HATCHERY AND GENETIC MANAGEMENT PLAN

Hatchery Program:	**Salmon River B-run Steelhead**
Species or Hatchery Stock:	Summer Steelhead-*Oncorhynchus mykiss.* Salmon River B-run stock
Agency/Operator:	Idaho Department of Fish and Game Shoshone-Bannock Tribes
Watershed and Region:	Salmon River, Idaho.
Date Submitted:	
Date Last Updated:	October 2018

EXECUTIVE SUMMARY

The management goal for the Salmon River B-run summer steelhead hatchery program is to provide fishing opportunities in the Salmon River for larger B-run type steelhead that return predominantly as 2-ocean adults. The program contributes to the Lower Snake River Compensation Plan (LSRCP) mitigation for fish losses caused by the construction and operation of the four lower Snake River federal dams.

Historically, the segregated Salmon River B-Run steelhead program has been sourced almost exclusively from broodstock collected at Dworshak National Fish Hatchery in the Clearwater River. Managers have implemented a phased transition to a locally adapted broodstock collected in the Salmon River. The first phase of this transition will involve releasing B-run juveniles (unclipped and coded wire tagged) at Pahsimeroi Fish Hatchery. Adult returns from these releases will be trapped at the Pahsimeroi facility and used as broodstock for the Salmon B-run program. The transition of this program to a locally adapted broodstock is in alignment with recommendations made by the HSRG in 2008.

Managers have also initiated longer term efforts to transition the program to Yankee Fork where a satellite facility with adult holding and permanent weir is planned as part of the Crystal Springs Fish Hatchery Program. Until these facilities are constructed, broodstock collection efforts in the Yankee Fork are accomplished with temporary picket weirs in side-channel habitats adjacent to where smolts are released.

Hatchery operations and monitoring activities are funded through the Lower Snake River Compensation Plan which is approved through the Water Resources Development Act of 1976 (public Law 94-587). The Pahsimeroi Fish Hatchery is owned and funded by the Idaho Power Company.

Each year, approximately 1,085,000 yearling summer steelhead smolts are released of which 248,000 are released into the Pahsimeroi River, 620,000 into the Yankee Fork Salmon River and the remaining 217,000 into the Little Salmon River (Table 2).

Key performance standards for the program include: (1) abundance and composition of hatchery returns; (2) number of smolts released; (3) in-hatchery and post-release survival rates; and (4) total adult recruitment, harvest and escapement of the hatchery component.

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 NAME OF HATCHERY OR PROGRAM

Hatchery: Magic Valley Fish Hatchery
Clearwater Fish Hatchery

Dworshak National Fish Hatchery
Pahsimeroi Fish Hatchery
Sawtooth Fish Hatchery
Yankee Fork Steelhead Project

Program: Salmon River B-run Steelhead

1.2 SPECIES AND POPULATION (OR STOCK) UNDER PROPAGATION, AND ESA STATUS

Summer Steelhead *Oncorhynchus mykiss.*

The Salmon River B-run steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS)(Figure 1). The hatchery population is ESA-listed.

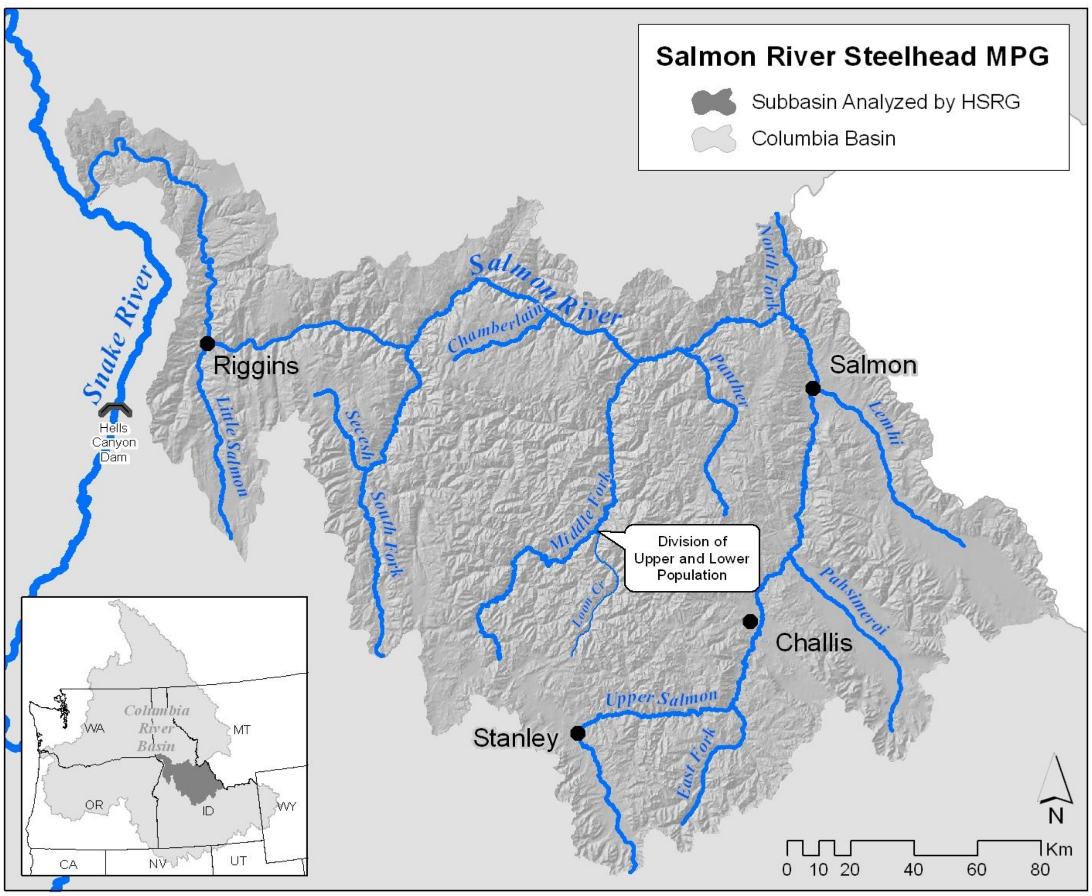

Figure 1. Salmon River Steelhead MGP (HSRG 2009).

1.3 RESPONSIBLE ORGANIZATION AND INDIVIDUALS

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

IDFG, the Nez Perce Tribe, the Shoshone/Bannock Tribes (SBT), the Lower Snake River Compensation Plan (LSRCP) office and the U.S. Fish and Wildlife Service collaboratively develop and implement production plans to meet mitigation goals and productions goals outlined in the *U.S. vs. Oregon* 2018-2027 Management Agreement. The same agencies meet collaboratively to co-author Annual Operating Plans for steelhead hatchery programs. IDFG coordinates with the Nez Perce Tribe and SBT, Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife to manage state and tribal fisheries for harvest shares and ESA take. Harvest and hatchery management coordination includes pre-season planning, scheduled weekly meetings, and post-season summary meetings to share information and identify management actions required to meet tribal and state fishery objectives.

The SBT plans to construct and operate a satellite facility in the Yankee Fork Salmon River. The satellite facility is proposed as part of the Tribes' Crystal Springs Fish Hatchery Program and would include on-site living quarters for program employees, permanent weir, adult holding ponds, and spawning shed. Once this facility is constructed B-run steelhead adults will be spawned on-site and green eggs will be transferred to Sawtooth Fish Hatchery. Until then, the SBT will operate temporary picket weirs in side-channel habitats. These adults will be transferred to Sawtooth Fish Hatchery for holding and spawning.

U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan Office: Administers the

Lower Snake River Compensation Plan as authorized by the Water Resources Development Act of 1976.

Dworshak National Fish Hatchery: Produces B-run steelhead eggs for the Clearwater Fish Hatchery. Eyed-eggs are shipped from Clearwater Fish Hatchery to the Magic Valley Fish Hatchery for the Salmon River B-run steelhead program.

1.4 FUNDING SOURCE, STAFFING LEVEL, AND ANNUAL HATCHERY PROGRAM OPERATIONAL COSTS*

- **Magic Valley Fish Hatchery**
  U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan funded.
  Staffing level: 3 FTE, 34 months of temporary staff.
  Annual budget: $890,000.

- **Clearwater Fish Hatchery**
  U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan funded.
  Staffing level: 8 FTE and 196 months of temporary staff.
  Annual budget: $2,583,000.

- **Sawtooth Fish Hatchery**
  U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan funded.
  Staffing level: 5 FTE, and 81 months of temporary staff.
  Annual budget: $973,000.

- **Dworshak National Fish Hatchery**
  Steelhead program funded by U.S. Army Corps of Engineers

- **Pahsimeroi Fish Hatchery** (Broodstock collection, spawning, and early incubation)
  Funded by Idaho Power Company
  Staffing level: 3 FTE plus 40 month of seasonal labor
  Annual budget: $555,390

- **Yankee Fork Steelhead Project** (Broodstock collection and spawning)
  Funded by U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan
  Staffing level: 1 FTE plus 6 month of seasonal labor
  Annual budget: $120,000

Budgets and staffing reflect all production programs at these facilities, not just those associated with this HGMP.

1.5 LOCATION(S) OF HATCHERY AND ASSOCIATED FACILITIES

- **Magic Valley Fish Hatchery** (MVFH)– The Magic Valley Fish Hatchery is located adjacent to the Snake River approximately 11.2 kilometers northwest of Filer, Idaho. Final incubation and juvenile rearing for this program occurs at MVFH.

- **Clearwater Fish Hatchery -** The Clearwater Fish Hatchery is located at confluence of the North Fork and main Clearwater rivers, river kilometer 65 on the Clearwater River.

Incubation to the eyed stage for Dworshak stock steelhead released in the Salmon River occurs at Clearwater Fish Hatchery

- **Sawtooth Fish Hatchery** – The Sawtooth Fish Hatchery is on the upper Salmon River approximately 8.0 kilometers south of Stanley, Idaho. The hatchery is approximately 400 miles upstream from the mouth of the Salmon River. **East Fork Salmon River Satellite** – The East Fork Salmon River Satellite is on the East Fork Salmon River approximately 29 kilometers upstream of the confluence of the East Fork with the mainstem Salmon River.

- **Dworshak National Fish Hatchery (DNFH)** – The Dworshak National Fish Hatchery is located at the confluence of the North Fork and the mainstem Clearwater rivers at river kilometer 65 in the Snake River Basin, Idaho. Adult trapping and spawning for Dworshak steelhead released in the Salmon River occurs at DNFH.

- **Pahsimeroi Fish Hatchery (PFH)** – Pahsimeroi Fish Hatchery (PFH) is comprised of two separate facilities – the lower Pahsimeroi Fish Hatchery (lower PFH) and the upper Pahsimeroi Fish Hatchery (upper PFH). The lower PFH is on the Pahsimeroi River approximately 1.6 kilometers above its confluence with the main Salmon River near Ellis, Idaho. The Upper PFH is approximately 11.3 kilometers further upstream from the lower facility on the Pahsimeroi River. Adult trapping, spawning, and incubation to the eyed stage of locally returning Salmon River B-run steelhead for this program occurs at PFH.

