have been used to supplement the Yankee Fork, and long-term plans are to capture broodstock from Yankee Fork for the program. The spring/summer Chinook salmon in the hatchery program are included in the ESA listing (70 FR 37160). The current program is intended to increase abundance primarily to support tribal treaty harvest.

The Panther Creek Chinook population was extirpated by the 1970s primarily due to mining activities (HSRG 2009a; 2009b), and is one of five populations in the Upper Salmon MPG which do not currently have ongoing artificial production. Rapid River stock fingerlings were released into Panther Creek in 1977 and 1986 (Kiefer et al. 1992), however reintroduction efforts were abandoned soon after. Mine clean- up efforts have improved water quality, and Panther Creek and habitat conditions are currently good enough to support bull trout and steelhead (HSRG 2009b). Some Chinook of unknown origin have begun to use Panther Creek in recent years, and

Panther Creek is supporting a small population. Reintroduction efforts are expected to accelerate population growth.

The Snake River Basin Steelhead DPS includes all naturally spawned anadromous *O. mykiss* originating below natural and manmade impassable barriers in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (NWFSC 2015). The Snake River Basin Steelhead DPS comprises twenty-four historical populations within six MGPs comprise the Snake River Basin Steelhead DPS. Inside the geographic range of the DPS, 19 hatchery steelhead programs are currently operational, but none are in Yankee Fork or Panther Creek.

Bull trout are known to be present within the Yankee Fork and Panther Creek drainages and both drainages have been designated as critical habitat for bull trout. Bull trout distribution and densities in the Yankee Fork are limited by a number of historic and present activities in the drainage which have degraded habitat and water quality. Data collected from the Salmon-Challis National Forest Fisheries database, indicates that 95% of the bull trout occupancy is located in the upper watershed of the Yankee Fork. Information on bull trout use of Panther Creek is limited to several electrofishing surveys conducted by USFS between 2005 and 2013. Like Yankee Fork, Juvenile fish would be expected to rear in the headwater streams outside of the where habitat and water temperature conditions would be more favorable than the mainstem Panther Creek. Hatchery Programs have not been implemented for bull trout.

3.2 Non-listed Species

Yankee Fork and its tributaries are known to support at least four other fish species: rainbow trout (*O. mykiss*), westslope cutthroat trout (*O. clarkii lewisi*), mountain whitefish (*Prosopium williamsoni*), and sculpin (presumably shorthead sculpin [*Cottus confusus*] and mottled sculpin [*Cottus bairdii*]) (Gamett and Bartel 2008; USFS 2006; USFS 2013a as cited in BPA et al. (2017)). Hatchery fish will be released in areas that these fish occur. Whitefish are typically constrained to the larger sections of the mainstem Yankee Fork. Rainbow trout and sculpin use the mainstem and some of the larger tributaries, while cutthroat trout are mostly found in headwater tributaries. Non-native species have not been collected in U.S. Forest Service (USFS) fish survey efforts in the Yankee Fork (Gamett and Bartel 2008 as cited in BPA et al. (2017)).

Panther Creek surveys (conducted by USFS fish biologists between 2006 and 2014) collected fish from Panther Creek and its tributaries, including brook trout, apparent bull trout-brook trout hybrids, rainbow trout, westslope cutthroat trout, various unidentified whitefish species, and various unidentified sculpin species (Garcia, pers. comm., as cited in BPA (2017)). The drainage is also believed to provide habitat suitable for and accessible to redside shiner, northern pikeminnow, Pacific lamprey, and river lamprey (Salmon-Challis National Forest 2008 as cited in BPA et al. (2017)).

Hatchery programs have not been used to support any of the unlisted species. Hatchery-produced Chinook salmon from the programs will share space, though microhabitat preferences specific to the species will be different.

3.3 Fish Habitat

The section of the Yankee Fork where the weir is installed is mostly cobble bottomed and has a mixture of usable habitats. The stream is bordered by a paved road adjacent to the site, which limits vegetation growth for concealment habitat on the east side of the stream. Habitat conditions seem to be favorable for juvenile salmon and steelhead, as well as resident trout and other native fish species.

Much of the mainstem Yankee Fork upstream of the site has been heavily altered by dredging associated with mining for gold that took place prior to 1952. The Yankee Fork gold dredge shifted the main flow pattern and reduced the floodplain in much of the Yankee Fork valley bottom. The channel is constrained by tall gravel tailing piles throughout the floodplain. These tailings mostly lack vegetation to this day (BPA et al. 2017). The lack of vegetation next to the stream is likely leading to higher water temperatures from lack of shade and decreased natural large wood input to the stream. A lack of large wood results in reduced habitat complexity with few pools that provided beneficial temperatures and cover. Aquatic habitat surveys conducted by the USFS in 2001 and 2010 (BPA et al. 2017) (USBWP 2005; USFS 2010) indicate a low number of pools, high width-to-depth ratios, sub-optimal spawning and rearing habitat, and low large wood loading in the mainstem, particularly downstream of Jordan Creek. In general, there is sufficient water quality and quantity in the Yankee Fork such that normal migration, reproduction, growth, foraging, and survival are not limited.

The section of Panther Creek adjacent to the proposed fish trapping and acclimation facility has mostly cobble bottom and a mixture of several different types of usable habitats. The stream is bordered by an improved gravel roadway adjacent to the site, resulting in a very little vegetation growth along the west side of the stream. The stream is located in a steep-sided valley with dense forest along its east bank. Habitat conditions seem to be favorable for juvenile salmon and steelhead, as well as resident trout and other native fish species, with structurally complex in-stream habitat and suitable spawning habitat.

Over time, Panther Creek has been the focus of habitat restoration, and an aggressive and closely monitored habitat improvement program (not funded under the Proposed Action) is continuing. In Panther Creek, the Tribes have actively protected over 5 miles of Chinook salmon spawning habitat as part of livestock fencing and restoration efforts from 2010 to 2012. In general, there is sufficient water quality and quantity in Panther Creek such that normal migration, reproduction, growth, foraging, and survival are not limited.

The effects of the ongoing operation of 49 hatchery programs in the Snake River Basin programs included in the Mitchell Act FEIS (NMFS 2014) are expected to remain unchanged from past effects, which have shown that they have little or no impact on fish habitat.

3.3.1 Critical Habitat and Essential Fish Habitat

ESA-listed species have specially designated Critical Habitat that is used in this EA to describe fish habitat. Critical habitat has been designated in the Upper Salmon River Basin and the Pahsimeroi River for the Snake River Spring/Summer Chinook Salmon ESU, and Snake River Basin Steelhead DPS. Both programs are within designated critical habitat. Within designated

critical habitat, NMFS identifies physical and biological features, also called primary constituent elements (PCEs), such as freshwater spawning and rearing sites, as well as freshwater estuarine migration corridors. These features are essential to the conservation of the listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration, and foraging). PCEs for Snake River spring/summer-run Chinook salmon that may be impacted by the Proposed Action are shown in Table 3.

Table 3. PCEs identified for Snake River spring/summer-run Chinook salmon.

Habitat Component	Primary Constituent Elements (PCEs)
Spawning and juvenile rearing areas	1) water quality 2) water quantity
Juvenile migration corridors	1) substrate 2) water quality 3) water quantity 4) water temperature 5) water velocity 6) safe passage
Adult migration corridors	1) substrate 2) water quality 3) water quantity 4) water velocity 5) safe passage

NMFS has prepared a biological opinion (NMFS 2017a) that considers the effects of the two hatchery programs relevant to the EA on ESA-listed salmon and steelhead. In the 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). The biological opinion provides an analysis of hatchery program effects on essential fish habitat (EFH), defined under the Magnuson-Stevens Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC § 1802(10)). EFH has been designated for Chinook salmon in the Upper Salmon River, and NMFS recognizes the need to consider EFH in

terms of the need to minimize risks from hatchery water withdrawals and genetic and ecological interactions of hatchery-origin fish with natural-origin fish.

The U.S. Fish and Wildlife Service (USFWS) designated critical habitat for bull trout in 2004 and revised their designation in 2010 (69 FR 59995 and 75 FR 63898, respectively). The collection and release sites for the Yankee Fork and Panther Creek lie within habitat designated critical for bull trout. PCEs for bull trout that may be impacted are:

- Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.
- Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
- Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass), interbreeding (e.g., brook trout), or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

3.4 Tourism and recreation

Recreation is an important use of the area immediately surrounding the Yankee Fork weir facility. Within the area surrounding the facility, there are 11 developed recreation sites within 5 miles. Most of these are located immediately off Yankee Fork Road, which serves as a primary access road into the Salmon-Challis National Forest.

The area's campgrounds see heavy use throughout the summer season (typically June through September, although some operate on the shoulder months of May and October, and, weather permitting, some may be accessible through November), and are often at capacity on weekends (Callaghan pers. comm. as cited in BPA et al. (2017)). They are popular with anglers because of their proximity to the Yankee Fork. Campgrounds are maintained from late May through mid-October.

In addition to these developed facilities, dispersed recreation occurs throughout the analysis area. At least three dispersed camping areas are also located within the analysis area, along with a motorized ATV trail within 1 mile of the Yankee Fork weir facility (Callaghan pers. comm. as cited in BPA et al. (2017)).

Angling is a popular draw to the Yankee Fork area. Historical tourism is another attraction. Like many rivers in Idaho, the Yankee Fork was heavily mined throughout the last two centuries. The analysis area includes some of the region's most popular historical interpretive sites: the ghost towns of Bonanza and Custer (both abandoned mining towns) and an abandoned mining dredge. USFS personnel and volunteers staff these sites during the summer season to provide educational and interpretive services. No data are available to estimate the annual visitation to the individual sites within the analysis area (Callaghan, pers. comm., as cited in (BPA et al. 2017)).

The Yankee Fork is also used by whitewater kayakers. The river is used for 27 miles, from north of the Eleven Mile Canyon Recreation Area down to the confluence with the Salmon River. This reach includes the analysis area. It is used primarily in spring and early summer, until declining flows leave the river too rocky for boating (BPA et al. 2017).

The area surrounding the Panther Creek weir facility receives light-to-medium recreational use, which is less use than other parts of the Salmon-Challis National Forest because of its distance from population centers (USFS 1988). In addition to the Cobalt Work Center, two developed recreation areas are located within 5 miles of the Panther Creek weir facility:

- Deep Creek Campground—3 campsites
- McDonald Flat Campground—6 campsites

Dispersed recreation is allowed throughout the analysis area, including camping, hiking, and horseback riding. No data are available to estimate the annual visitation to the sites within the analysis area (Callaghan, pers. comm., as cited in (BPA et al. 2017)).

Panther Creek is also used by whitewater kayakers; however, they primarily run the river from Trapper Flat, approximately 7 miles downstream of the proposed Panther Creek weir facility (American Whitewater 2016 as cited in BPA et al. (2017)). Therefore, recreational boating (kayaking) is not expected to occur in the river in the vicinity of the proposed facility.

3.5 Environmental Justice

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. Changes in hatchery production, such as changes to the two hatchery programs that are the subject of this EA, have the potential to affect the extent of fish harvest available for subsistence and economic purposes for minority and low-income populations.

For the environmental justice analysis, 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.

Both counties in the analysis area qualify as communities of concern; based on minority population and low-income thresholds and one qualifies as low-income only (Table 4). 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. .

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 on commercial, subsistence, and recreational harvest opportunities are examined for any effect on tribal and low-income harvest. All tribes identified in Subsection 3.6, 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 US EPA guidance; guidance regarding environmental justice extends beyond statistical threshold analyses to consider explicit environmental effects on Indian tribes (EPA 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.

Table 4. Population and Income in affected counties.

State, County	Total Population (2016 estimates)	Percent Non White	Percent Indian	Percent Hispanic	Poverty Rate Percent	Per Capita Income $ (2016)
Idaho						
Statewide Reference Area	1,635,483	17.2	1.1	12	18.0	$24,280
Lemhi County	7,875	6.5	1.2	3.2	17.7	$21,953
Custer County	4,172	8.2	0.9	4.8	15.7	$23,624

Source:U.S. Census Bureau (2014) 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).

3.6 Cultural Resources

Tribes of the Columbia River Basin have depended on salmon for subsistence purposes and attach great cultural importance to salmon for ceremonial purposes 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. 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. Though fish from these programs are available in downstream fisheries, they primarily support tribal fishing in terminal areas. Additionally, excess or surplus adult salmon from the hatchery programs included in this EA may be provided to tribes for direct consumption or for tribal fisheries. The Mitchell Act FEIS provides more details about the importance of salmon to Indian culture (NMFS 2014).

The programs are co-managed by the Shoshone-Bannock Tribes, and primarily support fishing in areas accessible to the Shoshone-Bannock Tribes. Therefore, the Shoshone-Bannock Tribes is most directly affected; however, the following Indian tribes are located within the analysis area

(Figure 2) 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
- 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 generally enjoy the exclusive right to take 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.

3.6.1 Shoshone-Bannock Tribes

The Shoshone-Bannock Tribes consist of the Northern Shoshone and the Bannock Bands. In 1868, the Shoshone and Bannock Tribes were granted 1.8 million acres in southeastern Idaho under the Fort Bridger Treaty, establishing the Fort Hall Indian Reservation. Today, this reservation is home to the Shoshone-Bannock Tribes in Idaho between the cities of Pocatello, American Falls, and Blackfoot and comprises land in Bingham, Power, Bannock, and Caribou Counties (Figure 2). The Shoshone-Bannock tribes have historically fished for salmon below Shoshone Falls on the Snake River (USEPA 2016 as cited in BPA et al. (2017)) and in the upper Salmon River subbasin.

Under the guidance of the 1868 Treaty, members of the Shoshone-Bannock Tribes primarily fish in the Salmon and Snake Rivers in Idaho. In 2008, the Shoshone Bannock Tribes signed an accord with several agencies to fund ongoing projects that benefit Snake River fisheries. The Tribes were the first to petition to list Snake River sockeye salmon as endangered. The Shoshone-Bannock Tribes are co-managers of fish resources in the analysis area and operate both programs.

3.6.2 Nez Perce Tribe

The Nez Perce Tribe has lived in and held historical and cultural ties to the greater Columbia River Basin, although the Nez Perce Tribe Reservation is located in north-central Idaho (Figure 2). The Tribe has several fishing locations spread throughout most of the Columbia and Snake River basins (CRITFC 2018).

Under the guidance of the 1855 Treaty, the Nez Perce Tribe co-manages fisheries resources, including hatchery programs, within the analysis area through the Tribe's Department of Fisheries Resources Management Program. The Tribe works and coordinates with state, Federal, and Tribal entities while monitoring fish resources within the region. Tribal members also fish on the Clearwater River, which runs through the Nez Perce Indian Reservation on the Selway

River in the Clearwater River subbasin, on the Rapid River in the Salmon River subbasin, and on the Columbia River outside of the analysis area.

3.6.3 Confederated Tribes and Bands of the Yakama Nation

The Confederated Tribes and Bands of the Yakama Nation includes 14 tribes (CRITFC 2018b). The Yakama Indian Reservation is located at the base of Mount Adams in central Washington (Figure 2). The Yakama Nation has historically depended on the Columbia River and salmon for subsistence. The Yakama Nation has primarily harvested fish in the Columbia River between Bonneville and McNary Dams, Columbia River tributaries including the Yakima and Kickitat rivers, and in Icicle Creek (a tributary of the Wenatchee River). Although ceded lands of the 1855 Treaty encompassed 12 million acres, tribal elders have stated that historically their tribes have traveled as far north as Canada and south to present-day California. The Yakama Nation may have usual and accustomed places within the analysis area.

3.6.4 Confederated Tribes of Umatilla Indian Reservation

The Confederated Tribes of the Umatilla Indian Reservation includes the Umatilla, Walla Walla, and Cayuse Tribes (CRITFC 2018c). These tribes have long depended on the abundant fisheries in the Columbia Plateau, historically living around the confluence of the Yakima, Snake, and Walla Walla Rivers. The Cayuse lived "...south of and between the Nez Perces and Wallah-Wallahs, extending from the Des Chutes or Wawanui river to the eastern side of the Blue Mountains. It [their country] is almost entirely in Oregon, a small part only, upon the upper Wallah-Wallah river, lying within Washington Territory" (CTUIR 2018). The Umatilla tribes traveled over vast areas to take advantage of salmon and steelhead runs, traditionally fishing the Columbia and Snake Rivers, and the Imnaha, Tucannon, Walla Walla, Grande Ronde, Umatilla, John Day, Burnt, and Powder Rivers of northeastern Oregon and southeastern Washington (USBOR 1988).

Tribal members typically harvest spring, summer, and fall Chinook salmon and steelhead in the Columbia River and its tributaries located in southeastern Washington and northeastern Oregon. The confederation has co-management responsibilities of fishery activities within the Columbia, Snake, Walla Walla, Tucannon, and Grande Ronde Rivers, including operation of hatcheries in tributaries to the Snake River in northeastern Oregon. Because of the close historical relationship and geographic proximity of the Confederated Tribes of Umatilla Indian Reservation to the project area (Figure 2), the Confederated Tribes may have usual and accustomed places within the analysis area.

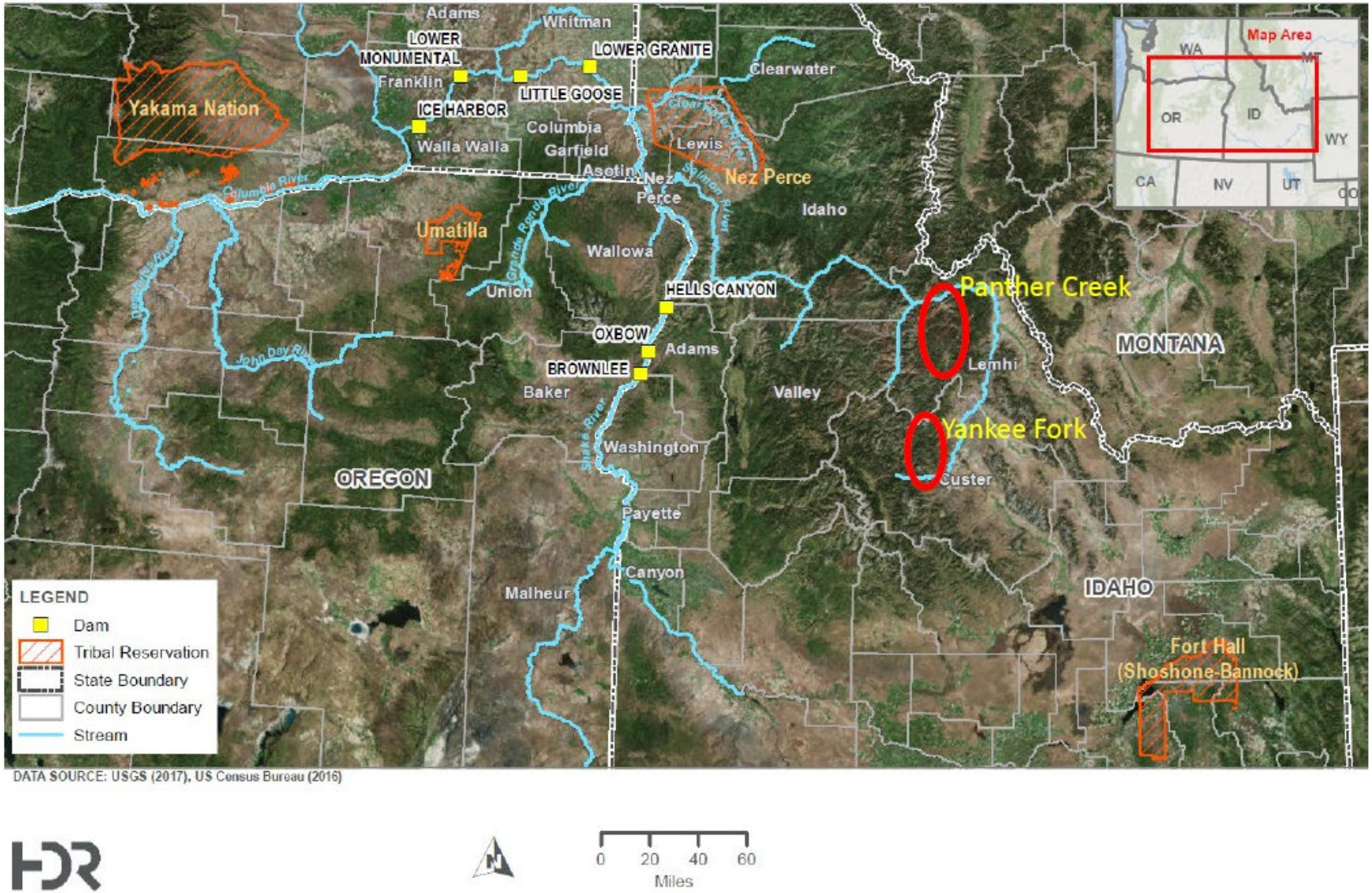

Figure 2. Map of analysis area for cultural resources and environmental justice showing counties and Tribal reservations.

3.7 Socioeconomics

Both programs would be operated in rural areas of Idaho with small populations. The Yankee Fork fish release site is located in Custer County within the Salmon-Challis National Forest. The nearest community is Stanley, Idaho, which has a population of less than 100. The Panther Creek fish release site is located in Lemhi County, also within the Salmon-Challis National Forest. The the nearest population center, Salmon, Idaho, is about two hours driving time away and has a population of about 3,000 (U.S. Census Bureau 2014). Custer and Lemhi Counties are more rural than the regional analysis area overall and have a greater proportion of workers employed in the natural resources and farming industries; however people in the area may benefit from commercial and recreation fishing opportunities.

Hatchery programs affect socioeconomic conditions by providing fish for commercial and recreational fishing opportunities, employment, and economic opportunities through hatchery operations. Hatchery-related spending affects the economy in the community surrounding the hatchery, and those economic impacts can extend outward, having a wider regional effect. The analysis area for socioeconomics is limited to the Snake River Basin upstream from Ice Harbor Dam, with the focus on economic impacts of hatchery operations.

One important impact hatchery programs can have on social economics is through tribal and nontribal commercial and recreational fisheries that target hatchery fish. Changes in hatchery production levels can create beneficial or adverse effects on harvests, which would affect the industries and communities that depend on them.

Tribal and sport fisheries occur each year in the Salmon River basin. Current harvest opportunities for Shoshone-Bannock Tribal members provide an estimated half-a-pound of salmon per person, compared to historical use of at least 583 pounds per person (Meyer 1997). The Tribes' Tribal Resource Management Plan harvest framework establishes harvest guidelines for each watershed in the Salmon River basin based on the size of the returning runs. Tribal harvest in the Salmon River basin has averaged roughly 789 fish per year between 2008 and 2014, with a low of 300 and a high of 1,015 fish harvested. In the Yankee Fork, Tribal members harvested a total of 266 spring and summer Chinook salmon between 2008 and 2014. For the past seven years, Panther Creek has had a harvest limit of three Chinook salmon per season (the lowest possible harvest amount allocated to a watershed, based on Tribal harvest guidelines). While it has never been closed to fishing, Tribal creel surveys have not recorded a catch in Panther Creek since 2001 (Stone, pers. comm., 2015 as cited in (BPA et al. 2017)).

Total recreational harvest in the basin removes over 7,800 fish per year, with approximately 20 angler hours spent per fish. An average of nearly 1,300 spring/summer Chinook salmon were harvested by sport anglers in the upper portion of the basin between 2008 and 2014, accounting for about 16% of the total recreational harvest. State-managed recreational fisheries on spring/summer Chinook salmon primarily target hatchery-origin fish returning to the Sawtooth and Pahsimeroi Hatcheries, and do not currently occur within Panther Creek and Yankee Fork; however, mainstem Salmon River fisheries may encounter fish returning to these areas. . Both Yankee Fork and Panther Creek attract large numbers of trout and steelhead fishers in other parts of the year (Schoby pers. comm. as cited in BPA et al. (2017)).

Salmon populations generate economic value in several ways. Some of the value arises through direct harvest or use of the fish (all dollar values in 2015 dollars).

Spring/summer Chinook salmon that are harvested commercially (i.e., in the lower Columbia's non-Tribal commercial zones and the Tribal commercial fishery in Zone 6 of the Columbia River under US vs Oregon) have value in terms of the prices they generate in the economic market. This value is quantifiable in monetary terms, using market-based valuation techniques. During the 2014 season, for example, ex-vessel prices[5] for Chinook salmon harvested on the Columbia mainstem averaged $6.99 per pound for spring Chinook salmon and $3.52 for summer Chinook salmon, for a per-fish price of $88.38 and $56.32, respectively (Joint Columbia River Management Staff 2015 as cited in BPA et al. (2017)).

Spring/summer Chinook salmon harvested in recreational fisheries have value in terms of the money anglers pay to go fishing (e.g., gas, fishing equipment, lodging, and food). This value is often quantifiable in monetary terms, using market- and non-market-based valuation techniques. For example, a 2005 study examining the economic impact of salmon and steelhead fishing in Idaho collected data on median angler expenditures in 19 different Idaho regions, and reported that spring/summer Chinook salmon fishers spend roughly $392 per trip (Reading 2005 as cited in BPA et al. (2017)).

Spring/summer Chinook salmon harvested in recreational fisheries also have value in terms of the enjoyment anglers receive from the experience. Many anglers value this experience above what they actually pay to go fishing. This additional value (which economists refer to as consumer surplus or net economic value) is often quantifiable in monetary terms, using nonmarket- based valuation techniques. A 2011 review of studies published on the net economic value associated with salmon fishing found that the value of a day of recreational salmon fishing ranged from $39.12 to $107.18 per angler day, with an average of $68.23 (Thomson and Speir 2011 as cited in BPA et al. (2017)).

Spring/summer Chinook salmon harvested in subsistence fisheries have value because they provide sustenance to and reinforce cultural and spiritual identity and relationships among the individuals in the Tribal community. A portion of the subsistence value is quantifiable in monetary terms insofar as any catch offsets salmon or other protein sources that would have to be purchased. Subsistence fisheries have value that transcends the value of replacement protein in that the practice of salmon fishing allows Tribal members to exercise treaty rights and cultural practices, which has widespread but largely unquantifiable benefits to Tribal individuals and communities.

In addition to these harvest-related values, some people value salmon even if they never fish or eat fish. This value reflects these people's willingness to pay to ensure the long-term survival of the species for ecological reasons or for the enjoyment of current and future generations (a value economists recognize as bequest value, or the willingness people have to pay today to ensure their children have the opportunity to experience something in the future) (see, for example,

[5] The post-season adjusted price per pound for the first purchase of commercial harvest.

Loomis 2006 as cited in BPA et al. (2017)). The existence of salmon also supports spiritual values that Tribal and some non-Tribal members hold. For many people, this value is not quantifiable in monetary terms, but is important to recognize and describe as part of an assessment of total economic value.

3.8 Human Health and Safety

Potential risks to human health from operating these hatchery programs are primarily related to operating temporary weirs for the collection of adults in both Yankee Fork and Panther Creek. Installation of temporary weirs involves wading into flowing water to install and anchor weir panels. If done carelessly, working in flowing water could lead to injury or death of employees.

Another risk to human health is contaminant exposure through consumption. Food from aquatic environments provides an important contribution to human nutrition and health. Risk is associated with the frequency of consuming fish, regardless of whether fish are of hatchery or natural origin. Risk is minimal when fish and fish products are harvested, handled, processed, stored, sold, and prepared properly in accordance to the Food and Drug Administration's "Procedures for the Safe and Sanitary Processing and Importing of Fish and Fishery Products" (USFDA 2018 as cited in BPA et al. (2017)).

Other risks to human health and safety in a hatchery environment include: accidental skin contact and needle-stick injuries involving infected fish are potential human health risks to hatchery personnel. Further, chemicals in the environment, including pesticides, heavy metals, and persistent organic pollutants, can accumulate in fish and pose a public health issue to people who consume it. Proper monitoring techniques, as well as control measures and risk-based surveillance, have been shown to be critical to the protection of public health. Compliance with safety programs, rules, and regulations, and the use of personal protective equipment limits the spread of pathogens and the potential risk to human health. The 2 programs analyzed in this EA currently comply with all such safety programs, rules, and regulations.

3.9 Water Quality, Water Quantity, and Hydrology

3.9.1 Yankee Fork

Water Quality

The Yankee Fork of the Salmon River, located in Custer County, is one of the main tributaries to the Salmon River, with a watershed covering about 122,000 acres. The Yankee Fork flows approximately 28 miles to its confluence with the Salmon River near Sunbeam, Idaho. The proposed facility on the Yankee Fork lies approximately 3 miles above the confluence with the Salmon River.

Upstream of the proposed facility, the Yankee Fork has experienced extensive habitat alteration due to historical dredging for gold and other metals (dredge operations ceased in 1952). Historical and present mining activities have formerly resulted in water quality impacts from

selenium, mercury, cyanide, and other pollutants associated with mining in the drainage. However, there are presently no chemical contaminants that exceed IDEQ water quality standards in the basin (Reclamation 2012d as cited in BPA et al. (2017)).