- **Yankee Fork Trap** – Temporary fish traps are located at Pond Series 1 and 3 approximately 3.5 and 6.0 river miles upstream from the confluence with the Salmon River, respectively. The fish traps are used to collect adult broodstock for the Salmon River B-run Steelhead Program. A permanent satellite facility is proposed to be constructed at river mile 3.2.

1.6 TYPE OF PROGRAM

This is a segregated harvest mitigation program.

1.7 PURPOSE (GOAL) OF THE PROGRAM

The management goal for the Salmon River B-run summer steelhead hatchery program is to provide fishing opportunities in the Salmon River for larger B-run type steelhead that return predominantly as 2-ocean adults.

The program is part of the LSRCP, a congressionally mandated program pursuant to PL 99-662. The purpose of the LSRCP is to replace adult salmon, steelhead and rainbow trout lost by construction and operation of four hydroelectric dams on the Lower Snake River. Specifically, the stated purpose of the plan is:

> *"…[to] ..... provide the number of salmon and steelhead trout needed in the Snake River*

system to help maintain commercial and sport fisheries for anadromous species on a sustaining basis in the Columbia River system and Pacific Ocean" (NMFS & USFWS 1972 pg 14)

Specific mitigation goals for the LSRCP were established in a three step process. First the adult escapement that occurred prior to construction of the four dams was estimated. Second an estimate was made of the reduction in adult escapement (loss) caused by construction and operation of the dams (e.g. direct mortality of smolt). Last, a catch to escapement ratio was used to estimate the future production that was forgone in commercial and recreational fisheries as result of the reduced spawning escapement and habitat loss. Assuming that the fisheries below the project area would continue to be prosecuted into the future as they had in the past, LSRCP adult return goals were expressed in terms of the adult escapement back to, or above the project area.

For steelhead, the escapement above Lower Granite Dam prior to construction of these dams was estimated at 114,800. Based on a 15% mortality rate for smolts transiting each of the four dams (48% total mortality), the expected reduction in adults subsequently returning to the area above Lower Granite Dam was 55,100. This number established the LSRCP escapement mitigation goal. Based on a catch to escapement ratio of 2:1, the anticipated benefit to fisheries below Lower Granite Dam was expected to be 110,200 fish.

Component	Number
Escapement Above Lower Granite Dam	55,100
Commercial Harvest	37,000
Recreational Harvest Below Lower Granite Dam	73,200
Total	165,300

One component of the steelhead mitigation computations was accounting for the estimated loss of 130,000 recreational angler days of effort caused by transforming the free flowing Snake River into a series of reservoirs. The COE recommended purchasing land to provide access for sportsman to compensate for this loss. When computing expected benefits for this loss, the COE assumed this access would be provided, that the 130,000 anger days would be restored and that one fish would be caught for each five hours of effort. As such, the COE expected that 26,000 of the 110,200 steelhead would be caught in the Snake River below Lower Granite Dam.
Location of the hatchery facilities was a key decision and the COE recommended: "These [steelhead hatcheries] should be constructed upstream of the Lower Snake River Project to provide for the sport fisheries of eastern Oregon, Washington and Idaho as well as the downriver fisheries". While recognizing that some steelhead crossing Lower Granite Dam would be caught, and some used for hatchery broodstock, no other specific priorities or goals were established regarding how the remaining fish might be used.

Since 1976 when the LSRCP was authorized, many of the parameters and assumptions used to size the hatchery program and estimate the magnitude and flow of benefits have changed.

- The survival rate required to deliver a 2:1 catch to escapement ratio has been less than expected and this has resulted in fewer adults being produced in most years.
- The listing of Snake River fall Chinook and Snake River Steelhead under the Endangered Species Act has resulted in significant curtailment of commercial, recreational and tribal

fisheries throughout the mainstem Columbia River. This has resulted in a much higher percentage of the annual run returning to the project area than was expected.

- The *U.S. v. Oregon* court case stipulated Fishery Management Plan has established specific hatchery production agreements between the states, tribes and federal government and this has diversified the hatchery program by adding new off station releases to meet short term conservation objectives.

The component of the LSRCP mitigation goal in the Salmon River was designed to escape 25,260 adults back to the project area after a harvest of 50,520. The program described in this HGMP is a component of that mitigation target. While recognizing the overarching purpose and goals established for the LSRCP, and realities' regarding changes since the program's authorization, the following objectives for the beneficial uses of adult returns have been established:

1. To contribute to the recreational, commercial and/or tribal fisheries in the mainstem Columbia River consistent with abundance based harvest rate schedules established in the *2018 – 2027 U.S. vs. Oregon* Management Agreement.
2. To be used as broodstock to perpetuate this hatchery program
3. To provide recreational and tribal fisheries annually (see Section 3.3 for more detail).

To maximize the beneficial uses of fish that return to the project area that are not used for broodstock, harvest, or natural spawning, managers have developed agreements to share and distribute these fish equally between tribal and non-tribal entities. Specific objectives are established annually as part of a preseason co-manager meeting between the states, tribes and federal agencies to prioritize the distribution of fish. Specific dispositions may include:

a. Tribal subsistence
b. Donations to food banks and charitable organizations
c. Outplanted in the Yankee Fork Salmon River to support Tribal fishery
d. Nutrient enhancement

1.8 JUSTIFICATION OF PROGRAM

The purpose of this program is harvest mitigation. The Salmon River B-run hatchery steelhead program is part of the LSRCP, a congressionally mandated program pursuant to PL 99-662. The purpose of the LSRCP is to replace adult salmon, steelhead and rainbow trout lost by construction and operation of four hydroelectric dams on the Lower Snake River. This program is operated as a segregated harvest program that is transitioning to the use of a locally adapted broodstock. Each year, approximately 1,085,000 yearling summer steelhead are released in the Salmon River basin as part of this program.

B-run steelhead are larger at age, older at maturity, and add diversity to fisheries. Non-tribal steelhead fisheries in Idaho targeting wild B-run stocks returning to the South Fork Salmon River and Middle Fork Salmon River have not occurred since the mid-1970s due to low abundance. Tribal fisheries on wild B-run stocks have occurred indefinitely but have been limited by steelhead abundance.

The Dworshak National Fish Hatchery B-run steelhead stock (DWOR) was used to expand B-run steelhead fishery opportunities to the Salmon River. DWOR smolts have been released into the Salmon River since the 1970s in an effort to increase the number of large two-ocean steelhead returning to the area. Managers are transitioning to localizing the DWOR stock to the Salmon River basin. This localized group is referred to as the USAL stock.

Survival data collected to date (Table 3; Sec 1.12) indicates that the locally adapted USAL stock returns at a higher rate than the DWOR stock. The higher survival of USAL stock is presumably linked to the process of local adaptation to both the hatchery and natural environments. It is also apparent that the USAL stock has maintained a life history similar to the ancestral stock, in which the majority of adults reside in the ocean for two years.

Managers have prioritized converting the entire Salmon River B-run Steelhead Program to USAL stock. To expedite this transition, smolts are released at a permanent weir located at the Pahsimeroi Fish Hatchery to eliminate the complications of operating a temporary weir to collect adult broodstock during spring runoff. Furthermore, these smolts are released with an intact adipose fin to allow fish to escape mark selective fisheries, but are coded-wire-tagged so that they can be distinguished from natural and other hatchery stocks returning to this location. The use of Pahsimeroi Fish Hatchery as a brood collection site is a temporary measure. During this interim period, the SBT collects broodstock in the Yankee Fork Salmon River by operating temporary weirs and through hook and line efforts. Ultimately, managers desire to move the broodstock collection to the Yankee Fork Salmon River when the weir that is linked with the Shoshone Bannock Tribes' Crystal Springs Fish Hatchery is constructed. The realization of a permanent weir on Yankee Fork Salmon River will provide a permanent broodstock collection and juvenile release site for the Salmon River B-run Steelhead Program.

1.9 LIST OF PROGRAM PERFORMANCE STANDARDS

"Performance Standards" are designed to achieve the program goal/purpose, and are generally measurable, realistic, and time specific. The Northwest Power and Conservation Council (NPCC)"Artificial Production Review" document attached with the instructions for completing the HGMP presents a list of draft "Performance Standards" as examples of standards that could be applied for a hatchery program. If an ESU-wide hatchery plan including your hatchery program is available, use the performance standard list already compiled.

Upon review of the NPCC "Artificial Production Review" document (2001) we have determined that this document represents the common knowledge up to 2001 and that the use of more recent reviews on the standardized methods for evaluation of hatcheries and supplementation at a basin wide ESU scale was warranted.

A NPCC "Artificial Production Review" document (2001) provides categories of standards for evaluating the effectiveness of hatchery programs and the risks they pose to associated natural populations. The categories are as follows: 1) legal mandates, 2) harvest, 3) conservation of wild/naturally produced spawning populations, 4) life history characteristics, 5) genetic characteristics, 6) quality of research activities, 7) artificial production facilities operations, and 8) socio-economic effectiveness. The NPCC standards represent the common knowledge up to 2001.

In a report prepared for NPCC, the Independent Scientific Review Panel (ISRP) and the Independent Scientific Advisory Board (ISAB) reviewed the nature of the demographic, genetic and ecological risks that could be associated with supplementation, and concluded that the current information available was insufficient to provide an adequate assessment of the magnitude of these effects under alternative management scenarios. The ISRP and ISAB recommended that an interagency working group be formed to produce a design(s) for an evaluation of hatchery supplementation applicable at a basin-wide scale. Following on this recommendation, the *Ad Hoc* Supplementation Workgroup (AHSWG) was created and produced a guiding document (Galbreath et al. 2008) that describes framework for integrated hatchery research, monitoring, and evaluation (RM&E) to be evaluated at a basin-wide ESU scale.

The AHSWG framework is structured around three categories of research monitoring and evaluation; 1) implementation and compliance monitoring, 2) hatchery effectiveness monitoring, and 3) uncertainty research. The hatchery effectiveness category addresses regional questions relative to both harvest augmentation and supplementation hatchery programs and defines a set of management objectives specific to supplementation projects. The framework uses a common set of standardized performance measures as established by the Collaborative Systemwide Monitoring and Evaluation Project (CSMEP). Adoption of this suite of performance measures and definitions across multiple study designs will facilitate coordinated analysis of findings from regional monitoring and evaluation efforts aimed at addressing management questions and critical uncertainties associated with relationships between harvest augmentation, supplementation hatchery production and ESA listed stock status/recovery.