All waters of the State of Idaho are designated for beneficial uses that include agricultural and industrial water uses, wildlife, and aesthetics. The Yankee Fork is further designated for domestic water supply, cold-water biota, salmonid spawning, primary contact recreation, and special resource water. The Upper Salmon River Subbasin Assessment and TMDL (IDEQ 2003) indicated water quality impairment in waters from Jordan Creek to the Salmon River for sediment and habitat alteration. Sections of the Yankee Fork within the Salmon-Challis National Forest were listed for sediment. However, a TMDL for sediment was determined to not be warranted by IDEQ (IDEQ 2003).

Water quality relative to fish needs in the Panther Creek Drainage is generally good, with the exception of streams affected by historical mining (see Subsection 3.5, Water Quality and Quantity, Subsection 3.5.1.3, Panther Creek Weir Facility). However, Blackbird Creek, which flows into Panther Creek approximately 1 mile downstream of the proposed weir and acclimation facility, has historically been, and will likely continue to be, impacted by releases of acidity and dissolved heavy metals from the historical Blackbird Mine site. Discharges of dissolved copper and cobalt in 1995 led the Idaho Department of Environmental Quality (IDEQ) to conclude that Blackbird Creek could not be remedied to the point of meeting water quality standards in the near future (BPA et al. 2017) (Salmon-Challis National Forest 2008). Water quality has improved through time, though, and BPA et al. (2017) cited that IDEQ reported in 2004/2005 that "water quality in Panther Creek downstream of Big Deer Creek met water quality criteria for copper most of the year with the exception of the spring high flow period of approximately March–June" (Salmon-Challis National Forest 2008)

Water Quantity

A U.S. Geological Survey (USGS) gauge (operated by the Tribes) was installed in the Yankee Fork about 1 mile above its confluence with the Salmon River in fall 2011. The monthly mean discharge for the three-year period (2012–2014) at this station ranged from 47 cubic feet per second (cfs) in January to 934 cfs in May (USGS 2015b as cited in BPA et al. (2017)). The flow rate measured at this gauge is representative of the flow rate at the proposed facilities on Yankee Fork (2 miles upstream). Peak flows in the Yankee Fork are predominantly driven by snowmelt.

No diversions or withdrawals are proposed for the Yankee Fork facility. Adults will be collected and transported to Sawtooth hatchery for spawning, and juveniles will be released directly into Yankee Fork.

Wild and Scenic Rivers

Under the National Wild and Scenic Rivers System, Yankee Fork is considered as eligible under the "Recreation" classification for Wild and Scenic Rivers (USFS 1989 as cited in BPA et al. (2017)). Section 2(b) of the Wild and Scenic Rivers Act (16 USC §§ 1271 *et seq.*) requires that all rivers considered eligible for designation need to be "free-flowing." Section 16(b) of the Act

defines a "free-flowing" river as one that is in a "natural condition" and "without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway," and also that existence of "low dams, diversion works, and other minor structures shall not automatically bar its consideration," though such construction is discouraged.

In the Challis National Forest's 1989 Wild and Scenic Rivers Evaluation Report (USFS 1989 as cited in BPA et al. (2017)), Segment A of the Yankee Fork was evaluated to be free-flowing in a natural condition for its entire length and that it contained one bridge. Segment B, however, was in question as to whether it met the intent of "free flowing in a natural condition" because of past dredging activities that re-routed the river and changed its width, depth, banks, and slope from its natural condition. The presence of this compromising condition did not prevent the Challis National Forest from finding both segments of the Yankee Fork eligible for Wild and Scenic River status in the "Recreation" classification. The "Recreation" classification allows for rivers that have undergone some impoundment or diversion in the past (16 USC § 1273(b)(3)).

3.9.2 Panther Creek Weir Facility

Water Quality

Panther Creek, located in Lemhi County, is a tributary to the Salmon River and covers about 1,810 square miles, flowing approximately 25 miles from the Panther Creek weir facility to the confluence with the Salmon River.

The Panther Creek drainage has experienced water quality issues associated with present and historical mining operations, particularly in the Blackbird Creek drainage, downstream of the proposed weir. Panther Creek is on the Clean Water Act 303(d) list (impaired waters) for copper from Blackbird Creek to Big Deer Creek, which lies downstream of the proposed weir site. Water quality above Blackbird Creek, which enters Panther Creek 0.9 mile below the facility, is considered good (i.e., no identified pollutants of concern).

Water Quantity

Panther Creek is a tributary to the upper Salmon River with a drainage area of approximately 1,810 square miles (1,158,400 acres) and approximately 400 miles of perennial streams (IDEQ 2015a). The proposed facilities are located at approximately river mile 3.1 on Panther Creek, across the creek from the U.S. Forest Service's (USFS) Cobalt Work Center.

A USGS gauge was installed in Panther Creek at Cobalt, Idaho, in fall 2011. The monthly mean discharge for the three-year period (2012–2014) ranged from an average of 26 cfs in January to 381 cfs in May (USGS 2015c). The flow rate measured at this gauge is representative of the flow rate at the proposed facilities on Panther Creek. Peak flows in Panther Creek are predominantly driven by snowmelt.

No diversions or withdrawals are proposed for the Panther Creek facility. Adults will be collected and transported to Pahsimeroi hatchery for spawning, and juveniles will be released directly into Panther Creek.

Wild and Scenic Rivers

Under the National Wild and Scenic Rivers System, Panther Creek is considered as eligible under the "Recreation" classification for Wild and Scenic Rivers (USFS 1989).

In the Salmon National Forest's 1993 Wild and Scenic Rivers Evaluation, Panther Creek was evaluated to be free-flowing in a natural condition for its entire length. That same free-flowing condition remains today as it was in 1993. Though there are numerous bridges that cross the river, there are no impoundments or major de-watering diversions that substantially alter the river's flow.

Panther Creek Road, located in the valley bottom, runs almost the entire length of Panther Creek from its mouth to a few miles below the Morgan Creek Summit. In some locations, it encroaches on the stream or floodplain, and in others, the road encroaches on the stream. This encroachment has resulted in reduced capacity for flood flows and a reduction in riparian vegetation and stream cover (USFS 2008 as cited in BPA et al. (2017)). This condition, however, was present in 1993 and deemed by the agency at that time to not compromise the free-flowing character of this river sufficient to disqualify it from consideration.

3.10 Land Use and Ownership

3.10.1 Yankee Fork

Current Land Use and Zoning

Forestry is the dominant land use in Custer County, and the primary land use within the analysis area of the Yankee Fork weir facility. The proposed site is located on the Salmon-Challis National Forest, within the Challis National Forest, Yankee Fork Management Area Number 6 (USFS 1987 as cited in BPA et al. (2017)).

The Yankee Fork Management Area is one of the larger management areas in the Salmon-Challis National Forest, encompassing the entire Yankee Fork of the Salmon River watershed. Current land uses in the unit include mining, recreation, grazing, and timber harvest (USFS 1987 as cited in BPA et al. (2017)). The land uses within the analysis area surrounding the Yankee Fork weir facility are consistent with the larger area.

The Yankee Fork weir facility would be located adjacent to U.S. Forest Service (USFS) Pole Flat Campground and Yankee Fork Road, a county road primarily used for recreational access to the National Forest. The site is located on the east side of the Yankee Fork, a tributary to the Salmon River. The Tribes currently set up a temporary weir in the river and use a clearing near the entrance to the Pole Flat Campground as a staging area for equipment and vehicles. There are no other landowners within the 0.25-mile analysis area.

Under the National Wild and Scenic River System, Yankee Fork is considered as eligible under the "Recreation" classification for Wild and Scenic Rivers (USFS 1989). Recreational rivers are those rivers or sections of rivers that are readily accessible by road or railroad, and that may have some development along their shorelines or may have undergone some impoundment or

diversion in the past (16 USC § 1273(b)(3)). There are two eligible segments of the Yankee Fork relevant to this analysis. Segment A is the lower reach heading upstream from the mouth for 2 miles; Segment B is immediately upstream of Segment A, from the private land boundary upstream from the Pole Flat campground to Jordan Creek, approximately 6 miles in length. The Yankee Fork project area is located within Segment A, very near its boundary with Segment B.

Recreation

Recreation is an important use of the area immediately surrounding the Yankee Fork weir facility. Within the 5-mile analysis area surrounding the facility, there are 11 developed recreation sites. Most of these are located immediately off Yankee Fork Road, which serves as a primary access road into the Salmon-Challis National Forest. Table 3.1-1 shows the developed recreation sites within the analysis area. Figure 3.1-2 (left panel) shows the recreational resources within the analysis area and the broader region.

- Flat Rock Campground Developed Campground – 6 sites
- Flat Rock Extension Campground Developed Campground – 3 sites
- Pole Flat Campground Developed Campground – 12 sites
- Blind Creek Campground Developed Campground – 7 sites
- Bonanza Group Campground Developed Group Campground Reservation only
- Jerry Creek Camping Area Dispersed Camping Area - 3 dispersed sites
- Custer Townsite - Day Use Only
- Yankee Fork Dredge - Day Use Only
- Pole Flat Picnic Area - Temporary facility, limited access
- West Fork Trailhead – Trailhead

Source: Salmon-Challis National Forest GIS data and Salmon-Challis Visitor Guide (USFS n.d.)

The area's campgrounds see heavy use throughout the summer season (typically June through September, although some operate on the shoulder months of May and October, and, weather permitting, some may be accessible through November), and are often at capacity on weekends (Callaghan, pers. comm., as cited in BPA et al. (2017)). They are popular with anglers because of their proximity to the Yankee Fork.

In addition to these developed facilities, dispersed recreation occurs throughout the 5-mile analysis area. At least three dispersed camping areas are also located within the analysis area, along with a motorized ATV trail within 1 mile of the Yankee Fork weir facility (Callaghan pers. comm. as cited in BPA et al. (2017)).

The Yankee Fork is also used by whitewater kayakers. The river can be run for 27 miles, from north of the Eleven Mile Canyon Recreation Area down to the confluence with the Salmon

River. This reach includes the analysis area. It is used primarily in spring and early summer, until declining flows leave the river too rocky for boating (American Whitewater 2016a as cited in BPA et al. (2017)).

Yankee Fork segments have not been formally proposed for designation, nor has a suitability determination been made (which must precede a proposal). The scale of the structures considered under Alternative 1 is consistent with the scale of structures discussed as being allowable for rivers proposed for designation under the "Recreation" category (USFS 1992 as cited in BPA et al. (2017)). Although there would be some impact on the free flowing character of the river during operations, a permanent weir would not affect the potential for Wild and Scenic Rivers designation or eligibility, a low impact.

3.10.2 Panther Creek Weir Facility

Current Land Use and Zoning

Forestry is the dominant land use in Lemhi County, and the primary land use within the analysis area of the Panther Creek weir facility. The proposed facility is located within the Salmon-Challis National Forest, Salmon-Cobalt Ranger District (USFS 1988 as cited in BPA et al. (2017)). The Salmon-Cobalt Ranger District is the largest district in the Salmon-Challis National Forest. The district is relatively remote in relation to major population centers, and sees less recreational use than other parts of the Salmon-Challis National Forest. Recreation remains a dominant use, however, along with mining, grazing, and timber harvest (USFS 1988 as cited in BPA et al. (2017)). The land uses within the analysis area surrounding the Panther Creek weir facility are consistent with the larger area.

The Panther Creek weir facility is located on a site within the Cobalt Work Center. USFS staff use the center during the summer months to coordinate field activities and forest fire response. There are approximately a dozen structures and a gravel parking lot associated with the work center, located on the west side of Panther Creek. A small bridge crosses Panther Creek at the center, providing access to a pasture on the east side of Panther Creek. The pasture is used for USFS livestock, primarily horses. There are no other landowners within the 0.25-mile analysis area.

Under the National Wild and Scenic River System, Panther Creek is considered as eligible under the "Recreation" classification for Wild and Scenic Rivers (USFS 1989 as cited in BPA et al. (2017)). The entire Panther Creek drainage (beginning at the mouth and extending 45 miles upstream) is considered eligible.

Recreation

The area surrounding the Panther Creek weir facility receives light-to-medium recreational use, which is less use than other parts of the Salmon-Challis National Forest because of its distance from population centers (USFS 1988 as cited in BPA et al. (2017)). In addition to the Cobalt Work Center, two developed recreation areas are located within 5 miles of the Panther Creek weir facility:

- Deep Creek Campground—3 campsites
- McDonald Flat Campground—6 campsites

Dispersed recreation is allowed throughout the analysis area, including camping, hiking, and horseback riding. No data are available to estimate the annual visitation to the sites within the analysis area (Callaghan pers. comm. as cited in BPA et al. (2017)).

Panther Creek is also used by whitewater kayakers; however, they primarily run the river starting from Trapper Flat, approximately 7 miles downstream of the proposed Panther Creek weir facility (American Whitewater 2016b as cited in BPA et al. (2017)). Boating is not expected to be a recreational use of the river in the vicinity of the proposed facility.

3.11 Transportation

The Proposed Action includes the use of areas that are remote, and therefore require access by roads for employees managing the programs, researchers monitoring the programs, and trucks used to transport fish to and from the facilities. If access for these purposes substantially changes regular uses, impacts on travel patterns or infrastructure may occur, as discussed in greater detail below.

3.11.1 Yankee Fork

The Yankee Fork weir facility is on Yankee Fork Road, north of Highway 75. Yankee Fork Road has two lanes along the site. The town of Stanley (population: about 60) is about 16 miles or 30 minutes away by car. The town of Challis (population: about 1,100) is about 57 miles or an hour away by car (U.S. Census Bureau 2014). The Redfish Lake Lodge is about 22 miles or a 40-minute drive away.

The proposed site is adjacent to the Yankee Fork and near the Pole Flat Campground. The road is paved along its distance from Highway 75 through the site, and then becomes gravel only a short distance north of the site. Custer County took over maintenance of the road in 2012 (Lanier pers. comm. as cited in BPA et al. (2017)).

The site currently hosts a temporary weir and field station. Additionally, the Pole Flat Campground sits on the east side of the road, opposite the Yankee Fork; campers and workers at the temporary weir must cross the road to access the river.

Road usage is highest in the summer, when tourists use Yankee Fork Road to explore the mountains. Additionally, Yankee Fork Road is the primary access for seasonal and permanent residences, and for mines in the forest, such as the Hecla Mine and the Custer Historic Mining Town (i.e., Custer Townsite). While Custer County does not record traffic counts for Yankee Fork Road, the State of Idaho Transportation Department reported that 386 vehicles used the road in one day in August 2010 (Viste, pers. comm., as cited in BPA et al. (2017)). This is consistent with the estimates from Custer County of 400 cars per day during the peak season, which lasts from July to September (Lanier, pers. comm., as cited in BPA et al. (2017)).

However, usage drops off markedly in the off-season. Off-season traffic may amount to fewer than 10 vehicles per day (Lanier, pers. comm., as cited in BPA et al. (2017)).

Custer County holds a Forest Road and Trail Act (FRTA) easement for the paved portion of Yankee Fork Road that extends 3.06 miles along the road north of Highway 75. This FRTA easement grants Custer County jurisdiction over the section of the road within the site. The realignment of Yankee Fork Road as well as the road usage by the construction crews would not require permits from Custer County (Lanier, pers. comm., as cited in BPA et al. (2017)). However, the U.S. Forest Service (USFS) likely would require a modification of Custer County's current FRTA easement to reflect the new path of the road, which may come with additional stipulations, as yet to be determined, under USFS FRTA regulation (Schuldt, pers. comm., as cited in BPA et al. (2017)).

3.11.2 Panther Creek

The Panther Creek weir facility is in a remote location in the mountains of the Salmon-Challis National Forest. It sits about a 10-minute drive south of the unincorporated community of Cobalt, about 36 miles or a 90-minute drive from the town of Salmon (population: about 3,100), and about 47 miles or two hours from the town of Challis (population: about 1,000) (U.S. Census Bureau 2014).

The site is located at a Forest Service field station, which is actively used by USFS staff during the summer season (Callaghan pers. comm. as cited in BPA et al. (2017)). The McDonald Flat campground is about 3 miles southwest of the site. The Blackbird Mine is about 6.7 miles from the site, on Blackbird Creek, which flows into Panther Creek about one mile downstream from the weir site. Recreation and mining serve as the primary draws for vehicle traffic in the area. The remote location is attractive to people seeking outdoor recreation, especially hunters. Due to hunting, October is the month of highest usage for recreational vehicle traffic (Schuldt, pers. comm., as cited by BPA et al. (2017)). Hunting groups often camp in one section of the forest and drive to other locations within the forest to access points from which to launch their trip (Schuldt, pers. comm. as cited by BPA et al. (2017)).

A 2003 traffic count from USFS recorded an average of 36 vehicles daily along Panther Creek Road near the site from September 22 to October 2. More recent traffic counts for this area are not available, but USFS reported that they expect current traffic volumes to be equal to or below the counts recorded in 2003.

Sites along Panther Creek Road are accessible without passing through the site, and there are alternative routes to Panther Creek-area destinations. For drivers already starting near Highway 93, there are multiple routes to reach sites along Panther Creek Road, either north or south of the site.

Lemhi County and USFS both help to maintain Panther Creek Road, but USFS has jurisdiction over the road between the intersections with Blackbird Creek and Morgan Creek (Schuldt pers. comm. as cited in BPA et al. (2017)). Construction crews would not require Lemhi County permitting to use the roads (J. Davis pers. comm. as cited in BPA et al. (2017)). USFS would require a special-use permit for operation of the weir facilities.

4 Environmental Consequences

This chapter describes the analysis of the direct and indirect environmental effects associated with the alternatives on the eleven 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 continued implementation of the two hatchery programs 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.

4.1 Listed Species

Natural-origin salmon and steelhead populations in the Snake River Basin could be affected by hatchery programs through various effect pathways (Table 5). In this subsection, the hatchery program effects on natural salmon and steelhead populations in the analysis area are described for each alternative.

Table 5. Summary of effects on ESA-listed fish species.

Effect Category	Species	Alternative 1 - No Action	Effects of Alternative Relative to Alternative 1		
			Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Genetics	Snake River Spring/Summer Chinook Salmon ESU	Low-adverse	Low-adverse	Low-adverse	Low-beneficial
	Snake River Steelhead DPS	No Effect	No Effect	No Effect	No Effect
	Bull Trout	No Effect	No Effect	No Effect	No Effect
Competition and Predation	Snake River Spring/Summer Chinook Salmon ESU	Low-adverse	Low-adverse	Low-adverse	Low-beneficial
	Snake River Steelhead DPS	Low-adverse	Low-adverse	Low-adverse	Low-beneficial
	Bull Trout	Low-adverse	Low-adverse	Low-adverse	low-beneficial
Disease Effects	Snake River Spring/Summer Chinook Salmon ESU	Low-adverse	Low-adverse	Low-adverse	Low-beneficial

	Snake River Steelhead DPS	Low-adverse	Low-adverse	Low-adverse	Low-beneficial
	Bull Trout	Low-adverse	Low-adverse	Low-adverse	Low-beneficial
Research and Monitoring	Snake River Spring/Summer Chinook Salmon ESU	Low-adverse	Low-adverse	Low-adverse	Low-adverse
	Snake River Steelhead DPS	Low-adverse	Low-adverse	Low-adverse	Low-adverse
	Bull Trout	Low-adverse	Low-adverse	Low-adverse	Low-adverse
Nutrient Cycling	Snake River Spring/Summer Chinook Salmon ESU	Low beneficial	Low-beneficial	Low-beneficial	Low-adverse
	Snake River Steelhead DPS	Low beneficial	Low-beneficial	Low-beneficial	Low-adverse
	Bull Trout	Low beneficial	Low-beneficial	Low-beneficial	Low-adverse
Facilities Impacts	Snake River Spring/Summer Chinook Salmon ESU	Low-adverse	Low-adverse	Low-adverse	Low beneficial
	Snake River Steelhead DPS	Low-adverse	Low-adverse	Low-adverse	Low beneficial
	Bull Trout	Low-adverse	Low-adverse	Low-adverse	Low beneficial

4.1.1 Alternative 1 – No Action

4.1.1.1 Chinook Salmon

Under Alternative 1, the proposed hatchery programs pose genetic risks to natural-origin Chinook salmon from the Snake River Spring/Summer Chinook Salmon ESU. The genetic risk to natural-origin Chinook comes from hatchery-origin fish—which are well suited for survival in hatcheries—spawning with natural-origin fish, and reducing the genetic influence of fish well-suited to survival in the wild. Hatchery-origin fish from the programs returning to spawn in the wild may impact both Yankee Fork and Panther Creek populations within the Snake River Spring/Summer Chinook Salmon ESU. In general, NMFS believes a gene flow typically measured using a proportionate natural influence (PNI) of 0.5 is adequate for maintaining the population's genetic structure and productivity because the natural-origin influence is not dominated by hatchery influence. However, a PNI less than 0.5 may be acceptable when natural-origin abundance is low to ensure enough fish are available to spawn regardless of fish origin.

Both programs produce Chinook salmon that are genetically similar enough to the respective underlying natural population to be listed within the same Snake River Spring/Summer Chinook Salmon ESU. Hatchery operators intend to move toward higher PNI levels (>0.5 and targeting 0.67 over the long-term) of integration in the future, which would result in higher PNI values using the sliding scale approach (Table 1) for future broodstock management. In the short-term, populations are expected to remain low, and little adult management would occur; however, as

the program increases in size, and abundance improves, adult management would occur based on adult abundance. The net effect on each population would be low-adverse because at low abundance, few fish would be available to impact surrounding populations, and as abundance increases, programs integrate natural-origin fish into the broodstock. As abundance increases, PNI levels for both the programs are designed to have natural selection be equal to or dominant over hatchery selection over time. The impact to the Snake River Spring/Summer Chinook Salmon ESU as a whole would likely be negligible.

Competition and predation effects from both programs would be low-adverse because Chinook salmon smolts from the programs may outcompete or prey on a very small proportion (up to 2.2 percent) of the natural-origin spring Chinook salmon population (NMFS 2017a). In addition, hatchery spring Chinook salmon smolts migrate out of the analysis area soon after release, with median travel times to Ice Harbor Dam of 29 total days for Pahsimeroi summer Chinook salmon releases (NMFS 2017a), which minimizes the time in which the hatchery fish interact with natural-origin juveniles.

Adults from the spring/summer Chinook salmon hatchery programs may compete for spawning sites and potentially superimpose their redds on those of natural-origin spring Chinook salmon in the analysis area. However, because the proportion of hatchery-origin fish on spawning grounds would continue to be reduced under Alternative 1 as part of ongoing monitoring of pHOS levels to determine if they are in line with recommendations by HSRG (NMFS 2017a), the competition would be controlled. Because adults from both programs produce hatchery-origin fish that are intended to spawn with natural-origin fish to supplement the natural-origin population, competition for spawning sites and redd superimposition would continue to occur at levels similar to current conditions. Competition between natural-origin Chinook salmon and adult steelhead and coho salmon from hatchery programs under Alternative 1 would be negligible due to differences in run timing, holding, and spawn timing.

Under Alternative 1, a low-adverse impact in disease effects on other salmon and steelhead species would be expected. Although pathogens can be passed to natural-origin salmon and steelhead species that occupy rivers near hatchery facilities or release sites, likelihood of disease and pathogen transmission between hatchery and natural fish would not change, because water use and discharge at Sawtooth and Pahsimeroi Hatcheries will remain similar. Smolt release strategies typically promote distribution of hatchery fish throughout the system and rapid outmigration, which reduces the concentration of hatchery-released fish and, therefore, the potential for a diseased hatchery fish to encounter natural-origin salmon and steelhead. Also, standard fish health protocols (i.e. health sampling and disease treatments) minimize the potential for disease and pathogen effects on natural-origin salmon and steelhead (NMFS 2017a). In Idaho, recommendations for treating specific disease agents comes from the Idaho Department of Fish and Game Fish Health Laboratory in Eagle, Idaho (IDFG 2017) and from USFWS's Pacific Region Fish Health Program office located at Kooskia National Fish Hatchery. Because few major outbreaks have occurred for any of the programs, production of all salmon discussed here would be expected to continue to have a similar low-adverse effect.

RM&E activities would continue under Alternative 1. Individual salmon and steelhead are currently captured at weirs and rotary screw traps associated with juvenile outmigration

monitoring (Subsection 2.2.4) for both hatchery programs. Electrofishing is also used to collect natural- and hatchery-origin steelhead in Panther Creek and the Yankee Fork for PIT tagging. Fish throughout the basin would be captured, anesthetized, tagged, and released. These ongoing collections temporarily delay downstream migration, and stress fish during handling, sampling, and tagging. Spawning ground surveys are passive observations, and may temporarily displace adults staging in spawning areas.

NMFS has developed general guidelines to reduce impacts when collecting listed adult and juvenile salmonids (NMFS 2000; 2008). Currently, hatchery operators and staff must abide by these guidelines, when they are incorporated as terms and conditions into current ESA Section 7 opinions and Section 10 permits for research and enhancement. Additional monitoring principles for supplementation programs have been developed (Galbreath et al. 2008). These guidelines reduce impacts, but a small proportion of juvenile fish caught (less than 2 percent) may still suffer serious injury or death. Therefore, Alternative 1 has a low-adverse impact on any fish captured during RM&E activities.

Most fish species in the analysis area would continue to indirectly benefit from nutrient cycling of carcasses from hatchery-origin fish because enhanced levels of nutrients would be available to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from fish spawned in hatcheries would continue to contribute to increased nutrient cycling in the natural environment. The effect would be low-beneficial.

4.1.1.2 Steelhead

Natural-origin steelhead do not spawn or interbreed with Chinook salmon, and therefore are not genetically linked through the hatchery programs. Therefore, under Alternative 1, there would be no effect on natural-origin steelhead genetics.

Competition and predation effects from both programs would be low-adverse for Snake River Basin steelhead. Hatchery spring Chinook salmon smolts migrate out of the analysis area soon after release, with median travel times to Ice Harbor Dam of 29 total days for Pahsimeroi Summer Chinook salmon releases (NMFS 2017a). Habitat preferences are slightly different between Chinook salmon and steelhead and, though they may compete for some overlapping space, fast outmigration of hatchery smolts and differing habitat preferences lessen the impact. Spawning site competition or redd superimposition is unlikely between spring/summer Chinook salmon and Snake River steelhead because of the difference in spawning time. Therefore, effects would remain low-beneficial.

Under Alternative 1, no change in disease effects on other salmon and steelhead species would be expected. Disease effects would be low-adverse. RM&E activities would continue under Alternative 1. Individual salmon and steelhead are currently captured at weirs and rotary screw traps associated with juvenile outmigration monitoring for several hatchery programs. Electrofishing is also used to collect natural- and hatchery-origin steelhead in Panther Creek and Yankee Fork for PIT tagging. Fish would be captured, anesthetized, tagged, and released. These ongoing collections temporarily delay downstream migration, and stress fish during handling, sampling, and tagging.

NMFS has developed general guidelines to reduce impacts when collecting listed adult and juvenile salmonids (NMFS 2000; 2008). Currently, hatchery operators and staff must abide by these guidelines, which are incorporated as terms and conditions into current ESA Section 7 opinions and Section 10 permits for research and enhancement. Additional monitoring principles for supplementation programs have been developed (Galbreath et al. 2008). These guidelines reduce impacts, but a small proportion (less than 2 percent) may still suffer serious injury or death. Therefore, Alternative 1 has a low-negative impact on any fish captured during RM&E activities.

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

4.1.1.3 Bull Trout

Bull trout do not spawn or interbreed with Chinook salmon, and therefore are not genetically linked through the hatchery programs. Therefore, under Alternative 1, there would be no effect on natural-origin steelhead genetics.

Competition and predation effects from both programs would be low overall, but both beneficial and adverse for bull trout. Where overlap occurs between spring/summer-run Chinook salmon and bull trout, juvenile bull trout are often larger than juvenile spring/summer-run Chinook salmon and have a clear competitive advantage (Young 2004). This size difference is sufficiently large that bull trout have been observed feeding on juvenile spring/summer-run Chinook salmon. Additionally, Underwood et al. (1995) found no evidence of substantial competition for rearing habitat between spring Chinook salmon and bull trout in several southwest Washington streams. They observed that the two species used dissimilar microhabitats. During smolt outmigration, bull trout are likely to encounter hatchery-origin smolts at some level. Chinook salmon smolts from the programs may are a prey source for bull trout in the area. The release of would provide a temporary boost in food availability, a beneficial effect, for bull trout.