The NPCC (2006) called for integration of individual hatchery evaluations into a regional plan. While the RM&E framework in AHSWG document represents our current knowledge relative to monitoring hatchery programs to assess effects that they have on population and ESU productivity, it represents only a portion of the activities needed for how hatcheries are operated throughout the region. A union of the NPCC (2001) hatchery monitoring and evaluation standards and the AHSWG framework likely represents a larger scale more comprehensive set of assessment standards, legal mandates, production and harvest management processes, hatchery operations, and socio-economic standards addressed in the 2001 NPCC document (sections 3.1, 3.2, 3.7, and 3.8 respectively). These are not addressed in the AHSWG framework and should be included in this document. NPCC standards for conservation of wild/natural populations, life history characteristics, genetic characteristics and research activities (sections 3.3, 3.4, 3.5, and 3.6 respectively) are more thoroughly in the AHSWG and the latter standards should apply to this document. Table 1 represents the union of performance standards described by the Northwest Power and Conservation Council (NPCC 2001), regional questions for monitoring and evaluation for harvest and supplementation programs, and performance standards described by the Ad Hoc Supplementation Work Group (Galbreath et al. 2008).

Table 1. Compilation of performance standards described by the Northwest Power and Conservation Council (NPCC 2001), regional questions for monitoring and evaluation for harvest and supplementation programs, and performance standards and testable assumptions as described by the Ad Hoc Supplementation Work Group (Galbreath et al. 2008).

Category	Standards	Indicators
1. LEGAL MANDATES	1.1. Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in applicable agreements such as under U.S. v. OR and U.S. v. Washington.	1.1.1. Total number of fish harvested in Tribal fisheries targeting this program. 1.1.2. Total fisher days or proportion of harvestable returns taken in Tribal fisheries, by fishery. 1.1.3. Tribal acknowledgement regarding fulfillment of tribal treaty rights.
	1.2. Program contributes to mitigation requirements.	1.2.1. Number of fish released by program, returning, or caught , as applicable to given mitigation requirements.
	1.3. Program addresses ESA responsibilities.	1.3.1. Section 7, Section 10, 4d rule and annual consultation
2. IMPLEMENTATION AND COMPLIANCE	2.1. Program contributes to mitigation requirements.	2.1.1. Hatchery is operated as a segregated program. 2.1.2. Hatchery is operated as an integrated program 2.1.3. Hatchery is operated as a conservation program
	2.2. Program addresses ESA responsibilities.	2.2.1. Hatchery fish can be distinguished from natural fish in the hatchery broodstock and among spawners in supplemented or hatchery influenced population(s)
	2.3. Restore and maintain treaty-reserved tribal and non-treaty fisheries.	2.3.1. Hatchery and natural-origin adult returns can be adequately forecasted to guide harvest opportunities. 2.3.2. Hatchery adult returns are produced at a level of abundance adequate to support fisheries in most years with an acceptably limited impact to natural-spawner escapement.
	2.4. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.	2.4.1. Number of fish release by location estimated and in compliance with AOPs and *US vs. OR* Management Agreement. 2.4.2. Number if adult returns by release group harvested 2.4.3. Number of non-target species encountered in fisheries for targeted release group.
	2.5. Hatchery incubation, rearing, and release practices are consistent with current best management practices for the program type.	2.5.1. Juvenile rearing densities and growth rates are monitored. And reported. 2.5.2. Numbers of fish per release group are known and reported. 2.5.3. Average size, weight and condition of fish per release group are known and reported. 2.5.4. Date, acclimation period, and release location of each release group are known and reported.
	2.6. Hatchery production, harvest management, and monitoring and evaluation of hatchery production are coordinated among affected co-managers.	2.6.1. Production adheres to plans documents developed by regional co-managers (e.g. US vs. OR Management agreement, AOPs etc.). 2.6.2. Harvest management harvest, harvest sharing agreements, broodstock collection schedules, and disposition of fish trapped at hatcheries in excess of broodstock needs are coordinated among co-management agencies. 2.6.3. Co-managers react adaptively by consensus to monitoring and evaluation results. 2.6.4. Monitoring and evaluation results are reported to co-managers and regionally in a timely fashion.
MONITORING REGIONAL FOR AUGMENTATION AND SUPPLEME	3.1. Release groups are marked in a manner consistent with information needs and protocols for monitoring impacts to natural- and hatchery-origin fish at the targeted life stage(s)(e.g. in juvenile migration corridor, in fisheries, etc.).	3.1.1. All hatchery origin fish recognizable by mark or tag and representative known fraction of each release group marked or tagged uniquely. 3.1.2. Number of unique marks recovered per monitoring stratum sufficient to estimate number of unmarked fish from each release group with desired accuracy and precision.

Category	Standards	Indicators
	3.2. The current status and trends of natural origin populations likely to be impacted by hatchery production are monitored.	3.2.1. Abundance of fish by life stage is monitored annually. 3.2.2. Adult to adult or juvenile to adult survivals are estimated. 3.2.3. Temporal and spatial distribution of adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored. 3.2.4. Timing of juvenile outmigration from rearing areas and adult returns to spawning areas are monitored. 3.2.5. Ne and patterns of genetic variability are frequently enough to detect changes across generations.
	3.3. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.	3.3.1. Number of fish release by location estimated and in compliance with AOPs and US vs. OR Management Agreement. 3.3.2. Number if adult returns by release group harvested 3.3.3. Number of non-target species encountered in fisheries for targeted release group.
	3.4. Effects of strays from hatchery programs on non-target (unsupplemented and same species) populations remain within acceptable limits.	3.4.1. Strays from a hatchery program (alone, or aggregated with strays from other hatcheries) do not comprise more than 10% of the naturally spawning fish in non-target populations. 3.4.2. Hatchery strays in non-target populations are predominately from in-subbasin releases. 3.4.3. Hatchery strays do not exceed 10% of the abundance of any out-of-basin natural population.
	3.5. Habitat is not a limiting factor for the affected supplemented population at the targeted level of supplementation.	3.5.1. Temporal and spatial trends in habitat capacity relative to spawning and rearing for target population. 3.5.2. Spatial and temporal trends among adult spawners and rearing juvenile fish in the available habitat.
	3.6. Supplementation of natural population with hatchery origin production does not negatively impact the viability of the target population.	3.6.1. Pre- and post-supplementation trends in abundance of fish by life stage is monitored annually. 3.6.2. Pre- and post-supplementation trends in adult to adult or juvenile to adult survivals are estimated. 3.6.3. Temporal and spatial distribution of natural origin and hatchery origin adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored. 3.6.4. Timing of juvenile outmigrations from rearing area and adult returns to spawning areas are monitored.
	3.7. Natural production of target population is maintained or enhanced by supplementation.	3.7.1. Adult progeny per parent (P:P) ratios for hatchery-produced fish significantly exceed those of natural-origin fish. 3.7.2. Natural spawning success of hatchery-origin fish must be similar to that of natural-origin fish. 3.7.3. Temporal and spatial distribution of hatchery-origin spawners in nature is similar to that of natural-origin fish. 3.7.4. Productivity of a supplemented population is similar to the natural productivity of the population had it not been supplemented (adjusted for density dependence). 3.7.5. Post-release life stage-specific survival is similar between hatchery and natural-origin population components.
	3.8. Life history characteristics and patterns of genetic diversity and variation within and among natural populations are similar and do not change significantly as a result of hatchery augmentation or supplementation programs.	3.8.1. Adult life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics observed in the natural population prior to hatchery influence. 3.8.2. Juvenile life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics in the natural population those prior to hatchery influence. 3.8.3. Genetic characteristics of the supplemented population remain similar (or improved) to the unsupplemented populations.
	3.9. Operate hatchery programs so that life history characteristics and genetic diversity of hatchery fish mimic natural fish.	3.9.1. Genetic characteristics of hatchery-origin fish are similar to natural-origin fish. 3.9.2. Life history characteristics of hatchery-origin adult fish are similar to natural-origin fish. 3.9.3. Juvenile emigration timing and survival differences between hatchery and natural-origin fish are minimized.

Category	Standards	Indicators
	3.10. The distribution and incidence of diseases, parasites and pathogens in natural populations and hatchery populations are known and releases of hatchery fish are designed to minimize potential spread or amplification of diseases, parasites, or pathogens among natural populations.	3.10. Detectable changes in rate of occurrence and spatial distribution of disease, parasite or pathogen among the affected hatchery and natural populations.
4. OPERATION OF ARTIFICIAL PRODUCTION FACILITIES	4.1. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.	4.1.1. Annual reports indicating level of compliance with applicable standards and criteria. 4.1.2. Periodic audits indicating level of compliance with applicable standards and criteria.
	4.2. Effluent from artificial production facility will not detrimentally affect natural populations.	4.2.1. Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc.
	4.3. Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	4.3.1. Water withdrawals compared to applicable passage criteria. 4.3.2. Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria. 4.3.3. Number of adult fish aggregating and/or spawning immediately below water intake point. 4.3.4. Number of adult fish passing water intake point. 4.3.5. Proportion of diversion of total stream flow between intake and outfall.
	4.4. Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.	4.4.1. Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence. 4.4.2. Juvenile densities during artificial rearing. 4.4.3. Samples of natural populations for disease occurrence before and after artificial production releases.
	4.5. Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.	4.5.1. Number and location(s) of carcasses or other products distributed for nutrient enrichment. 4.5.2. Statement of compliance with applicable regulations and guidelines.
	4.6. Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population.	4.6.1. Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution.
	4.7. Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.	4.7.1. Mortality rates in trap. 4.7.2. Prespawning mortality rates of trapped fish in hatchery or after release.
	4.8. Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.	4.8.1. Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present. 4.8.2. Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition.
5. SOCIO-ECONOMIC EFFECTIVENESS	5.1. Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	5.1.1. Total cost of program operation. 5.1.2. Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits.
	5.2. Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	5.2.1. Total cost of program operation. 5.2.2. Average total cost of activities with similar objectives.
	5.3. Non-monetary societal benefits for which the program is designed are achieved.	5.3.1. Number of adult fish available for tribal ceremonial use. 5.3.2. Recreational fishery angler days, length of seasons, and number of licenses purchased.

1.11 EXPECTED SIZE OF PROGRAM

1.11.1 Proposed annual broodstock collection level (maximum number of adult fish)

The current size of the B-run steelhead hatchery program in the Salmon River is 1,085,000 yearling smolts. To achieve this release target approximately 250 pairs of adults are needed (1:1 spawning ratio). An additional 100 pairs are also needed for the 500,000 eyed eggs associated with the SBT's Steelhead Streamside Incubator Program (SSIP) described in a separate HGMP. Proposed annual release numbers by location are listed in Table 2. However, because of the variability in within-hatchery survival in any given year caused by; low adult holding survival, unexpected drops in trapping success, low egg fecundity in spawned females, poor juvenile survival, fish pathogen impacts, diminished water quality, human error, power outages, etc., some flexibility is needed. Therefore, the proposed action includes juvenile release targets that include a cushion, not to exceed an additional 10 percent of each program's proposed release target, by the hatchery annually, which must be approved by the managers as part of the AOP process.

1.11.2 Proposed annual fish release levels (maximum number) by life stage and location

Table 2. Annual fish release levels by life stage and location.

Life Stage	Rearing Facility	Release Location	Annual Release Level
Yearling	Magic Valley	Pahsimeroi R.	248,000
Yearling	Magic Valley	Yankee Fork Salmon R.	620,000
Yearling	Magic Valley	Little Salmon R	217,000

1.12 CURRENT PROGRAM PERFORMANCE, INCLUDING ESTIMATED SMOLT-TO-ADULT SURVIVAL RATES, ADULT PRODUCTION LEVELS, AND ESCAPEMENT LEVELS. INDICATE THE SOURCE OF THESE DATA.

Estimated smolt-to-adult survival rates (from release back to Columbia River mouth) for release years 2003-2011 are presented in Table 3 below. Estimates for both the locally adapted (USAL) and Dworshak Hatchery (DWOR) releases into the Salmon River basin are presented.

Table 3. Estimated smolt to adult survival rates (juvenile release to adults returns at the Columbia River mouth) for summer steelhead release years 2003-2011.				
Release Year	Stock	Number of Smolts Released	Total Adult Return	Smolt to Adult Survival
2003	DWOR	670,808	5,622	0.84%
2003	USAL	58,140	531	0.91%
2004	DWOR	614,191	1,932	0.31%
2004	USAL	58,377	241	0.41%
2005	DWOR	691,242	2,114	0.31%
2005	USAL	35,448	171	0.48%
2006	DWOR	587,676	2,575	0.44%
2006	USAL	31,015	568	1.83%
2007	DWOR	501,763	201	0.04%
2007	USAL	127,266	506	0.40%
2008	DWOR	560,074	3,386	0.60%
2008	USAL	62,314	969	1.55%
2009	DWOR	581,146	5,845	1.01%
2009	USAL	57,464	700	1.22%
2010	DWOR	584,568	1,228	0.21%
2010	USAL	95,023	533	0.56%
2011	DWOR	593,174	682	0.56%
2011	USAL	91,525	427	0.47%

Source: IDFG unpublished data

1.13 Date Program Started (Years in Operation)

Smolts produced from eggs collected at Dworshak National Fish Hatchery (DWOR stock) have been released into the Salmon River since the 1970s in an effort to increase the number of large two-ocean fish returning to the area. The more recent effort to establish a locally adapted stock of fish in the Salmon River began in 1999. Releases of DWOR and USAL steelhead into the Yankee Fork Salmon River began in 2013.

1.14 Expected Duration of Program

This program is expected to continue indefinitely to provide mitigation under the Lower Snake River Compensation Plan.

1.15 Watersheds Targeted by Program

Pahsimeroi River

Yankee Fork Salmon River

Little Salmon River

1.16 INDICATE ALTERNATIVE ACTIONS CONSIDERED FOR ATTAINING PROGRAM GOALS

LSRCP hatcheries were constructed to mitigate for fish losses caused by construction and operation of the four lower Snake River federal hydroelectric dams. The IDFG's objective is to ensure that harvestable components of hatchery-produced summer steelhead are available to provide fishing opportunities consistent with meeting spawning escapement and preserving the genetic integrity of natural populations (IDFG 2001).

Smolt release targets that were modeled at the outset of this program are not currently achievable due to reduced water availability at Magic Valley fish hatchery. Additional resources may be needed to maintain current production capacity in light of diminishing water availability at the Magic Valley Fish Hatchery. This could be accomplished through an increased water supply or potentially through technological fixes (e.g. oxygenation or reuse systems).

As this program transitions from using primarily out-of-basin DWOR stock to a locally adapted USAL stock, managers anticipate that overall SAR and adult returns for the Salmon River B-run hatchery program will increase. This programmatic shift to a locally adapted stock will also address concerns of using out-of-basin stocks in the Salmon River.

The US Fish and Wildlife Service Hatchery Review Team (HRT) provided several potential programmatic alternatives to the current hatchery program along with their recommendation for the preferred alternative. For the Salmon River B-run steelhead program, the HRT preferred two alternatives to either: 1) stop the transfer of Dworshak B-run steelhead eggs to the upper Salmon River and develop a locally adapted broodstock to maintain a B-run steelhead fishery, or 2) terminate the B-run hatchery program in the Salmon River altogether and increase the size of the A-run program at Magic Valley Hatchery. Managers have committed to expanding the effort to build a locally adapted broodstock in the upper Salmon River. See section 1.8 and 1.11.1 for details.

1.17 Staffing, support logistics, and facility changes needed for program implementation

Additional resources may be needed to maintain current production capacity in light of diminishing water availability at the Magic Valley Fish Hatchery. This could be accomplished through an increased water supply or potentially through technological fixes (e.g. oxygenation or reuse systems).

Resources are also needed to construct and operate the permanent weir in the Yankee Fork Salmon River. The permanent weir is proposed to be funded by the LSRCP and the satellite facility is proposed to be funded by BPA as part of the Crystal Springs Fish Hatchery Program.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS

2.1 LIST ALL ESA PERMITS OR AUTHORIZATIONS IN HAND FOR THE HATCHERY PROGRAM

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation. Nine Snake River Steelhead Hatchery Programs and one Kelt Reconditioning Program in Idaho. NMFS Consultation Number WCR-2017-7286. Issued December 2017.

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation. Four Salmon River Basin Spring/Summer Chinook Salmon Hatchery Programs in the Upper Salmon River Basin. NMFS Consultation Number WCR-2017-7042. Issued December 2017.

Endangered Species Act (ESA) Section 7(a)(2) and 4(d) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation Five Clearwater River Basin Spring/Summer Chinook Salmon and Coho Salmon Hatchery Programs. NMFS Consultation Number: WCR-2017-7303. Issued December 2017.

2.2 PROVIDE DESCRIPTIONS, STATUS, AND PROJECTED TAKE ACTIONS AND LEVELS FOR NMFS ESA-LISTED NATURAL POPULATIONS IN THE TARGET AREA

2.2.1 Description of NMFS ESA-listed salmonid population(s) affected by the program

Populations affected by this program are described by the Interior Columbia Technical Recovery Team (ICTRT 2005).

The Snake River steelhead ESU extends throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon, and north/central Idaho (NMFS 1996a). Snake River steelhead migrate a substantial distance from the ocean (up to 1,500 km) and use high-elevation tributaries (typically 1,000-2,000 m above sea level) for spawning and juvenile rearing. Snake River steelhead occupy habitat that is considerably warmer and drier (on an annual basis) than other steelhead ESUs. Snake River Basin steelhead are generally classified as summer run based on their adult run-timing patterns. Summer-run steelhead enter the Columbia River from late June to October. After holding over the winter, summer-run steelhead spawn the following spring (March to May). Managers classify upriver summer steelhead runs into two groups based primarily on ocean age and adult size on return to the Columbia River: A-run steelhead are predominantly age-1 ocean fish, while B-run steelhead are larger, predominated by age-2 ocean fish.

With the exception of the Tucannon River and some small tributaries to the mainstem Snake River, the tributary habitat used by Snake River Basin steelhead in the ESU is above Lower Granite Dam. Major groupings of populations and subpopulations can be found in 1) the Grand Ronde River Basin; 2) the Imnaha River Basin; 3) the Clearwater River Basin; 4) the South Fork Salmon River sub-basin; 5) the smaller mainstem tributaries before the confluence of the mainstem Snake River; 6) the Middle Fork Salmon River; 7) the Lemhi and Pahsimeroi rivers; and 8) Upper Salmon River tributaries.

The ICTRT classified the Upper Salmon River steelhead as an "intermediate" population based on historical habitat potential (ICTRT 2005). A steelhead population classified as intermediate has a mean minimum abundance threshold criteria of 1,000 naturally produced spawners with a sufficient intrinsic productivity greater than 1.15 recruits per spawner to meet the 5% extinction risk criteria. Historically, it is estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that returned historically to the Upper Salmon River, but it was likely in the thousands.

The ICTRT has identified five major spawning areas (MaSAs) and two minor spawning areas (MiSAs) within the Upper Salmon River Steelhead Population. Spawning is distributed throughout the upper mainstem Salmon River and its tributaries above the East Fork Salmon River. Primary tributaries include the Yankee Fork Salmon River, Basin Creek, and Valley Creek. Spawning occurs from mid-March through mid-June.

Identify the NMFS ESA-listed population(s) that will be directly affected by the program

No natural-origin adults are incorporated into the hatchery broodstock. Any natural-origin steelhead trapped during broodstock collection are released to spawn naturally.

Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program

- Snake River Fall-run Chinook salmon ESU (T – 4/92)
- Snake River Spring/Summer-run Chinook salmon ESU (T – 4/92)
- Snake River Basin Steelhead DPS (T – 8/97)

2.2.2 Status of NMFS ESA-listed salmonid population(s) affected by

the program

Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

The ICTRT classified the Upper Salmon River A-run steelhead as an "intermediate" population based on historical habitat potential (ICTRT 2005). A steelhead population classified as intermediate has a mean minimum abundance threshold criteria of 1,000 naturally produced spawners with a sufficient intrinsic productivity greater than 1.15 recruits per spawner to meet the 5% extinction risk criteria. Current abundance (number of adults spawning in natural production areas) is unknown for this population. The only direct count of natural-origin steelhead occurs at the Sawtooth Fish Hatchery weir and represents adults returning to a small proportion of total habitat in the population.

Provide the most recent 12 year progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Smolt to adult survival for the Salmon River MPG is estimated using PIT tag detection at Lower Granite Dam (Table 4)

Table 4. Smolt to Adult survival (Lower Granite to Lower Granite) of PIT tagged wild steelhead from the Salmon River MPG.

Outmigration year	Number of Smolts PIT tagged	Estimated SAR	90% CI
2008	19,133	4.78	4.51-5.07
2009	29,321	1.91	1.78-2.04
2010	34,240	1.99	1.85-2.14
2011	31,923	1.13	1.04-1.23
2012	31,756	1.74	1.62-1.87

Source: Follow Idaho Salmon Home website (link)

Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Abundance of natural origin steelhead is estimated annually at Lower Granite Dam through the systematic sampling of migrating adults at the adult trapping facilities. Genetic analysis is conducted to assign individuals to genetic reporting groups within the Snake River DPS and MPGs (Camacho et al. 2017). Returns of natural-origin adults from the Salmon River MPG for returns years 2009-2016 is summarized in Table 5.

Annual escapement estimates for the portion of the steelhead population upstream of the Pahsimeroi Fish Hatchery is shown in Table 6.

Table 5. Estimated number of wild adult steelhead from the four genetic reporting groups that comprise the Salmon River Major Population Group (MPG) returning to Lower Granite Dam for run years 2009-2016.

	Adult Run Year							
Genetic Reporting Group	2009	2010	2011	2012	2013	2014	2015	2016
Upper Salmon	3,242	7,334	6,699	6,808	4,188	4,742	6,833	4,894
MF Salmon	2,635	4,927	4,312	3,069	2,097	1,821	4,000	2,385
SF Salmon	1,198	2,046	2,512	1,196	843	1,030	2,247	1,334
Lower Salmon	985	2,025	1,941	1,683	834	984	1,805	1,170
Salmon River MPG	**8,060**	**16,332**	**15,464**	**12,756**	**7,962**	**8,577**	**14,885**	**9,783**

Source: Camacho et al. 2017

Table 6. Number of natural-origin steelhead captured, handled and released at the Pahsimeroi 2001-2017.