Adults from the spring/summer Chinook salmon hatchery programs may compete for spawning sites and potentially superimpose natural-origin spring Chinook salmon redds in the analysis area. Timing of bull trout and spring/summer-run Chinook salmon spawning in the both Yankee Fork and Panther Cree overlaps almost completely, and there is the potential for partial overlap in spawning habitat selection. Although they may spawn at similar times, there is currently little spatial overlap between spring/summer-run Chinook salmon and bull trout spawning because of microhabitat selection. There is, however, a chance for greater overlap as numbers of spawning spring/summer-run Chinook salmon increase. This could result in adverse effects on bull trout because adult spring/summer-run Chinook salmon have a size-based competitive advantage over adult bull trout, which allows spring/summer-run Chinook salmon to out-compete bull trout for spawning sites, limiting the amount of spawning habitat available. Spring/summer-run Chinook salmon are also capable of displacing bull trout and superimposing their own redds on bull trout redds, resulting in the exposure and death of bull trout eggs.

Because the programs are relatively new, both hatchery-origin and natural-origin Chinook salmon abundance is expected to increase over time. Competition for spawning sites and redd superimposition would continue to occur. Overall, the impact is low because of differing spawning preferences of the species, but some negative impact is expected.

Under Alternative 1, no change in disease effects on other salmon and steelhead species would be expected. Disease effects would be low-adverse.

RM&E activities would continue under Alternative 1. Individual salmon and steelhead are currently captured at weirs and rotary screw traps associated with juvenile outmigration monitoring for several hatchery programs. Electrofishing is also used to collect natural- and hatchery-origin steelhead in Panther Creek and the Yankee Fork for PIT tagging. Fish would be captured, anesthetized, tagged, and released. These ongoing collections temporarily delay downstream migration, and stress fish during handling, sampling, and tagging.

NMFS has developed general guidelines to reduce impacts when collecting listed adult and juvenile salmonids (NMFS 2000; 2008). Currently, hatchery operators and staff must abide by these guidelines, which are incorporated as terms and conditions into current ESA Section 7 opinions and Section 10 permits for research and enhancement. Additional monitoring principles for supplementation programs have been developed (Galbreath et al. 2008). These guidelines reduce impacts, but a small proportion (less than 2 percent) may still suffer serious injury or death. Therefore, Alternative 1 has a low-negative impact on any fish captured during RM&E activities.

Most fish species in the analysis area would continue to benefit indirectly from nutrient cycling of carcasses from hatchery-origin fish through enhanced availability of nutrients to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from outplanting carcasses of fish spawned in hatcheries would continue to contribute to increased nutrient cycling in the natural environment.

4.1.2 Alternative 2 – Proposed Action

4.1.2.1 Chinook Salmon

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

Similarly, under Alternative 2, the operation of all hatchery programs would be the same as under current conditions, with no change in competition and predation effects on other salmon and steelhead species. Therefore, this alternative would have the same low adverse effects as Alternative 1.

Under Alternative 1, no change in disease effects on Chinook salmon would be expected. Because all RM&E activities would continue similar to current conditions, the effect on fish species would be low-adverse, similar to Alternative 1.

Most fish species in the analysis area would continue to indirectly benefit (low-beneficial) from nutrient cycling of carcasses from hatchery-origin fish through having enhanced nutrients available to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from outplanting carcasses of fish spawned in hatcheries would continue to contribute to increased nutrient cycling in the natural environment.

4.1.2.2 Steelhead

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no effect on natural Steelhead genetics, differing only in that, under Alternative 2, the programs would have ESA coverage.

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

Under Alternative 2, no change in disease effects on steelhead would be expected and would remain low-adverse.

Because all RM&E activities would continue similar to current conditions, the low-adverse effect on steelhead would be similar to Alternative 1.

Most fish species in the analysis area would continue to benefit (at a relatively low level) indirectly from nutrient cycling of carcasses from hatchery-origin fish through enhanced availability of nutrients to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from outplanting carcasses of fish spawned in hatcheries would continue to contribute to increased nutrient cycling in the natural environment.

4.1.2.3 Bull Trout

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no effect on bull trout genetics, differing only in that, under Alternative 2, the programs would have ESA coverage.

Similarly under Alternative 2, the operation of all hatchery programs would be the same as, with no change in competition and predation effects on other salmon and steelhead species. Therefore, this alternative would have the same low-adverse effect as Alternative 1; low beneficial prey availability for bull trout, as well as low negative impact from spawning competition.

Under Alternative 1, no change in disease effects on bull trout would be expected, and would remain low-adverse.

Because all RM&E activities would continue similar to current conditions, the low-adverse effect on bull trout would be similar to Alternative 1.

Most fish species in the analysis area would continue to benefit (low-beneficial) indirectly from nutrient cycling of carcasses from hatchery-origin fish through enhanced availability of nutrients to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from outplanting carcasses of fish spawned in hatcheries would continue to contribute to increased nutrient cycling in the natural environment.

4.1.3 Alternative 3 – Reduced Production

4.1.3.1 Chinook Salmon

Reduction of hatchery programs by 50 percent under Alternative 3 would reduce the hatchery-influenced selection from both programs, resulting in a low-adverse effect, although it would be somewhat less adverse than Alternative 1 because fewer hatchery-natural matings would occur. Overall abundance of Snake River Spring/Summer Chinook Salmon ESU in both Yankee Fork and Panther Creek would likely decrease without these programs, which are intended to maintain or contribute to genetic diversity of natural-origin fish. Thus, reduction of hatchery production in Yankee Fork and Panther Creek may result in slightly less adverse effects on genetics compared with Alternative 1; however, the programs would not support depressed natural-origin populations.

The competition and predation effects would be low-adverse for the Snake River Spring/Summer Chinook Salmon ESU; however, they would be slightly less because of the reduced number of hatchery fish competing with natural-origin fish. Reductions in smolt numbers from the spring/summer Chinook 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. Therefore, the effect of redd superimposition would still be low-adverse, but less than Alternative 1.

The 50-percent reduction in total quantity of smolts under Alternative 3 would still result in a low-adverse effect on the potential for pathogen transmission to natural-origin fish associated with the hatchery programs; however, it would be less than under Alternative 1 because fewer fish would be reared. Although a the low-adverse effect would be lessened in Yankee Fork and Panther Creek, Sawtooth and Pahsimeroi Hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species in those areas.

RM&E activities would also continue even with the 50 percent reduction in production under Alternative 3. Because all RM&E activities would continue similar to current conditions, the low-adverse effect on Chinook salmon would be similar to Alternative 1.

Most fish species in the analysis area would continue to benefit (low-beneficial) indirectly from nutrient cycling of carcasses from hatchery-origin fish through having enhanced nutrients available to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from outplanting carcasses of fish spawned in hatcheries would continue to

contribute to increased nutrient cycling in the natural environment; however, it would be lessened under Alternative 3 because fewer hatchery-origin fish would return to spawn.

4.1.3.2 Steelhead

Under Alternative 3, the 50-percent reduction in hatchery programs would have no effects on natural steelhead genetics, similar to Alternative 1.

The competition and predation effects would be low-adverse, similar to Alternative 1, for the Snake River Basin steelhead; however, they would be slightly less because of the reduced number of hatchery fish competing with steelhead. Reductions in smolt numbers from the spring/summer Chinook 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 fewer redd superimpositions.

The 50-percent reduction in total quantity of smolts under Alternative 3 would result in a low-adverse effect on the potential for pathogen transmission to natural-origin fish associated with the hatchery programs; however, it would be less than under Alternative 1 because fewer fish would be reared. Although a the low-adverse effect would be lessened in Yankee Fork and Panther Creek, Sawtooth and Pahsimeroi Hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species in those areas.

RM&E activities would also continue even with the 50-percent reduction in production under Alternative 3. Because all RM&E activities would continue similar to current conditions, the low-adverse effect on steelhead would be similar to Alternative 1.

Most fish species in the analysis area would continue to indirectly benefit (at a relatively low level) from nutrient cycling of carcasses from hatchery-origin fish through having enhanced nutrients available to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from outplanting carcasses of fish spawned in hatcheries would continue to contribute to increased nutrient cycling in the natural environment; however, the contribution of nutrients would be lessened under Alternative 3 because fewer hatchery-origin fish would return to spawn.

4.1.3.3 Bull Trout

Under Alternative 3, the 50-percent reduction in hatchery programs would have no effect on bull trout genetics, similar to Alternative 1.

The competition and predation effects would be low-adverse for bull trout; however, they would be slightly less because of the reduced number of hatchery fish competing with bull trout. The change would still be low-beneficial due to increasing prey availability for bull trout benefiting from smolt releases; however, the effect would be less than under Alternative 1. Other food sources would remain available, because hatchery production and activities would not affect

these resources, the effect would still be low-adverse under Alternative 3; however, fewer salmon would compete with bull trout for habitat space or spawning sites.

The 50-percent reduction in total quantity of smolts under Alternative 3 would result in a low-adverse effect on the potential for pathogen transmission to bull trout; however, it would be less than under Alternative 1 because fewer fish would be reared. Although the low-adverse effect would be lessened in Yankee Fork and Panther Creek, Sawtooth and Pahsimeroi Hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species in those areas.

RM&E activities would also continue even with the 50 percent reduction in production under Alternative 3. Because all RM&E activities would continue similar to current conditions, the low-adverse effect on bull trout would be similar to Alternative 1.

Most fish species in the analysis area would continue to benefit (low-beneficial) from nutrient cycling of carcasses from hatchery-origin fish through having more nutrients available to their prey sources. Naturally spawning fish of hatchery origin or increased nutrient levels derived from carcass outplants from fish spawned in hatcheries would continue to contribute to increased nutrient cycling in the natural environment; however, it would be less under Alternative 3 relative to Alternative 1 because fewer hatchery-origin fish would return to spawn.

4.1.4 Alternative 4 – Program Termination

4.1.4.1 Chinook Salmon

With immediate termination of the hatchery programs under Alternative 4, hatchery-origin fish that have already been released would return to the Snake River Basin for 4 or 5 years. Therefore, hatchery-influenced selection may initially remain similar to current levels, but would decrease as the hatchery-origin adults cease to return. Overall, the elimination of all hatchery programs would have a low-beneficial effect on Snake River Spring/Summer Chinook Salmon ESU genetics within the Snake River Basin instead of the low-adverse effect in Alternative 1.

Because there would be a reduction in the overall number of spring/summer Chinook salmon hatchery-origin smolts (and eggs), and a subsequent reduction in returning adults in the analysis area over time, the competitive and predatory effects directly attributable to the hatchery programs would eventually subside. Therefore, the effects would be low-beneficial to all species instead of the low-adverse effect in Alternative 1.

Under Alternative 4, a low-beneficial effect on the potential for pathogen transmission to natural-origin fish associated with the hatchery programs instead of the low-adverse effect in Alternative 1. A slight beneficial effect might be realized in Yankee Fork and Panther Creek because fish would not be released there Sawtooth and Pahsimeroi Hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species within the basin.

RM&E activities are likely to continue even with termination in production under Alternative 4 to monitor natural-origin abundance. Because RM&E activities would continue similar to current conditions, the low-adverse effect on Chinook salmon would be similar to Alternative 1.

Nutrient cycling of carcasses from hatchery-origin fish would not make additional nutrients available to prey sources, and so the impact would be low-negative under Alternative 4, rather than the low-beneficial effect under Alternative 1.

4.1.4.2 Steelhead

Under Alternative 4, the termination in hatchery programs would have no effects on natural steelhead genetics. Therefore, this alternative would have no effect, as under Alternative 1.

With immediate termination of the hatchery programs under Alternative 4 there would be a reduction in the overall spring/summer Chinook salmon hatchery-origin smolts (and eggs), and a subsequent reduction in returning adults in the analysis area over time. The competitive and predatory effects directly attributable to the hatchery programs would eventually subside. Therefore, the effects would be low-beneficial to steelhead rather than the low-adverse effect under Alternative 1.

Under Alternative 4, a low-beneficial effect on the potential for pathogen transmission to natural-origin fish associated with the hatchery programs instead of the low-adverse effect in Alternative 1. Although a slight beneficial effect might be realized in Yankee Fork and Panther Creek because fish would not be released there, Sawtooth and Pahsimeroi Hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species within the basin.

RM&E activities are likely to continue even with termination in production under Alternative 4 to monitor natural-origin abundance. Because all RM&E activities would continue similar to current conditions, the low-adverse effect on fish species would be similar to Alternative 1.

Nutrient cycling of carcasses from hatchery-origin fish would not be available for nutrients to their prey sources, and would the impact would be low-adverse under Alternative 4 instead of the low-beneficial effect in Alternative 1.

4.1.4.3 Bull Trout

Under Alternative 4, the termination in hatchery programs would have no effects on bull trout genetics. Therefore, this alternative would have no effect, as under Alternative 1.

The programs would not release smolts or eggs, eliminating one source of prey for some fish (especially bull trout) in the analysis area; however, bull trout do not rely solely on the smolts from the programs and would find other sources of food. Bull trout would be affected because they occur throughout the Upper Salmon River watershed. Overall, this could result in a low-adverse effect on bull trout due to reduced prey availability. Though there was also a low-adverse effect in Alternative 1 that was related to competition.

Under Alternative 4, a low-beneficial effect on the potential for pathogen transmission to natural-origin fish associated with the hatchery programs instead of the low-adverse effect in Alternative 1. Although a slight beneficial effect might be realized in Yankee Fork and Panther Creek because fish would not be released there, Sawtooth and Pahsimeroi Hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species in the basin.

RM&E activities are likely to continue even with termination in production under Alternative 4 to monitor natural-origin abundance. Because all RM&E activities would continue similar to current conditions, the low-adverse effect on fish species would be similar to Alternative 1.

Nutrient cycling of carcasses from hatchery-origin fish would not be available for nutrients to their prey sources, and would the impact would be low-negative under Alternative 4 instead of the low-beneficial effect in Alternative 1.

4.2 Non-listed Species

The overall effect on fish species other than salmon and steelhead would range from low-adverse to low-beneficial under Alternative 1 and Alternative 2 (Table 6). Relative to Alternative 1, effects would be generally low-beneficial or low-adverse under Alternative 3, and would range from low-beneficial to low-adverse under Alternative 4.

Table 6. Summary of effects on fish species other than salmon or steelhead.

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

4.2.1 Alternative 1 – No Action

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 (which are described below), no change in effects on other fish species is expected. Competition and predation effects would continue to be low-adverse for fish species in the analysis area. Salmonid species such as rainbow trout may compete for spawning grounds or rearing space with hatchery-origin salmonids. Effects on non-listed species would likely be smaller than those on natural-origin salmon and steelhead because of differences in spawn timing, location, and habitat preference. Predation by hatchery fish on native species would remain similar to current levels, and therefore, the effect is low-adverse.