Spawn Year	Pahsimeroi Fish Hatchery
2001	133
2002	378
2003	181
2004	67
2005	42
2006	68
2007	22
2008	45
2009	30
2010	157
2011	239
2012	285
2013	178
2014	206
2015	130
2016	92
2017	25

Source: IDFG unpublished data

Provide the most recent 12 year estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.

Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

ESA-listed natural steelhead are incidentally collected during broodstock trapping periods at the Pahsimeroi Fish Hatchery and in the Yankee Fork Salmon River. All unmarked/untagged steelhead are released with a minimum of delay and handling. Incidental take of ESA- listed Snake River Chinook or Sockeye salmon is unlikely during steelhead broodstock collection due to the lack of temporal and spatial overlap. Steelhead broodstock collection in the upper Salmon River generally occurs from March through early May. Fall Chinook Salmon are not present in the upper Salmon River (Mendel et al. 1992). Neither adult spring/summer Chinook nor Sockeye salmon are usually present in the upper Salmon River until mid-May or later (Sankovich and Bjornn 1992). Therefore, we believe there will be no adverse effect from broodstock collection at current hatchery weirs, or weirs developed in the future to accommodate additional hatchery steelhead broodstock collection.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Listed hatchery-origin steelhead (DWOR stock) are collected for broodstock at the Pahsimeroi Fish Hatchery. However, the primary function of this trap is to collect broodstock for the Pahsimeroi A-run program that is described under a separate HGMP and take of natural-origin steelhead at the Pahsimeroi Fish Hatchery is reported under the Pahsimeroi Steelhead HGMP. Trapping of B-run steelhead at the Pahsimeroi trap does not increase the number of natural steelhead handled as the trapping period for both stocks occurs at the same time.

Prior to construction of a permanent trapping facility on the Yankee Fork, temporary trapping facilities and/or angling in the Yankee Fork may be used to augment the number of fish trapped at the Pahsimeroi Fish Hatchery and will result in take of both listed hatchery- and natural-origin steelhead. Similar to how the Pahsimeroi fish trap is operated, all natural origin fish captured in the Yankee Fork will be released to spawn naturally with a minimum of delay and handling.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Adult steelhead (hatchery- and natural-origin) are trapped and handled at the Pahsimeroi Fish Trap. The number of natural-origin adults captured varies annually (see Table 6). Currently, the program described in this HGMP captures and retains ESA listed hatchery-origin steelhead (DWOR stock) at Pahsimeroi Fish Hatchery for spawning. The projected number of adults removed for broodstock is listed in Appendix A; Table 1. Take of listed hatchery- and natural-origin steelhead also occurs in the Yankee Fork Salmon River resulting from broodstock collection and is listed in Appendix A; Table 2, and Table 3.

Take of listed natural-origin steelhead at Pahsimeroi Fish Hatchery is covered in the Pahsimeroi Steelhead HGMP.

Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

It is unlikely that take levels for listed steelhead will exceed projected take levels presented in Appendix A; Tables 1-3. However, in the unlikely event that this occurs, the IDFG and SBT will consult with NMFS Sustainable Fisheries Division or Protected Resource Division staff and agree to an action plan.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1 DESCRIBE ALIGNMENT OF THE HATCHERY PROGRAM WITH ANY ESU-WIDE HATCHERY PLAN OR OTHER REGIONALLY ACCEPTED POLICIES. EXPLAIN ANY PROPOSED DEVIATIONS FROM THE PLAN OR POLICIES.

This program conforms to the plans and policies of the LSRCP administered by the U.S. Fish and Wildlife Service to mitigate for the loss of steelhead production caused by the construction and operation of the four dams on the lower Snake River.

The IDFG participated in the development of the Artificial Production Review and Evaluation (APRE) and Hatchery Scientific Review Group (HSRG) documents and the USFWS Hatchery Review Team (HRT) process and is familiar with concepts and principals contained therein. This program is largely consistent with recommendations from these reviews and documents

3.2 LIST ALL EXISTING COOPERATIVE AGREEMENTS, MEMORANDA OF UNDERSTANDING, MEMORANDA OF AGREEMENT, OR OTHER MANAGEMENT PLANS OR COURT ORDERS UNDER WHICH PROGRAM OPERATES.

- Cooperative Agreement between the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game, USFWS Agreement No.: F16AC00027 (for Lower Snake River Compensation Plan monitoring and evaluation studies).
- Cooperative Agreement between the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game, USFWS Agreement No.: F16AC00028 (for Lower Snake River Compensation Plan hatchery operations).
- Cooperative Agreement between the U.S. Fish and Wildlife Service and the Shoshone-

Bannock Tribes, USFWS Agreement No.: F16AC00032 (for LSRCP operations and maintenance and monitoring and evaluation).3.3 Relationship to harvest objectives

2018-2017 *U.S. v. Oregon* Management Agreement

3.3 Relationship to harvest objectives

The Lower Snake River Compensation Plan defined replacement of adults "in place" and "in kind" for appropriate state management purposes. Juvenile production and adult escapement targets were established at the outset of the LSRCP. State, tribal and federal co-managers work co-operatively to develop annual production and mark plans that are consistent with original LSRCP, the *US vs. Oregon* Management Agreement, and recommendations of the HSRG and HRT relative to ESA impact constraints, genetics, fish health and fish culture concerns.

In the Snake River basin, mitigation hatchery returns are harvested in both mainstem and tributary terminal fisheries. Fish that return in excess to broodstock needs for the hatchery programs are shared equally between sport and Tribal fisheries. State and Tribal co-managers cooperatively manage fisheries to maximize harvest of hatchery returns that are in excess of broodstock needs. Fisheries are managed temporally and spatially to: minimize impacts to non-target natural returns and comply with ESA incidental take limits; achieve hatchery broodstock goals; achieve sharing objectives among Tribal and recreational fisheries; optimize the quantity and quality of fish harvested that are in excess of what is needed to meet broodstock needs; maximize temporal and spatial extent of fishing opportunities; and minimize conflicts between different gear types and user groups.

Locally, State and Tribal co-managers confer pre-season relative to assessing forecasted levels of abundance of both hatchery and natural fish in the fisheries. Incidental take rates applicable to fisheries are projected based on forecasted natural populations. As part of the in-season harvest management and monitoring program, the IDFG and Tribal cooperators conduct annual angler surveys to assess the contribution program fish make toward meeting harvest mitigation objectives. The surveys are also used for in-season assessments of recreational and Tribal harvest shares and to determine ESA take relative to allowable levels based on the sliding scales of natural spawner abundance. Co-managers also conduct meetings after fisheries conclude to assess the success of the management actions taken during the season.

3.3.1 Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years if available.

Fisheries that benefit from the release of hatchery-origin B-run steelhead include sport, tribal, and commercial fisheries in Oregon, Washington and Idaho. Idaho fisheries for B-run steelhead begin at the Washington-Idaho border and occur in the mainstem Snake River and the Salmon River Basin. Salmon River releases of locally adapted upper Salmon River B-run steelhead (USAL) and first generation releases from Dworshak National Fish Hatchery (DWOR) contributed to these fisheries. The estimated number of harvested steelhead from brood years 2002-2010 is summarized in Table 7. As the local broodstock is expanded to the full 1,085,000 smolt program, it is expected that the number of fish from this program contributing to fisheries will significantly increase due to the higher SARs observed for the localized stock (Table 3).

Table 7. Estimated harvest of Salmon R b-run steelhead upstream and downstream of Lower Granite Dam for Brood years 2002-2010

Brood Year	Stock	Harvest downstream of Lower Granite Dam	Harvest upstream of Lower Granite Dam
2002	DWOR	306	1,672
	USAL	42	459
2003	DWOR	444	2,009
	USAL	0	215
2004	DWOR	686	1,830
	USAL	10	143
2005	DWOR	1,038	2,625
	USAL	34	514
2006	DWOR	10	719
	USAL	28	464
2007	DWOR	757	5,129
	USAL	90	841
2008	DWOR	722	2,061
	USAL	116	484
2009	DWOR	367	1,577
	USAL	8	6
2010	DWOR	258	661
	USAL	22	0

Source: IDFG unpublished data

3.4 RELATIONSHIP TO HABITAT PROTECTION AND RECOVERY STRATEGIES

Hatchery production for harvest mitigation is influenced but not linked to habitat protection strategies in the Salmon River Basin and other areas

3.5 ECOLOGICAL INTERACTIONS

We assume potential adverse effects to listed salmon and steelhead could occur from the release of hatchery-origin steelhead smolts in the Salmon, Yankee Fork, and Pahsimeroi rivers through the following interactions: predation, competition, behavior modification, and disease transmission.

We have evaluated potential interactions between listed steelhead and salmon and hatchery steelhead and their effect in the migration corridor of the Salmon River and downstream. Timing of hatchery-origin steelhead in the migration corridor overlaps with listed spring/summer Chinook salmon, steelhead, and to a lesser degree with listed sockeye salmon. Steelhead from the LSRCP program are more temporally separated from listed fall Chinook salmon in the Snake River and Lower Granite Reservoir based on different migration periods. The NMFS has identified potential competition for food and space and behavioral interactions in the migration corridor as a concern (M. Delarm, NMFS, pers. comm.).

Because of their size and timing, Chinook salmon fry are probably the most vulnerable to predation. Hillman and Mullan (1989) observed substantial predation of newly emerged Chinook salmon by hatchery and wild steelhead in the Wenatchee River. Cannamela (1992) used existing literature to evaluate potential predation of Chinook salmon fry by hatchery steelhead smolts. He evaluated a 1-1.3 million steelhead smolt release in the upper Salmon River primary production area, where steelhead were released in the vicinity of redds and migrated over redds for several miles. He assumed steelhead smolts at least 105 mm could consume Chinook salmon fry, 35-37 mm in length. Cannamela (1992) estimated potential predation by using various percentages of fry in the diet, residualism, and predator size. Using ranges of assumptions, he estimated fry losses to predation by steelhead smolts and residuals for up to a 70-day period from smolt release to June 25. According to his calculations, his scenario of 500,000 steelhead predators using fish as 1 percent of their diet for 40 days resulted in potential consumption of 34,500 fry. Empirical information collected in 1992 infers that this may be an overestimate. IDFG biologists attempted to quantify Chinook salmon fry predation by hatchery steelhead in the upper Salmon River. Their samples were collected from a release of 774,000 hatchery steelhead in the upper Salmon River primary production area where steelhead would migrate directly over redds. The fish were released in early April. The biologists sampled 6,762 steelhead and found that 20 contained fish parts in the cardiac stomach. Of these, three contained 10 Chinook salmon fry. The biologists estimated that the proportion of hatchery steelhead that consumed fry was 0.000444. The estimated predation rate of steelhead smolts on Chinook salmon fry was 1.48 x 10-3 (95% CI 0.55 x 10-3 to 2.41 x 10-3) for the 6,762 hatchery steelhead smolts examined that consumed the ten Chinook fry. Biologists used this consumption rate to estimate that the total number of Chinook fry consumed during the sample period, April 3-June 3, was 24,000 fry (IDFG 1993). We believe that the potential consumption for steelhead released in the lower Salmon River would be much lower because steelhead are not released in the immediate vicinity of redds and emerging fry.

By using Cannamela's calculations and scenarios of 0.05-1.0 percent fish in the diet and 10-25 percent residualism, we predict a range of potential loss of 2,300-51,000 Chinook fry for a 1.25 million smolt release in the Salmon River primary production area. Cannamela (1992) estimated fry losses would occur for up to a 70-day period from smolt release to June 25. He noted that there is an assumed mechanism for Chinook salmon fry to avoid predation by steelhead since they are coevolved populations. However, literature references were scant about this theory although Peery and Bjornn (1992) documented that Chinook fry tend to move at night. Cannamela concluded that only assumptions could be made about the availability and vulnerability of fry to steelhead predators.

Martin et al. (1993) collected 1,713 steelhead stomachs from the Tucannon River and three contained juvenile spring Chinook salmon. They estimated that 456-465 juvenile spring Chinook salmon were consumed by hatchery steelhead in the Tucannon River from a total release of 119,082 steelhead smolts. Biologists found that rate of predation increased from the time of steelhead release through September 31. Predation rates increased from 9.4 x 10-3 to 4.3 x 10-2. Martin et al. (1993) theorized that although numbers of steelhead decreased, remaining fish may have learned predatory behavior. By October, juvenile salmon were too large to be prey, and stream temperature had dropped.

No precise data are available to estimate the importance of Chinook salmon fry in a steelhead smolt's diet (USFWS 1992). The USFWS cited several studies where the contents of steelhead stomachs had been examined. Few, if any, salmonids were found. They concluded that the limited empirical data suggested that the number of Chinook salmon fry/fingerlings consumed by steelhead is low. Schriever (IDFG, pers. comm.) sampled 52 hatchery steelhead in the lower Salmon and Clearwater rivers in 1991 and 1992 and found no fish in their stomach contents.

Steelhead residualism in the upper Salmon River appeared to be about 4 percent in 1992 (IDFG 1993). We do not know the rate of residualism for steelhead released in the lower Salmon River. In 1992, the steelhead smolt migration in the Salmon River primary production area began around May 10 and about 95% of the hatchery steelhead had left the upper Salmon River study area by May 21. IDFG biologists found that after one week, hatchery steelhead smolts were consuming natural prey items such as insects and appeared to be effectively making the transition to natural food (IDFG 1993). It is unknown if smolts continued to feed as they actively migrated. Biologists observed that the environmental conditions during the 1992 study were atypical. Water velocity was much lower, while water temperature and clarity were higher than normal for the study period. Furthermore, about 637,500 of the smolts had been acclimated for up to three weeks at Sawtooth Fish Hatchery prior to release, but these fish were not fed during acclimation. It is unknown if acclimation reduced residualism. Biologists concluded that within the framework of 1992 conditions, Chinook fry consumption by hatchery steelhead smolts and residuals was very low.

Kiefer and Forster (1992) were concerned that predation on natural Chinook salmon smolts by hatchery steelhead smolts released into the Salmon River at Sawtooth Fish Hatchery could be causing mortality. They compared PIT-tag detection rates of upper Salmon River natural Chinook salmon emigrating before and after the steelhead smolt releases for the previous three years. They found no significant difference and concluded that the hatchery steelhead smolts were not preying upon the natural Chinook smolts to any significant degree.

The release of a large number of prey items which may concentrate predators has been identified as a potential effect on listed salmon. Hillman and Mullan (1989) reported that predaceous rainbow trout (>200 mm) concentrated on wild salmon within a moving group of hatchery age-0 Chinook salmon. The wild salmon were being "pulled" downstream from their stream margin stations as the hatchery fish moved by. It is unknown if the wild fish would have been less vulnerable had they remained in their normal habitat. Hillman and Mullan (1989) also observed that the release of hatchery age-0 steelhead did not pull wild salmon from their normal habitat. During their sampling in 1992, IDFG biologists did not observe predator concentration. We have no further information that supports or disproves the concern that predators may concentrate and affect salmon because of the release of large numbers of hatchery steelhead.

There is potential for hatchery steelhead smolts and residuals to compete with Chinook salmon and natural steelhead juveniles for food and space, and to potentially modify their behavior. The literature suggests that the effects of behavioral or competitive interactions would be difficult to evaluate or quantify (Cannamela 1992, USFWS 1993). Cannamela (1992) concluded that existing information was not sufficient to determine if competitive or behavioral effects occur to salmon juveniles from hatchery steelhead smolt releases. Our strategy of releases over several days should reduce release densities at a single site.

Cannamela's (1992) literature search indicated that there were different habitat preferences between steelhead and Chinook salmon that would minimize competition and predation. Spatial segregation appeared to hinge upon fish size. Distance from shore and surface as well as bottom velocity and depth preferences increased with fish size. Thus, Chinook salmon fry and steelhead smolts and residuals are probably not occupying the same space. Cannamela theorized that if interactions occur, they are probably restricted to a localized area because steelhead, which do not emigrate, do not move far from the release site. Within the localized area, spatial segregation based on size differences would place Chinook salmon fry and fingerlings away from steelhead smolts and residuals. This would further reduce the likelihood of interactions. Martin et al. (1993) reported that in the Tucannon River, spring Chinook salmon and steelhead did exhibit temporal and spatial overlap, but they discuss that the micro-habitats of the two species were likely very different.

The USFWS (1992) theorized that the presence of a large concentration of steelhead at and near release sites could modify the behavior of Chinook. However, they cited Hillman and Mullan (1989) who found no evidence that April releases of steelhead altered normal movement and habitat use of age-0 Chinook. Throughout their study, IDFG biologists (IDFG 1993) noted concentrations of fry in typical habitat areas, whether steelhead were present or not.

Cannamela (1992) also described the potential for effects resulting from the release of a large number of steelhead smolts in a small area over a short period of time. He theorized that high concentrations of steelhead smolts could limit Chinook salmon foraging opportunities or limit available food. However, the effect would be of limited duration because most steelhead smolts emigrate or are harvested within two months of release. He found no studies to support or refute his hypothesis. Cannamela also discussed threat of predation as a potentially important factor causing behavioral changes by stream salmonids. The literature was not specific to interactions of steelhead smolts and Chinook fry. It is assumed that coevolved populations would have some mechanism to minimize this interaction.

There is a potential effect to listed salmon from diseases transmitted from hatchery-origin steelhead adults. Pathogens that could be transmitted from adult hatchery steelhead to naturally produced Chinook salmon include Infectious Hematopoietic Necrosis Virus (IHNV) and Bacterial Kidney Disease (BKD) (K. Johnson, IDFG, pers. comm.). Although adult hatchery-origin steelhead may carry pathogens of Chinook, such as BKD and Whirling Disease, which could be shed into the drainage, these diseases are already present in the Salmon River headwaters in naturally produced Chinook and steelhead populations. The prevalence of BKD is less in hatchery-origin steelhead than in naturally produced Chinook salmon. Idaho Chinook salmon are rarely affected by IHNV (D. Munson, IDFG, pers. comm.). Idaho Department of Fish and Game disease monitoring will continue as part of the IDFG fish health program. We do not believe that the release of hatchery-origin steelhead adults above the Sawtooth and East Fork weirs will increase the prevalence of disease in naturally produced Chinook salmon or steelhead.

Hauck and Munson (IDFG, unpublished) provide a thorough review of the epidemiology of major Chinook pathogens in the Salmon River drainage. The possibility exists for horizontal transmission of diseases to listed Chinook salmon or natural steelhead from hatchery-origin steelhead in the migration corridor. Current hatchery practices include measures to control pathogens at all life stages in the hatchery. Factors of dilution, low water temperature, and low population density of listed anadromous species in the production area reduce the potential of disease transmission. However, none of these factors preclude the existence of disease risk (Pilcher and Fryer 1980, LaPatra et al. 1990, Lee and Evelyn 1989). In a review of the literature, Steward and Bjornn (1990) stated there was little evidence to suggest that horizontal transmission of disease from hatchery smolts to naturally produced fish is widespread in the production area or free-flowing migration corridor. However, little research has been done in this area.

Transfers of hatchery steelhead between any facility and the receiving location conforms to PNFHPC guidelines. IDFG and USFWS personnel monitor the health status of hatchery steelhead using protocols approved by the Fish Health Section, AFS. Disease sampling protocol, in accordance to the PNFHPC and AFS Bluebook is followed. IDFG hatchery and fish health personnel sample the steelhead throughout the rearing cycle and a pre-release sample is analyzed for pathogens and condition. Baseline disease monitoring of naturally produced Chinook salmon has been implemented in the upper Salmon River. At this time, we have no evidence that horizontal transmission of disease from the hatchery steelhead release in the upper Salmon River has an adverse effect on listed species. Even with consistent monitoring, it would be difficult to attribute a particular incidence or presence of disease to actions of the LSRCP steelhead program.

SECTION 4. WATER SOURCE

4.1 PROVIDE A QUANTITATIVE AND NARRATIVE DESCRIPTION OF THE WATER SOURCE (SPRING, WELL, SURFACE), WATER QUALITY PROFILE, AND NATURAL LIMITATIONS TO PRODUCTION ATTRIBUTABLE TO THE WATER SOURCE.

Descriptions of the water source for all current and future facilities used for trapping, spawning, incubation and rearing are provided below.

Sawtooth Fish Hatchery – The Sawtooth Fish Hatchery receives water from the Salmon River and from four wells. River water enters an intake structure located approximately 0.8 km upstream of the hatchery facility. River water intake screens comply with NMFS criteria. River waters flows from the collection site to a control box located in the hatchery building where it is screened to remove fine debris. River water can be distributed to indoor vats, outside raceways, or adult holding raceways. The hatchery’s surface water right is 43cfs. Incubation and early rearing water needs are met by three primary wells. A fourth well provides tempering water to control the build-up of ice on the river water intake during winter months. The fourth well also provides domestic water for the facility. The hatchery water right for well water is approximately 11.6 cfs. River water temperatures range from 0.0ºC in the winter to 20.0ºC in the summer. Well water temperatures range from 3.9ºC in the winter to 11.1ºC in the summer. The intake screens comply with NMFS criteria and were designed by the Army Corp of Engineers.

Lower Pahsimeroi Fish Hatchery –Water from the Pahsimeroi River is supplied to the adult trap and holding ponds through a 0.25-mile earthen intake canal. Water from the canal is also used to supply the four early rearing raceways (not currently used for steelhead production). The intake canal is equipped with NMFS-approved rotating drum screens designed to prevent entrainment of wild Chinook salmon and steelhead from the river into the hatchery facility. IPC holds a water right to divert 40 cfs of river water from the Pahsimeroi River for operations at the lower hatchery. Pahsimeroi River water temperatures at this site vary throughout the year from seasonal lows of 33° F in the winter to seasonal highs of 72° F in the summer. Daily fluctuations can be as much as 12° F.