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

Diseases that are endemic to many fish species would continue to have a low-adverse effect on fish species in the analysis area, though such incidences are not likely to occur with current ongoing hatchery programs. Diseases that pose particular risk to hatchery-origin salmonids (e.g., BKD and IHN) only affect salmonid species. Although other salmonid species such as resident rainbow trout have the potential to occur near existing hatchery facilities and release sites, several factors, such as the smolt release strategies and fish health protocols, would continue to reduce the likelihood of disease and pathogen transmission between hatchery fish and other salmonids.

Most fish species in the analysis area would continue to benefit (low-beneficial) from nutrient cycling of carcasses from hatchery-origin fish through having enhanced nutrients available to their prey sources. Naturally spawning fish of hatchery origin or nutrient enhancement derived from outplanting carcasses of fish spawned in hatcheries would continue to contribute to nutrient cycling in the natural environment.

Weir operations would continue to have low-adverse effects because the program facilities minimize any impediment to fish movement due to their weir by passing non-target species in the direction they were traveling. Weirs may act as barriers that cause population subdivision if other fish species (e.g., small, non-game fish) are not consistently passed upstream. Upstream migration may be delayed slightly for fish trapped at collection facilities. Handling levels and potential for injury would remain unchanged from current conditions. Effects on other fish species from water withdrawals, intakes, effluent discharge, and maintenance activities at Sawtooth and Pahsimeroi Hatcheries would also remain unchanged (low-adverse).

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

4.2.2 Alternative 2 – Proposed Action

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no change in effects on other fish species. Therefore, this alternative would have the same effects as Alternative 1 (Table 6).

4.2.3 Alternative 3 – Reduced Production

Under Alternative 3, the 50-percent decrease in hatchery-origin salmon and steelhead smolt production would still be low-adverse, but would be slightly reduced relative to Alternative 1 because fewer hatchery fish would be competing. The change would be low-beneficial under Alternative 3 (Table 6) because fewer juvenile salmon would compete with other fish species for prey, and fewer salmon smolts would compete with other salmonids for habitat space.

The decrease in hatchery-origin salmon and steelhead smolt production would reduce the availability of a prey resource of larger fish in Yankee Fork and Panther Creek compared to Alternative 1, but would still provide some enhancement of prey availability. Therefore, the effect would still be low beneficial. Other food sources would remain available, because hatchery production and activities would not affect these resources.

Current rearing and release strategies and fish health protocols reduce the likelihood of disease and pathogen transmission between hatchery fish and other salmonids; however, reduction of hatchery production may further reduce the risk of disease amplification to salmonids other than salmon and steelhead. Although a low-adverse effect might still be realized, in Yankee Fork and Panther Creek, the effect would be less than under Alternative 1. Sawtooth and Pahsimeroi Hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species.

The 50-percent reduction in hatchery production under Alternative 3 would result in fewer hatchery-origin salmon and steelhead contributing to nutrient cycling in the analysis area; however, it would still provide some returning adults and have a low-beneficial effect. The effect would be slightly reduced from Alternative 1.

The 50-percent reduction in hatchery production under Alternative 3 would reduce the number of hatchery broodstock collected annually; however it is unlikely it would reduce the number of non-target fish collected because both weirs would continue to operate throughout the adult return window to collect broodstock that represent the total returning run. Therefore, the effect on fish species would continue to be low-adverse, similar to Alternative 1.

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

4.2.4 Alternative 4 – Program Termination

With the complete termination of hatchery programs under Alternative 4, fish would not be released into Yankee Fork or Panther Creek, but Sawtooth and Pahsimeroi facilities would continue to operate for other salmon or steelhead programs described by NMFS (2017a); (NMFS and NOAA 2019). The decrease in production at these facilities will have little effect on water usage or discharge though it may slightly reduce both. Therefore, a light reduction in water use may result in low-beneficial effects on resident fish instead of the low-adverse effect in Alternative 1.

Termination of the hatchery programs would reduce competition with and predation on other fish species, leading to an overall low-beneficial effect instead of the low-adverse effect in Alternative 1. The programs would not release smolts or eggs, eliminating one source of prey for some in the analysis area. This could result in a low-adverse effect on other fish species instead of the low-beneficial effect in Alternative 1.

Termination of hatchery programs would eliminate the risk of hatchery-related disease amplification to salmonids other than salmon and steelhead. Although a slight beneficial effect might be realized, in Yankee Fork and Panther Creek, Sawtooth and Pahsimeroi hatcheries would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species. Complete cessation of hatchery production in Yankee Fork and Panther Creek would contribute to a low-beneficial effect on other fish species relative to Alternative 1 because the risk of hatchery-related disease would be eliminated in Yankee Fork and Panther Creek.

Over time, as salmon and steelhead from terminated programs no longer return to the analysis area, hatchery-origin adults would no longer contribute to nutrient cycling. Some hatchery-origin fish would successfully spawn in the natural environment, and therefore, add to future generations that would contribute to nutrient cycling. However, complete cessation of hatchery production, and corresponding reduced intake of nutrients through prey sources, would contribute to a low-adverse effect on other fish species instead of the low-beneficial effect in Alternative 1 because far less adults would contribute to nutrient cycling in Yankee Fork and Panther Creek.

RM&E would likely continue at similar levels to current regardless of termination for these programs. Because both Yankee Fork and Panther Creek have very low abundance, monitoring natural-origin abundance will be a concern, and monitoring is likely to continue. Therefore, complete cessation of hatchery-production activities in these watersheds would have a similar low-adverse effect on other fish species, similar to Alternative 1.

4.3 Fish Habitat

Operation of both Yankee Fork and Panther Creek include operation of weirs that are designed to block fish passage for management and evaluation of Chinook salmon in the area. The operation of temporary weirs impacts free passage of fish both up and downstream of the weir while it is in operation. The existing conditions of the stream morphology and critical habitat (dredge spoils, lack of vegetation and large wood, water temperatures, limited pool habitat, etc.) will not be impacted by the Alternatives considered.

4.3.1 Alternative 1 – No Action

Under Alternative 1, weir operations would continue to have low-adverse effects because the weir management minimizes impediment to fish movement by passing any non-target species in the direction they were traveling. Migration may be delayed slightly for fish trapped at collection facilities. Handling levels and potential for injury would remain unchanged from current

conditions. Effects of water diversions, intakes, effluent discharge, and maintenance activities at Sawtooth and Pahsimeroi Hatcheries would also remain unchanged (low-adverse).

4.3.2 Alternative 2 – Proposed Action

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no change in effects on fish habitat. Therefore, this alternative would have the same effects as Alternative 1.

4.3.3 Alternative 3 – Reduced Production

The 50-percent reduction in hatchery production under Alternative 3 would reduce the number of hatchery broodstock collected annually; however, it would not reduce the timing of weir operations annually. Because Chinook salmon migration timing will remain unchanged, weir operation will still occur for the same duration because both weirs would continue to operate throughout the adult return window to collect broodstock that represent the total returning run. Therefore, the effect on access to fish habitat would be low-adverse, similar to Alternative 1.

4.3.4 Alternative 4 – Program Termination

With the complete termination of hatchery programs under Alternative 4, weirs would not be installed because broodstock would not be collected at either location. Fish would also not be released into Yankee Fork or Panther Creek. Sawtooth and Pahsimeroi facilities would continue to operate for other salmon or steelhead programs. The effect on fish species due to water use and discharge at Sawtooth and Pahsimeroi relative to Alternative 1 would be the same; however, Yankee Fork and Panther Creek would see a low-beneficial effect by not operating the weirs, which would allow unhindered passage.

4.4 Tourism and Recreation

Operation of the weir facilities at Yankee Fork and Panther Creek could temporarily affect surrounding areas for recreational use for boaters that may encounter the weir, and thus could alter the desire for tourism in the area for recreation.

4.4.1 Alternative 1 – No Action

However, all recreational sites and campgrounds in the region would remain accessible even during operation of the weirs, and would have no effect on the ability of forest users to access recreation in the area.

Any kayakers within the immediate vicinity would be required to portage around the weir sites. Given the limited area of both Yankee Fork and Panther Creek affected for this purpose, this would constitute a low-adverse impact for recreational boaters.

Operation of Alternative 1 would improve fishing opportunities for Tribal and non-tribal anglers fishing for spring/summer Chinook salmon in both Yankee Fork and Panther Creek. The increase in value of the recreational fishery is discussed in detail in Socioeconomics and Environmental

Justice (Subsections 4.5, Environmental Justice, and 4.7, Socioeconomics). Improved fishing opportunities and public interpretive signage provided at the weir site would result in a long-term, medium-beneficial impact on use of campgrounds and recreation sites.

4.4.2 Alternative 2 – Proposed Action

Under Alternative 2, the operation of all hatchery programs would be the same as under Alternative 1, with no change in effects on recreation or tourism. Therefore, this alternative would have the same effects as Alternative 1.

4.4.3 Alternative 3 – Reduced Production

Under Alternative 3, though production would be reduced by 50 percent, the operation of all hatchery weirs would be the same as under Alternative 1. Therefore, this alternative would have the same effects as Alternative 1.

4.4.4 Alternative 4 – Program Termination

Under Alternative 4, the operation of all hatchery weirs would not occur; therefore, this alternative would have a low beneficial effect for kayakers who do not have to portage around the weir, and the natural viewscape would not be impacted.

4.5 Environmental Justice

Production of fish intended for harvest has the potential to impact people who may rely on fish for food (from fishing or food banks) or income. Alternatives 1 and 2 may result in medium-beneficial impacts, while Alternative 3 may have a low-adverse impact, and Alternative 4 may have a medium-adverse impact.

4.5.1 Alternative 1 – No Action

Under Alternative 1, the hatchery programs would continue to distribute fish collected for adult management to local tribes for ceremonial and subsistence purposes or public entities (e.g., local food banks). The environmental justice communities of concern (Subsection 3.5, Environmental Justice) would benefit from the distribution of fish to local food banks to the extent that these communities rely on these food banks. In addition, the programs would provide returning adults (both hatchery and natural) for local communities to provide fishing opportunity and access to fish for food. The programs would also continue to provide economic opportunities (Subsection 3.7, Socioeconomics) and fish of cultural and economic importance to the tribes (Subsection 3.6, Cultural Resources). Because of the positive benefit to communities of concern, economics, and local tribes, this alternative would have a medium-beneficial effect.

4.5.2 Alternative 2 – Proposed Action

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.

4.5.3 Alternative 3 – Reduced Production

Decreasing hatchery production under Alternative 3 could result in a reduction of charitable harvest donations. Because these programs are intended to support tribal harvest, tribes may still have some of the benefits describe in Subsection 4.5 (Environmental Justice), but the effect would be low-beneficial (rather than the medium-beneficial effect in Alternative 1).The reduction in returning adult Chinook salmon would allow fewer opportunities to partake in traditional practices of harvesting fish. Tribes, food banks, and nontribal organizations may continue to benefit from receiving surplus fish for consumption and ceremonial purposes from ongoing other programs; however it is likely that the 50 percent reduction in production of these programs under Alternative 3 would result in a low-beneficial effect rather than the medium-beneficial effect in Alternative 1.

4.5.4 Alternative 4 – Program Termination

Termination of the hatchery programs under Alternative 4 would reduce the number of fish returning to Yankee Fork and Panther Creek. Because these programs are intended to support tribal harvest, tribes may be negatively impacted by the reduction in returning adult Chinook salmon used for food. Tribes would also have fewer opportunities to partake in traditional practices of harvesting fish. Fishing for subsistence purposes may be reduced or eliminated in Yankee Fork and Panther Creek. It is likely that other hatchery facilities would continue to operate and provide charitable harvest donations to tribes, food bank, and nontribal organizations for consumption, ceremonial, or subsistence purposes; however, this alternative would have a medium-adverse effect on environmental justice communities rather than the medium-beneficial effect in Alternative 1.

4.6 Cultural Resources

Production of fish intended for harvest has the potential to impact people, particularly tribes, who may rely on fish for food or income. These programs specifically support tribal fisheries, and support a resource (fish) that is culturally important to tribes in the area. Alternatives 1 and 2 may result in medium-beneficial impacts, while Alternatives 3 and 4 may have a medium-adverse impact.

4.6.1 Alternative 1 – No Action

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 abundance and productivity, the tribes would continue to receive the surplus of adult fish collected. The tribes would benefit through the long-term potential for salmon to continue existing and for salmon populations to increase in size in the Yankee Fork and Panther resulting in a medium-beneficial effect because more fish would be available for harvest.

4.6.2 Alternative 2 – Proposed Action

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. Therefore, this alternative would have the same medium-beneficial effect as Alternative 1.

4.6.3 Alternative 3 – Reduced Production

Under Alternative 3, the effects of the hatchery programs on cultural resources would be similar to those under Alternative 1, but harvests will likely be reduced in the analysis area. Tribes would also have fewer opportunities to partake in traditional practices of harvesting fish. Reduced returns of hatchery fish would also likely reduce the numbers of surplus fish received by tribes because the reduction largely affects hatchery-origin fish that are intended for harvest rather than natural production. Overall, this alternative would have a low-beneficial effect, though less than under Alternative 1.

4.6.4 Alternative 4 – Program Termination

Under Alternative 4, the hatchery programs would no longer contribute to the tribes receiving surplus fish or to the abundance and productivity of salmon. Although natural-origin salmon and steelhead would continue to return to these areas, few (or none) would be available for harvest or surplused for food. Sawtooth and Pahsimeroi hatcheries would likely continue to operate at current levels because of other hatchery programs being implemented, that may provide some harvest or surplus opportunity, though it would be less if these programs are terminated. Therefore, this alternative would have a medium-adverse effect compared to Alternative 1.

4.7 Socioeconomics

Production of fish intended for harvest has the potential to impact people who may rely on fish for income through the sale of goods and services to fishermen in the area. Additionally, the fish may be used for food that offsets some food expenditures, thus acting like a supplement to income. Alternatives 1 and 2 may result in medium-beneficial effects, while alternative 3 and 4 may have a low-adverse effect.

4.7.1 Alternative 1 – No Action

Under Alternative 1, the hatchery programs would be operated the same as under current conditions, so recreational expenditures, employment opportunities, and the local procurement of goods and services related to hatchery operations, commercial fishing, recreational fishing, and tribal fishing would remain the same. Thus, the contribution to the regional economy would lead to a medium-beneficial effect of these hatchery programs, as seen under current conditions.

4.7.2 Alternative 2 – Proposed Action

Under Alternative 2, the operation of hatchery programs would be the same as under Alternative 1, with no change in recreational expenditures, employment opportunities, or the local

procurement of goods and services related to hatchery operations. Therefore, this alternative would also have the same medium-beneficial effect as Alternative 1.

4.7.3 Alternative 3 – Reduced Production

Under Alternative 3, hatchery production would be reduced by 50 percent compared to Alternative 1. The reduction could result in a reduction of harvest and associated recreational expenditures within the analysis area. The primary loss in fisheries would be observed in Yankee Fork or Panther Creek, and the impact is unlikely to be noticeable outside of these areas. Although possible, it is unclear whether staff reduction and impacts on personal income would occur because some staff will be needed to continue the programs. Overall, this alternative would have a have low-beneficial effect because some fish would still be available; however, because fewer fish would be available, the benefit would not be as high as the medium-beneficial effect in Alternative 1.

4.7.4 Alternative 4 – Program Termination

Under Alternative 4, operations of the hatchery programs described in the Proposed Action would no longer contribute to recreational expenditures, jobs, or operational expenses for the regional economy. The primary loss in fisheries would be observed in Yankee Fork or Panther Creek, and the impact is unlikely to be noticeable outside of these areas. It is likely there would be staff reductions and impacts on personal income would occur because staff would not be needed to continue the programs or operate the weirs. Because the programs are operated primarily by tribal staff, the reductions would likely impact the tribes more directly. Overall, this alternative would have low-adverse effect compared to Alternative 1.

4.8 Human Health and Safety

Operation of the hatchery programs may discharge chemicals, which may lead to increased accumulation of these chemicals in the environment. Additionally, 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.

Primary concerns for human safety would be for hatchery staff installing the temporary weirs in flowing water.

4.8.1 Alternative 1 – No Action

Under Alternative 1, the hatchery programs would be operated the same as under current conditions. Use of best management practices minimizes the risk to human health. Therefore, Alternative 1 has a low-negative impact on human health.

Safety precautions for weir installation such as working in teams and installing weirs during safe flow minimizes these risks. Therefore, this alternative is likely to have a low-adverse effect.

4.8.2 Alternative 2 – Proposed Action

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.

4.8.3 Alternative 3 – Reduced Production

Under Alternative 3, the operation of the hatchery programs would be reduced, but the risks would be the same as under Alternative 1 because of ongoing weir operation and continued program activities (even at a lower level). Therefore, this alternative would have the same low-adverse effect as Alternative 1.

4.8.4 Alternative 4 – Program Termination

Under Alternative 4, the termination of hatchery programs would reduce any potentially harmful effects associated with hatchery operations, like weir installation, on human health and safety. 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. Therefore, this alternative would have a low-beneficial effect relative to Alternative 1.

4.9 Water Quality, Water Quantity, and Hydrology

The overall effect on water quality from operation of the two hatchery programs would be low-adverse under Alternative 1, Alternative 2, and Alternative 3 (Table 7). Effects would be low-beneficial under Alternative 4.

Table 7. Summary of effects on water quality.

Resource	Alternative 1 - No Action (Status Quo)	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination
Water Quality	Low-adverse	Low-adverse	Low-adverse	low-beneficial

The overall effect on water quantity from operation of the two hatchery programs would be low-adverse under Alternative 1, Alternative 2, and Alternative 3 (Table 8). Effects would be low-beneficial under Alternative 4.

Table 8. Summary of effects on water quantity.

Resource	Alternative 1 - No Action (Status Quo)	Effects of Alternative Relative to Alternative 1		
		Alternative 2 – Proposed Action	Alternative 3 – Reduced Production	Alternative 4 – Program Termination4
Water Quantity	Low-adverse	Low-adverse	Low-adverse	low-beneficial

4.9.1 Alternative 1 – No Action

Under Alternative 1, the hatchery programs would be operated the same as under current conditions. The two hatchery programs would continue to need the use of surface water and groundwater at both Sawtooth and Pahsimeroi Hatcheries (NMFS and NOAA 2019). Because the holding and rearing for these programs is just a proportion of the production that already occurs at both hatcheries, the additional water used would be small. Overall, the continued operation of the hatchery programs under Alternative 1 would likely have a low-adverse effect on water quantity.

Similarly, water quality should not change under Alternative 1. The existing production does not require the use or discharge of water in Yankee Fork or Panther Creek. A small amount of sediment may be suspended in the water column from use of the weir, but is expected to be minor or undetectable. The use and discharge of water will continue to occur at Sawtooth and Pahsimeroi Hatcheries (which are used for rearing space), and under Alternative 1, effluent discharged by hatchery facilities would be expected to continue contributing similar levels of pollutants to receiving waters. Because the holding and rearing for these programs is just a proportion of the production that already occurs at both hatcheries, the additional amount of water used would be small. Overall, the continued operation of the hatchery programs under Alternative 1 would likely have a low-adverse effect on water quality.

4.9.2 Alternative 2 – Proposed Action

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

4.9.3 Alternative 3 – Reduced Production

Under Alternative 3, the effect on water quantity would be similar to that under Alternative 1 even though the production levels of the hatchery programs would be reduced by 50 percent. Both Sawtooth and Pahsimeroi facilities would continue to be operated for other programs as described by NMFS (2017a) and (NMFS and NOAA 2019), and, therefore, reductions in surface water withdrawals or discharge would be minimal.

Overall, Alternative 3 would have a low-adverse effect on water quantity or quality, but possibly slightly less negative than Alternative 1.

4.9.4 Alternative 4 – Program Termination

Similar to Alternative 3, even with immediate termination of both Sawtooth and Pahsimeroi hatchery programs under Alternative 4, both facilities would remain in operation for the programs described by NMFS (2017a) and (NMFS and NOAA 2019). Reductions in production would have little effect on water use from either surface water or groundwater. The corresponding change in discharge would be similarly small.

Overall, Alternative 4 would have a low-beneficial effect on water quantity and quality.

4.10 Land Use and Ownership

Operation of both programs requires the issuance of a special use permit to operate weirs on federal land. Neither program involves the purchase or exchange of land, but a special use permit would authorize a specific use for land that is publically accessible. No other current land use would be impacted. Alternatives 1, 2, and 3 may have a low-adverse impact, while Alternative 4 may have a low-beneficial impact.

4.10.1 Alternative 1 – No Action

Under Alternative 1, the hatchery programs, including weirs, would be operated the same as under current conditions. There would be in no change in land ownership, designation of Wild and Scenic Rivers, and only minor impact due to the dedicated use of land in the area for hatchery operations. Therefore, this alternative would have a low-adverse effect.

4.10.2 Alternative 2 – Proposed Action

Under Alternative 2, the operation of the hatchery programs would be the same as under Alternative 1, resulting in no change in land ownership, designation of Wild and Scenic Rivers, and only minor impact due to the dedicated use of land in the area for hatchery operations. Therefore, this alternative would have the same low-adverse effect as Alternative 1.

4.10.3 Alternative 3 – Reduced Production

Under Alternative 3, the programs would be reduced; however, the operation of the weirs would be the same as under Alternative 1, resulting in no change in land ownership, designation of Wild and Scenic Rivers, and only minor impact due to the dedicated use of land in the area for hatchery operations. Therefore, this alternative would have the same low-adverse effect as Alternative 1.

4.10.4 Alternative 4 – Program Termination

Under Alternative 4, the termination of hatchery programs would eliminate the operation of the weirs. There would still be no change in land ownership or designation of Wild and Scenic Rivers; however, the minor impact of not operating facilities here may be improved as compared

to Alternative 1 since weirs would not be installed. Therefore, this alternative would have a low-beneficial effect compared to the low-adverse effect under Alternative 1.

4.11 Transportation

Both programs require the use of state, county, and forest roads to access weir sites and release locations. Fish tanker trucks and research vehicles designed to transport fish may be used on these publically accessible roads. Though different roads are used to access each of the sites in Yankee Fork and Panther Creek, impacts will occur on different sections of road; however, because the impacts at both locations will be similar in nature, the analysis here is combined. No new roads are required, and none will be constructed with the implementation of these programs. Alternatives 1, 2, and 3 may have a low-adverse impact, while Alternative 4 may have a low-beneficial impact.

4.11.1 Alternative 1 – No Action

Under Alternative 1, the hatchery programs would be operated the same as under current conditions. During spring releases, tanker trucks would be used to transport juvenile fish from Sawtooth and Pahsimeroi Hatcheries for release. Through spring and summer, staff would drive vehicles to access weir sites, and use pick-up trucks with tanks to transport adults back to hatcheries for holding. These vehicles may drive slower than regular traffic, resulting in minor delays for people accessing the forest for recreation. Delays would be minor, and would primarily occur in spring when fewer people are accessing the forest for recreation because access is blocked by snow. Therefore, Alternative 1 would have a low adverse impact.

4.11.2 Alternative 2 – Proposed Action

Under Alternative 2, the operation of the hatchery programs would be the same as under Alternative 1, resulting in the same low-adverse effect as Alternative 1.

4.11.3 Alternative 3 – Reduced Production

Under Alternative 3, the programs would be reduced; however, the operation of the weirs would be the same as under Alternative 1, resulting in the same number of vehicle trips to check the weir. With reduced release numbers, it is possible that fewer trips would be required to release fish in the spring. There would still be a low-adverse effect; however, it would be less adverse than Alternative 1.

4.11.4 Alternative 4 – Program Termination

Under Alternative 4, the termination of hatchery programs would eliminate the operation of the weirs and the use of trucks to release fish. Therefore, this alternative would eliminate the low-adverse effect of Alternative 1.

5 Cumulative Effects

Cumulative effects 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 effects analysis extends from the construction of the Hells Canyon Complex of dams (opened from 1959 through1967) 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 Subsection 1.1, Purpose and Need.

The geographic area for the cumulative effects 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 effects 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 hatchery fish may be monitored or stray downstream to Ice Harbor Dam. The cumulative effects for socioeconomics, 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.

5.1 Past, Present, and Reasonably Foreseeable 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 analysis area. This development, along with other factors such as historical 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 effects with the alternatives described in this EA include operation of hatchery programs as described in the Mitchell Act FEIS (NMFS 2014) , climate change, and potential habitat restoration activities. Because the Action Area is rural, and much of the land is public land, climate change is expected to be the most likely element to affect the Action Area. Climate change may contribute to effects of the alternatives and is considered a reasonably foreseeable future condition for purposes of this cumulative effects analysis. The project area is in the Pacific Northwest where the effects of climate change are affecting hydrologic patterns and water temperatures. Climate change impacts on the regional hydrologic cycle and ESA-listed salmon and steelhead populations, and their

habitats, have been evaluated extensively across the Columbia River Basin (Mote et al. 2003; ISAB 2007; Karl et al. 2009; Dittmer 2013; USBR 2016). Evidence of climate change includes increased average annual air temperatures and water temperatures over the past century. Recently researchers examined data from 1990 through 2009 and found that temperatures in the Snake River Basin are increasing, while average streamflows are slightly decreasing (NMFS 2017a; 2017d; 2017b; 2017c).

According to the Independent Scientific Advisory Board (ISAB), average annual temperatures in the Northwest have increased by approximately 1.8°F since 1900, or about 50 percent more than the global average evaluated over the same period of time (ISAB 2007). Earlier climate investigations have estimated that the mean annual temperature in the Columbia River Basin has increased by approximately 3.6°F since the late 1800s (USBR 2016). The latest climate models project a warming of 0.2°F to 1.1°F per decade over the next century (NMFS 2017a; 2017d; 2017b; 2017c).

In general, warming air temperature in winter and spring will lead to more precipitation falling as rain, rather than snow. At elevations within the Snake River Basin along the transient snow zone, even a small amount of warming in winter may cause substantial shifts in the accumulated rainfall versus snowfall during the cool months (October through March); alternatively, locations at higher elevations typically experience winter temperatures far below freezing, so a slight increase in temperature may not initiate a shift from snow to rain (ISAB 2007). In watersheds that historically develop a seasonal snow pack, warmer temperatures will likely reduce snowpack depth—thereby resulting in less flow from snowpack-driven streams—and cause a temporal shift in snowmelt runoff—thereby changing the timing of runoff, and potentially causing either too much water or too little water at critical times during fish development.

Reduction in snowpack depth is attributed to both warming surface air temperatures and reduction of precipitation falling as snow (ISAB 2007). Annual snowpack measurements taken throughout the region on April 1 are considered a prime indicator of natural water storage available as runoff during the warmer months of the year. These measurements indicate a substantial snowpack reduction across the Northwest (Karl et al. 2009). For example, the average snowpack decline in the Cascade Mountains was about 25 percent over the past 40 to 70 years, and is projected to decline by as much as 40 percent by the 2040s (Karl et al. 2009). In general, declines in the Northwest snowpack are projected to continue over this century, varying with latitude, elevation, and proximity to the coastal regions.

Flow timing has shifted over the past 50 years, with the peak of spring runoff shifting from a few days earlier in some places to as much as 25 to 30 days earlier in others (Karl et al. 2009).

Throughout the region, shifts in the timing and magnitude of snowmelt runoff increase the winter flood risk and summer drought risk in more sensitive watersheds. Increased winter temperatures and reduced snowpack would likely increase winter runoff, causing peak flows along rivers and large streams to increase and causing diminished runoff earlier in the season (ISAB 2007). Reductions in warm season (April through September) runoff in the region are expected to reach approximately 10 percent by mid-century(Karl et al. 2009). Impacts caused by shifts in flow

timing range from lower streamflows to drought in the warmer months, June through September (ISAB 2007).

Over time, both Yankee Fork and Panther Creek have been the focus of habitat restoration, and an aggressive and closely monitored habitat improvement program (not funded under the Proposed Action). Because of the interest in preserving fish species in these drainages, and Federal funding, these actions are likely to continue. Though already sufficient, water quality and quantity to support normal migration, reproduction, growth, foraging, and survival may improve even more with restoration projects.

5.2 Impacts Analysis

5.2.1 Listed Species

Cumulative impacts of hatchery production in the Snake River Basin may benefit listed salmon and steelhead, but can also pose risks (Subsection 4.1, Listed Species). The effects of the programs included in this EA are similar to those that were included in the Mitchell Act FEIS (NMFS 2014) as part of 49 hatchery programs in the Snake River Basin and 117 hatchery programs in the Columbia River Basin. Though not part of the Mitchell Act FEIS, the alternatives discussed for hatchery salmon production for programs under the Proposed Action in this EA (Alternative 2) fall generally in the range between various Mitchell Act FEIS alternatives.