A small pathogen free spring-water source supplies water to the spawning building and hatchery building for rinsing and water hardening green eggs. The spring source can produce up to 200 gpm of 52-56° F water.

Upper Pahsimeroi Fish Hatchery – The upper Pahsimeroi Fish Hatchery operates on a combination of well water and river water. Egg incubation of summer steelhead occurs solely on well water pumped from three on-site wells. Up to 14 cfs of well water is pumped to an elevated aeration tank for gas abatement before flowing via gravitational force to egg incubators and rearing vats in the hatchery building. Well water temperature is a constant 50° F. Current incubation and rearing operations at the upper hatchery are conducted under National Pollutant Discharge Elimination System (NPDES) permit IDG130039. The permit specifies waste discharge standards for net total suspended solids (TSS) and net total phosphorus (TP). The river water supply at the upper Pahsimeroi Fish Hatchery is used exclusively for Chinook salmon rearing and will not be discussed in this HGMP.

Magic Valley Fish Hatchery- The Magic Valley Fish Hatchery receives water from a spring on the north wall of the Snake River canyon. The spring (Crystal Springs) is covered to prevent contamination. Water is delivered to the hatchery (87.2 cfs maximum 2009) through a 42 inch pipe that crosses the Snake River. Water temperature remains a constant 59ºF year-round.

Clearwater Fish Hatchery- Clearwater Fish Hatchery receives water through two supply intakes from Dworshak Reservoir. The warm water intake is attached to a floating platform and can be adjusted from five feet to forty feet below the surface. The cool water intake is stationary at 245 feet below the top of the dam. Between the two intakes, an average of 64 cfs is utilized from the 89cfs water right. The cool water supply has remained fairly constant between 40˚F and 45˚F. The warm water can reach 80˚F but is adjusted regularly to maintain 56˚F for as long as possible throughout the year. When water temperatures drop in the fall, the intake is moved to the warmest water available until water temperatures rise in the spring. All water is gravity fed to the hatchery. The intake screens are in compliance with NMFS screen criteria by design of the Corp of Engineers

Dworshak National Fish Hatchery-The main supply for the hatchery is river water pumped from the North Fork of the Clearwater River.Up to 154 cfs is utilized from this source.. In addition, up to 28 cfs is utilized from a reservoir supply source to the hatchery for incubation and nursery rearing. It consists of a 24-inch warm water supply line and an 18-inch cold water supply line from the distribution box for the Clearwater Hatchery.

4.2 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR THE TAKE OF LISTED NATURAL FISH AS A RESULT OF HATCHERY WATER WITHDRAWAL, SCREENING, OR EFFLUENT DISCHARGE.

SECTION 5. FACILITIES

5.1 BROODSTOCK COLLECTION FACILITIES (OR METHODS)

In the near term, broodstock collection will continue to occur at Pahsimeroi Fish Hatchery and Dworshak Fish Hatchery. It will also include adults collected at temporary trapping facilities in the Yankee Fork Salmon River and from hook and line efforts in the Yankee Fork. The use of fish trapped at Dworshak Fish Hatchery will be phased out as the locally adapted broodstock is developed. It is anticipated that in the future, the primary brood collection will occur in the Yankee Fork Salmon River when the permanent weir, linked to the Shoshone-Bannock Tribes' Crystal Springs Fish Hatchery, is constructed and operational. At that point, hatchery-origin adults will be trapped, held, and spawned on-site in the Yankee Fork and green eggs will be delivered to Sawtooth Fish Hatchery.

Dworshak National Fish Hatchery – Steelhead adults are trapped at the Dworshak National Fish Hatchery after ascending a fish ladder on the North Fork Clearwater River. Trapping of steelhead for the Salmon River program at this location is incidental to trapping that occurs for the Clearwater River steelhead programs conducted at Dworshak and Clearwater fish hatcheries.

Pahsimeroi Fish Hatchery- Adult summer steelhead collection occurs at the lower Pahsimeroi Fish Hatchery and is facilitated by a removable barrier weir that spans the Pahsimeroi River. This structure diverts adults through an attraction canal and a fish ladder supplied with up to 40 cfs of river water. The adult trap consists of a concrete pond measuring 70 feet long x 16 feet wide x 6 feet deep. The trap is situated between two additional concrete ponds (each measuring 70 feet long x 16 feet wide x 6 feet deep) that are used as the adult holding ponds. Summer steelhead return to the Pahsimeroi Hatchery from late February through late May. Fish volitionally migrate into the adult trap where they are manually sorted into the adult holding ponds. The trap is checked daily. All fish are examined for fin clips, measured to the nearest centimeter for fork length, and identified by sex. Adults retained for artificial propagation are placed in the holding ponds to await spawning.

5.2 FISH TRANSPORTATION EQUIPMENT

A truck fitted with two 900 gallons tanks is used to transport adults when needed. Each tank is fitted with two fresh flow agitators and oxygen diffusers.

5.3 BROODSTOCK HOLDING AND SPAWNING FACILITIES

In the near term, broodstock will generally be held and spawned at Dworshak National Fish

Hatchery, and Pahsimeroi Fish Hatchery. However, adults collected in the Yankee Fork Salmon River via adult trap/weir or hook and line will be transported to Sawtooth Fish Hatchery for holding, spawning, and early incubation. Once the permanent Yankee Fork weir is constructed, adult steelhead trapped at Yankee Fork will be held and spawned on site and green eggs will be transferred to Sawtooth Fish Hatchery.

5.4 INCUBATION FACILITIES

Egg incubation for the Salmon River B-run steelhead program occurs at the facilities described below. Currently, eggs are incubated to the eyed-stage of development at the Clearwater, Pahsimeroi, and Sawtooth fish hatcheries. However, once the permanent weir is constructed on the Yankee Fork, adults will be spawned on-site at Yankee Fork and green eggs will be transferred to Sawtooth Fish hatchery and incubated until eye-up. Final incubation and rearing will continue to occur at the Magic Valley Fish Hatchery.

Sawtooth Fish Hatchery – Incubation facilities at the Sawtooth Fish Hatchery consist of a well water-supplied system of 100 stacks of incubator frames containing 800 incubation trays. The maximum incubation capacity at the Sawtooth Fish Hatchery is 7 million steelhead eggs. .

Magic Valley Fish Hatchery – Incubation facilities at the Magic Valley Fish Hatchery consist primarily of forty 12-gallon upwelling incubators. Each incubator is capable of incubating and hatching 50,000 to 60,000 eyed steelhead eggs. Two incubators are placed on 8-inch aluminum square tubes that sit on the floor of the concrete vat. A total of 20 vats are available. Vats measure 40 feet long x 4 feet wide x 3 feet deep. Each vat has the capacity to rear 100,000 to 115,000 steelhead to <200 fish per pound.

Clearwater Fish Hatchery- The Clearwater Fish Hatchery incubation room contains 49 double stack Heath incubators with a total of 784 trays available for egg incubation. The upper and lower half of each stack (eight trays each) has a different water supply and drain. This design aids in segregation of diseased eggs. The maximum capacity of this facility is five million green eggs. The incubation room is supplied with both reservoir water sources to provide the desired temperature for incubation at a flow of 5 to 8 gpm per one-half stack.

Isolation incubation consists of 16 double stack Heath incubators with a total of 256 trays. The maximum capacity of this facility is 1.5 million green eggs. The isolation incubation room is supplied from two reservoir water sources to provide the desired temperature for incubation with a flow of 5 to 8 gpm per stack.

Pahsimeroi Fish Hatchery – Pahsimeroi Fish Hatchery's incubation room is located at the upper facility. The incubation room consists of twenty 16-tray stacks of Marisource vertical flow incubators supplied with 120 gpm of chilled (40° F) and unchilled (50° F) pumped well water (240 gpm total). Steelhead eggs will be incubated to eyed-up stage and then transferred to Magic Valley Fish Hatchery for final incubation and rearing.

5.5 REARING FACILITIES

The Magic Valley Fish Hatchery is the juvenile rearing facility for the Salmon River B-run steelhead program.

Magic Valley Fish Hatchery – The Magic Valley Fish Hatchery has 32 outside raceways available for juvenile steelhead rearing. Each raceway measures 200 feet long x 10 feet wide x 3 feet deep. Each raceway has the capacity to rear approximately 65,000 fish to release size. Raceways may be subdivided to create 64 rearing sections. A movable bridge, equipped with 16 automatic Neilsen fish feeders, spans the raceway complex. Two 30,000 bulk feed bins equipped with fish feed fines shakers and a feed conveyor complete the outside feeding system.

5.6 ACCLIMATION/RELEASE FACILITIES

Yearling smolts released from Magic Valley Fish Hatchery are direct released into the Pahsimeroi and Little Salmon rivers. Smolts released into the Yankee Fork Salmon River include both approximately 400,000 smolts as a direct release at the confluence of Jordan Creek and Yankee Fork and 220,000 smolts as semi-acclimation into connected ponds to emigrate volitionally (Pond Series 1 approximately 5.5 km upstream from confluence of Yankee Fork and the mainstem Salmon River).

5.7 DESCRIBE OPERATIONAL DIFFICULTIES OR DISASTERS THAT LED TO SIGNIFICANT FISH MORTALITY

No operational difficulties or disasters have led to significant fish mortality at any of the facilities addressed in this HGMP.

5.8 INDICATE AVAILABLE BACK-UP SYSTEMS, AND RISK AVERSION MEASURES THAT WILL BE APPLIED, THAT MINIMIZE THE LIKELIHOOD FOR THE TAKE OF LISTED NATURAL FISH THAT MAY RESULT FROM EQUIPMENT FAILURE, WATER LOSS, FLOODING, DISEASE TRANSMISSION, OR OTHER EVENTS THAT COULD LEAD TO INJURY OR MORTALITY.

Sawtooth Fish Hatchery - The Sawtooth Fish Hatchery serves only an early egg incubation function for the Salmon River B-run steelhead program. The hatchery is staffed around the clock and equipped with an alarm system. The hatchery well water supply system is backed up by generator power. The inside vat room can be switched to gravity flow with river water in the event of a generator failure. Protocols are in place to guide emergency situations when the hatchery well water supply is interrupted. Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

Clearwater Fish Hatchery - The Clearwater Fish Hatchery serves only as as early egg incubation function for the Salmon River B-run steelhead program. The Idaho Department of Fish and Game, working with the U.S. Army Corps of Engineers, has developed a reliable low water and high temperature alarm system. Hatchery staff checks raceway flows and temperatures manually on a daily schedule. Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

Magic Valley Fish Hatchery – The Magic Valley Fish Hatchery provides final incubation and rearing-to-release functions for the program. The hatchery is staffed around the clock. The hatchery receives only gravity flow water, and as such, no generator backup system is in place or needed. Hatchery staff perform routine maintenance checks on gravity lines that supply the hatchery with water. Proper disinfection protocols are in place to prevent the transfer of disease agents.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

This section describes the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1 SOURCE

North Fork Clearwater River steelhead adults (DWOR stock) were used to found the program with eggs from Dworshak National Fish Hatchery. Progeny of adults returning to Dworshak National Fish Hatchery are used annually as well as progeny from adult returns to the Pahsimeroi River and Yankee Fork Salmon River that are derived from Dworshak hatchery fish. Managers have initiated a transition to a 100% locally adapted Salmon River broodstock (USAL) for this program.