In the Mitchell Act FEIS, NMFS (2014) 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 across the basin
- Pose risks of effects related to operation of hatchery facilities, such as impeded passage (weirs), reduced spatial structure, reduced habitat, entrainment, and diminished water quality
- Pose competition and predation risks to natural-origin salmon and steelhead
- Pose a risk of masking hatchery effects as a result of inadequate marking and sampling
- Pose a risk of disease transfer to natural-origin populations

NMFS (2014, Subsection 4.2.3, Effects on Salmon and Steelhead) determined that natural-origin abundance of Snake River salmon and steelhead would generally increase under all Mitchell Act FEIS alternatives relative to current conditions (Alternative 1), with the largest increase occurring under Alternative 5 and the smallest under Alternative 2 and Alternative 3. Genetic diversity would also likely increase under all alternatives relative to current conditions, with changes being similar under all alternatives compared to current conditions. New weirs would be installed only under Alternative 3 through Alternative 5. Hatchery facility risks would be decreased equally from current conditions under Alternative 2 through Alternative 6. Competition with and predation on natural-origin juvenile salmonids would be reduced with decreases in hatchery production; therefore, FEIS Alternative 2 would result in the largest

decreases in competition and predation, and FEIS Alternative 6 would result in the smallest decreases. Risks of masking and disease transfer may also be reduced through reduced hatchery production; therefore, relative effects would be similar to those for competition and predation.

Climate change, particularly changes in streamflow and water temperatures, would likely impact natural-origin salmon and steelhead life stages in various ways. The effects of climate change on salmon and steelhead would vary among species and among life history stages (ISAB 2007). Effects of climate change may affect every species and life history in every type of salmon and steelhead in the cumulative effects analysis area (Glick 2005; Mantua et al. 2010) (Table 9).

It is likely that, as climate change affects ocean conditions and streamflows, abundances of salmon and steelhead would change accordingly, resulting in changes in abundance of adults returning to freshwater to spawn. Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, whereas cooler ocean periods have coincided with relatively high abundances (Karl et al. 2009).

If climate change reduces the water volumes and increases the water temperatures in the analysis area, it will likely reduce the suitable habitat for spring and summer Chinook salmon, coho salmon, and steelhead rearing, potentially decreasing their abundance. Effects would likely be smaller on fish that migrate as subyearlings, and therefore do not rear during summer low flows. Lower summer flows and increased water temperatures may lead to an increase in the abundance of nonnative warm water species that can compete and prey on listed salmon and steelhead. If abundance is decreased because of climate change, over time the populations may become more reliant on hatchery production to supplement declining populations. Further reliance on hatchery production may increase the impacts of the hatchery on natural-origin population as described in Subsection 4.1.

Warmer water temperatures may also increase the incidence of disease outbreaks and pathogen virulence in both the natural population and hatchery-produced juveniles. On the other hand, warmer water temperature may also shift pathogen composition through increase in pathogens that thrive in warmer waters and decrease in pathogens that are susceptible to warmer waters.

Although climate change may well have impacts on the abundance and/or distribution of salmonids and steelhead populations that are considered under all of the alternatives in this EA, the proposed hatchery management described in the HGMPs and the associated monitoring provide the ability to evaluate hatchery program impacts as abundances change, making appropriate adjustments feasible and timely. In general, the effects described in Subsection 4.1, Listed Species, would be worse under climate change conditions because the proportion of hatchery fish to wild fish would be higher (with reduced natural survival).

Table 9 Examples of potential impacts of climate change by salmon and steelhead life stage 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.

Because bull trout require similar water quality and habitat as salmon and steelhead, impacts on bull trout from climate change are expected to be similar; however, the programs will not mitigate the lower abundance of bull trout populations through hatchery production.

Although climate change will likely have impacts on the abundance and/or distribution of salmon and steelhead, proposed hatchery management actions and associated monitoring provide the ability to make appropriate adjustments. However, the cumulative effects on salmon, steelhead, and bull trout under Alternative 1 and Alternative 2 of this EA may extend beyond that considered in Subsection 4.1, Listed Species, because of the potential changes in natural production and distribution, and changes in hatchery production and operations that may be required.

Under Alternative 1, Alternative 2, and Alternative 3 of this EA, the cumulative effects on salmon, steelhead, and bull trout when including climate change would likely be similar to the effects described for each alternative in Subsection 4.1, Listed Species; however, it is likely that magnitude of the impact would be slightly increased because natural-origin populations may decline relative to the hatchery population. Under Alternative 4 of this EA, the release of smolts would be eliminated. Under this alternative, impacts on listed species would be lessened or eliminated (see Subsection 4.1.4); however the impacts of climate change would not be countered by maintaining abundance with hatchery production.

5.2.2 Non-listed Species

NMFS (2014, Subsection 4.2.4, Effects on Other Fish Species that Have a Relationship to Salmon and Steelhead) determined that reductions in hatchery production for Mitchell Act FEIS Alternative 2 through Alternative 6 would likely result in a reduction in competition and predation for Pacific lamprey, and other fish species, but also a reduction in prey resources compared to current conditions (FEIS Alternative 1). The greatest effect would be under FEIS Alternative 2, with FEIS Alternative 6 having the least change compared to current conditions.

Other fish species would likely respond to climate change in similar ways as salmon and steelhead. Habitat may be affected by future changes in water temperatures, precipitation, and extreme events, which can occur from climate changes. Fish that are more adaptable to warmer aquatic conditions could ultimately replace cold-water fish as the dominant species. As previously noted, the mitigated benefits from habitat restoration actions are difficult to predict, and therefore, there is some uncertainty about the degree to which this would occur.

Under Alternative 1 and Alternative 2 of this EA, hatchery juveniles and adults would continue to either be prey for other fish species, prey upon other fish species, and/or compete for resources with the other fish species. However, because climate change may favor introduced warmer water fish over native cold-water fish, the effects of the hatchery production on other fish species may be greater than those described in Subsection 4.2 Non-listed Species.

Under Alternative 3 and Alternative 4 of this EA, the number of smolts released would decrease; effects on other fish species would range from low-beneficial (like prey source and nutrient enhancement) to low-adverse (like competition/predation and disease) (Subsection 4.2 Non-listed Species). However, because climate change may favor introduced warmer water fish over native cold-water fish, the cumulative effects on other fish species may be greater than those described in Subsection 4.2 Non-listed Species.

5.2.3 Fish Habitat

Climate change may affect water quantity by changing seasonal river flows or change fire frequency, which also impacts flow regimes and sediment loads. Migration timing or holding habitat could change with altered flows or changes in wood recruitment to streams. Such changes are difficult to predict, and would generally impact fish habitat in the same way regardless of hatchery operations.

Because changes in habitat access due to climate change are likely to be independent of hatchery operation, cumulative effects on fish habitat would likely be similar to those described in Subsection 5.2.1 Listed Species. Some habitat restoration may reduce some of the impacts; however, as previously noted, the mitigated benefits from habitat restoration actions are difficult to predict, and therefore, there is some uncertainty about the degree to which this would occur.

The effects of the ongoing operation of 49 hatchery programs in the Snake River Basin programs included in the Mitchell Act FEIS (NMFS 2014) are expected to remain the same, as they have little or no impact on fish habitat.

5.2.4 Tourism and recreation

Climate change may affect water quantity by changing seasonal river flows or change fire frequency. Over time, climate change may impact the types of recreation or access to campgrounds. Such changes are difficult to predict, and would generally impact tourism and recreation in the same way regardless of hatchery operations.

Changes in tourism and recreation due to climate change are likely to reduce fishery opportunities. Therefore, cumulative effects on tourism and recreation would likely be greater than those described in Subsection 4.4, Tourism and Recreation.

The effects of the ongoing operation of 49 hatchery programs in the Snake River Basin programs included in the Mitchell Act FEIS (NMFS 2014) are expected to remain the same, as they will not alter the availability or access for tourism and recreation.

5.2.5 Environmental Justice

Climate change is not expected to change human population compositions in the area. Tribes would continue to be the primary group impacted by hatchery operations. It is likely that, as climate change affects ocean conditions, abundances of salmon and steelhead would change accordingly, resulting in changes in abundance of adults returning to freshwater to spawn. Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, whereas cooler ocean periods have coincided with relatively high abundances (Karl et al. 2009).

Under Alternative 1 and Alternative 2 of this EA, the total number of juvenile salmon released would have a positive effect for tribes that benefit from salmon harvest or surplused fish for consumption. With climate change, these positive effects may be less positive if survival is poor and because natural-origin populations may be depressed.

Under Alternative 3, reducing production would have a low negative effect for tribes that benefit less from salmon harvest or surplused fish for consumption. With climate change, these effects may be worse because natural-origin populations may be depressed.

Under Alternative 4, eliminating production would have a moderate negative effect for tribes that benefit less from salmon harvest or surplused fish for consumption. With climate change, these effects may be worse if survival is poor and because natural-origin populations may be depressed, and not supplemented with hatchery production.

Overall, climate change may reduce the positive the effects or exacerbate the negative effects discussed in section 4.5, Environmental Justice.

The effects of the ongoing operation of 49 hatchery programs in the Snake River Basin programs included in the Mitchell Act FEIS (NMFS 2014) are expected to remain the same. They would continue to contribute to the total availability of fish in the Snake River basin, though not specifically in Yankee Fork or Panther Creek.

5.2.6 Cultural Resources

It is likely that, as climate change affects ocean conditions and streamflow patterns, abundances of salmon and steelhead would change accordingly, resulting in changes in abundance and distribution of adults returning to freshwater to spawn. Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, whereas cooler ocean periods have coincided with relatively high abundances (Karl et al. 2009).

Under Alternative 1 and Alternative 2 of this EA, the total number of juvenile salmon released would have a positive effect for tribes that benefit from salmon harvest or surplused fish for consumption. With climate change, these positive effects may be less positive if survival is poor and because natural-origin populations may be depressed, reducing overall opportunity.

Under Alternative 3, reducing production would still provide some fish for harvest, though that benefit would be less from reduced salmon harvest or surplused fish for consumption because fewer fish would be available. With climate change, these effects may be worse if survival is poor.

Under Alternative 4, eliminating production would have a moderate negative effect for tribes that benefit less from salmon harvest or surplused fish for consumption. With climate change, these effects may be worse because natural-origin populations may be depressed, and hatchery fish would not be available, reducing overall opportunity.

Overall, climate change may reduce the positive the effects or exacerbate the negative effects discussed in section 4.6, Cultural Resources.

The effects of the ongoing operation of 49 hatchery programs in the Snake River Basin programs included in the Mitchell Act FEIS (NMFS 2014) are expected to remain the same. They would continue to contribute to the total availability of fish in the Snake River basin, though not specifically in Yankee Fork or Panther Creek.

5.2.7 Socioeconomics

As discussed above, it is likely that abundances of salmon and steelhead returning to freshwater to spawn would decline due to climate change.

Under Alternative 1 and Alternative 2 of this EA, the total number of juvenile salmon released would have a positive effect for tribes that benefit from salmon harvest or surplused fish for consumption. In addition, local businesses benefit from sport fishermen who visit or buy goods and services related to fishing and travel. With climate change, these positive effects may be less positive if survival is poor and because natural-origin populations may be depressed, reducing overall opportunity.

Under Alternative 3, reducing production would have a low negative effect for tribes that benefit less from salmon harvest or surplused fish for consumption as well as for businesses that cater to sport fishermen. With climate change, these effects may be worse.

Under Alternative 4, eliminating production would have a moderate negative effect for tribes that benefit less from salmon harvest or surplused fish for consumption and for businesses that cater to sport fishermen. With climate change, these effects may be worse.

Overall, climate change may reduce the positive the effects or exacerbate the negative effects discussed in section 4.7, Socioeconomics.

The effects of the ongoing operation of 49 hatchery programs in the Snake River Basin programs included in the Mitchell Act FEIS (NMFS 2014) are expected to remain the same. They would continue to contribute to the total availability of fish in the Snake River basin, though not specifically in Yankee Fork or Panther Creek.

5.2.8 Human Health and Safety

Future hatchery operations and climate change could affect water temperature and flows, which could impact disease prevalence in the hatchery. Therefore, it is possible that there would be an increase in the use of chemicals in hatchery facilities and discharge of chemicals into the environment. Consumption of hatchery-produced fish could change if hatchery stock abundance changes. Such changes are difficult to predict; however, hatcheries would continue to implement safe handling and storage procedures to support human health and safety, and follow water quality standards.

The hatchery programs under Alternative 1, 2 and 3 of this EA would minimize risks through compliance with safety programs, rules, and regulations, as well as through the use of protective equipment (Subsection 4.8, Human Health and Safety). Also, the risk to human health through consumption is directly associated with frequency of consuming fish, regardless of whether the fish are natural- or hatchery-origin, and the risk to human health through consumption is not measurable.

Climate change may affect water quantity by changing seasonal river flows as well as increased fire intensity and severity. 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). Risks of installing a weir in flows that become less predictable over time could increase the risk to human safety of hatchery staff. However, safety protocols are likely to minimize the risk. Therefore, little or no increase in risks to human health and safety would be expected as conditions change.

With termination of the programs under Alternative 4 of this EA, no cumulative effects would be expected beyond those already discussed in Subsection 4.8 Human Health and Safety.

5.2.9 Water Quality, Water Quantity, and Hydrology

Climate change may affect water quantity by changing seasonal river flows as well as increased fire intensity and severity. 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). Increased fire activity may result in increased sediment input into streams, as well as reduced shade.

Under all Alternative of this EA, the Sawtooth and Pahsimeroi Hatcheries are expected to have measurable, but low-adverse effects on water quantity. The effects on water quantity are due primarily to a facility diverting a proportion of streamflow over relatively short diversion reaches for a limited time during low-flow periods (Subsection 4.9, Water Quality, Water Quantity, and Hydrology). Hatchery needs are likely to remain somewhat stable; therefore, any reductions in water quantity and quality because of climate change would be exacerbated because of already reduced stream flows, and have greater effects than considered in Subsection 4.9 Water Quality, Water Quantity, and Hydrology.

The effects of the ongoing operation of 49 hatchery programs in the Snake River Basin programs included in the Mitchell Act FEIS (NMFS 2014) are expected to remain the same, and would have little or no impact in Yankee Fork or Panther Creek

5.2.10 Land Use and Ownership

Though climate change may affect water quantity by changing seasonal river flows or change fire frequency and intensity. Overall climate change is not expected to have an impact on the current ownership or use of lands surrounding the hatchery programs. Operation of the hatchery programs does not involve any land acquisition, so no change is expected.

Therefore, no cumulative effects would be expected beyond those already discussed in Subsection 4.10 Land Use and Ownership.

5.2.11 Transportation

Though climate change may affect water quantity by changing seasonal river flows or change fire frequency, overall climate change is not expected to have an impact on the current road density or expected use of roads surrounding the hatchery programs. Operation of the hatchery programs under alternatives 1, 2, and 3, as well as other hatchery programs, will have a low negative impact on transportation, while Alternative 4 is not expected to have an impact.

Therefore, no cumulative effects would be expected beyond those already discussed in Subsection 4.11.

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