6.2 SUPPORTING INFORMATION

6.2.1 History

See Section 1.8 above.

6.2.2 Annual size

Annual guidelines for broodstock size are listed in section 7.4 below.

6.2.3 Past and proposed level of natural fish in broodstock

Natural origin fish are not used for broodstock in this hatchery program.

6.2.4 Genetic or ecological differences

"Major population groupings" (MPGs) are groups of populations that share similarities within the ESU. They are defined on the basis of genetic, geographic (hydrographic), and habitat considerations (McClure et al. 2003). In the Snake River basin, the Clearwater River drainage (of which the Dworshak hatchery stock belongs) and Salmon River drainage (of which the Pahsimeroi and Yankee Fork belongs) are separate MPGs. Genetic analyses support these groupings. Nielsen et al. (2009) observed greater genetic differentiation between the Dworshak hatchery stock and populations in the Salmon River basin (FST = 0.04-0.06) than between Dworshak and other geographically proximate populations in the Clearwater River drainage (FST = 0.01-0.03). Narum et al. (2007) and IDFG (unpublished data), used genetic differences observed between these MPGs to successfully assign unknown individuals and mixtures of individuals back to reporting groups within MPGs.

6.2.5 Reasons for choosing

The DWOR stock is used for harvest mitigation purposes in the Salmon River to expand fishery opportunity. These fish are larger at age, older at maturity, and add diversity to the steelhead fishery. Steelhead fisheries in Idaho targeting wild B-run stocks returning to the South Fork and Middle Fork Salmon rivers have not occurred since the mid-1970s due to low abundance and therefore these native stocks were not available as a broodstock source to start the Salmo River B-run Steelhead Program.

6.3 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR ECOLOGICAL EFFECTS TO LISTED NATURAL FISH THAT MAY OCCUR AS A RESULT OF BROODSTOCK SELECTION PRACTICES.

No adverse impacts or effects to the listed population are expected as wild/natural adults are not trapped and used for broodstock purposes.

SECTION 7. BROODSTOCK COLLECTION

7.1 LIFE-HISTORY STAGE TO BE COLLECTED (ADULTS, EGGS, OR JUVENILES)

Only hatchery-origin adults are collected for broodstock purposes.

7.2 COLLECTION OR SAMPLING DESIGN

Adults are collected at a permanent weir at the Pahsimeroi Fish Hatchery or temporary traps in the Yankee Fork Salmon River. Hatchery-origin fish incorporated into the spawning design are selected at random and represent the entire run.

7.3 IDENTITY

All harvest mitigation, hatchery-produced fish are marked with either an adipose fin clip, or a coded wire tag (CWT). Natural-origin fish captured at weirs are released with a minimum of handling and delay.

7.4 PROPOSED NUMBER TO BE COLLECTED

7.4.1 Program goal (assuming 1:1 sex ratio for adults)

The current size of the hatchery program in the Salmon River is 1,085,000 yearling smolts. To achieve this release target approximately 250 pairs of adults are needed (1:1 spawning ratio). An additional 100 pairs are also needed for the 500,000 eyed eggs associated with the Yankee Fork SSIP that is described in a separate HGMP.

7.4.2 Broodstock collection levels for the last twelve years or for most recent years available

Annual broodstock collection levels from Dworshak National Fish Hatchery are targeted to include approximately 22 pairs of adults (to produce 93,000 smolts for release at the Pahsimeroi FH), but if the brood collection at Pahsimeroi Fish Hatchery and the Yankee Fork is insufficient to achieve the total brood target, then the number of eggs requested from Dworshak is increased to make up for the shortfall. Prioritization of eggs at Dworshak is determined through the Annual Operating Plans (AOPs) for the Clearwater and Salmon River basins. The annual collection of steelhead broodstock is summarized in Table 8. Adults are collected for broodstock from locally adapted returns in the Salmon River as well as from adults collected at Dworshak Nation Fish Hatchery in the Clearwater River basin. Data in Table 8 is summarized to reflect the number of adults spawned from each source.

Table 8. Broodstock collection history for Salmon River B-run steelhead program for Brood Years 2005-2016.

Brood Year	Collection Facility	Stock	Males Used for Spawning	Females Used in Spawning
2005	Dworshak NFH	DWOR	234	234
2005	Squaw Creek	USAL	3	8
	2005 Total		**237**	**242**
2006	Dworshak NFH	DWOR	153	153
2006	Squaw Creek	USAL	24	32
	2006 Total		**177**	**185**
2007	Dworshak NFH	DWOR	160	160
2007	Squaw Creek	USAL	17	21
	2007 Total		**177**	**181**
2008	Dworshak NFH	DWOR	166	166
2008	Squaw Creek	USAL	10	14
	2008 Total		**176**	**180**
2009	Dworshak NFH	DWOR	136	136
2009	Squaw Creek	USAL	22	25
	2009 Total		**158**	**161**
2010	Dworshak NFH	DWOR	164	164
2010	Squaw Creek	USAL	15	19
	2010 Total		**179**	**183**
2011	Dworshak NFH	DWOR	185	185
2011	Squaw Creek	USAL	26	26
	2011 Total		**211**	**211**
2012	Dworshak NFH	DWOR	206	206
2012	Squaw Creek	USAL	27	27
	2012 Total		**233**	**233**
2013	Dworshak NFH	DWOR		
2013	Pahsimeroi FH	USAL	210	210
	2013 Total		**210**	**210**
2014	Dworshak NFH	DWOR	66	88
2014	Pahsimeroi FH	USAL	74	87
	2014 Total		**140**	**175**
2015	Dworshak NFH	DWOR	68	135
2015	Pahsimeroi FH	USAL	73	94
	2015 Total		**141**	**229**
2016	Dworshak NFH	DWOR	20	21
2016	Pahsimeroi FH	USAL	111	222
	2016 Total		**131**	**243**

Source: IDFG unpublished data

7.5 DISPOSITION OF HATCHERY-ORIGIN FISH COLLECTED IN SURPLUS OF BROODSTOCK NEEDS

Adults collected in excess of what is needed for broodstock may be given to tribes, the public, or foodbanks; given to landfills or rendering plants for disposal; outplanted in Yankee Fork Salmon

River for tribal fishery; or carcasses distributed for nutrient enhancement in Yankee Fork Salmon River.

7.6 FISH TRANSPORTATION AND HOLDING METHODS

Generally, adult steelhead arrive ripe or very close to spawning. Fish are held in adult holding facilities (described above) until they are spawned. An opercle or caudal fin punch may be used to track time of arrival or to indicate previously spawned males.

In the event that fish are transported to different locations to meet other objectives, trucks fitted with transport tanks are used. Tanks support both oxygen and fresh flow agitation systems.

7.7 DESCRIBE FISH HEALTH MAINTENANCE AND SANITATION PROCEDURES APPLIED

Adult steelhead held for spawning are typically spawned within two weeks of arrival. Fish health monitoring at spawning includes sampling for viral, bacterial and parasitic disease agents. Ovarian fluid is sampled from females and used in viral assays. Kidney samples are taken from a representative number of females spawned and used in bacterial assays. Head wedges are taken from a representative number of fish spawned and used to assay for presence/absence of the parasite responsible for whirling disease.

Eggs are rinsed with pathogen-free well water after fertilization, and disinfected with a 100 ppm buffered iodophor solution for one half hour before being placed in incubation trays. Necropsies are performed on pre-spawn mortalities as dictated by the IDFG Fish Health Laboratory.

Details on the collection of adults in the Clearwater R. basin are presented in the HGMP for the Dworshak National Fish Hatchery steelhead program.

7.8 DISPOSITION OF CARCASSES

Typically, adult steelhead carcasses generated during spawning events are distributed to the general public, charitable organizations, and to the SBT. Additionally, carcasses may be transported to sanitary landfills or to rendering facilities.

7.9 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR ECOLOGICAL EFFECTS TO LISTED NATURAL FISH RESULTING FROM THE BROODSTOCK COLLECTION PROGRAM.

Only hatchery-origin adults are collected for broodstock purposes.

SECTION 8. MATING

This section describes fish mating procedures that are used, including those applied to meet performance indicators identified previously.

8.1 SELECTION METHOD

Adult steelhead are chosen at random but with regard to run timing. Male steelhead may be marked with an opercle or caudal punch and used more than once if needed. Generally, a 1:1 spawn design is followed. Fish are typically checked twice weekly for ripeness.

8.2 MALES

Generally, males are used only once for spawning. Only in those cases where skewed sex ratios exist (fewer males than females) or in situations where males mature late, males may be used twice. Males are chosen at random but with regard to run timing.

8.3 FERTILIZATION

Spawning ratios of 1 male to 1 female will be prioritized but in the case of skewed sex ratios, males may be reused

8.4 CRYOPRESERVED GAMETES

Milt cryopreserved at Dworshak National Fish Hatchery may be used in this program.

8.5 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR ECOLOGICAL EFFECTS TO LISTED NATURAL FISH RESULTING FROM THE MATING SCHEME.

No adverse genetic or ecological effects to listed natural fish are anticipated as only hatchery-origin adults are spawned.

SECTION 9. INCUBATION AND REARING

9.1 INCUBATION

9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding

Table 9 displays the green-egg to eyed-egg survival of USAL and DWOR stock steelhead from brood year 2005-2017.

Table 9. Number of Green eggs taken and survial to the eyed stage for USAL and Dwor stock steelhead reared at Magic Valley Fish Hatchery for Brood Years 2005-2017.

Brood Year	Collection Facility	Rearing Facility	Stock	Number of Green Eggs	Number of Eyed eggs	Survial to Eyed-Egg stage (%)
2005	Dworshak NFH	Magic Valley	DWOR	1,309,455	950,000	72.5
2005	Squaw Creek	Magic Valley	USAL	50,317	44,009	87.5
2006	Dworshak NFH	Magic Valley	DWOR	1,030,471	965,551	93.7
2006	Squaw Creek	Magic Valley	USAL	201,793	143,799	71.3
2007	Dworshak NFH	Magic Valley	DWOR	1,147,096	863,651	94.5
2007	Squaw Creek	Magic Valley	USAL	143,521	80,939	56.4
2008	Dworshak NFH	Magic Valley	DWOR	1,070,650	869,017	90.9
2008	Squaw Creek	Magic Valley	USAL	103,764	68,988	66.5
2009	Dworshak NFH	Magic Valley	DWOR	1,525,057	948,419	92.7
2009	Squaw Creek	Magic Valley	USAL	182,602	121,035	66.3
2010	Dworshak NFH	Magic Valley	DWOR	1,193,496	991,124	92.7
2010	Squaw Creek	Magic Valley	USAL	117,057	97,008	82.9
2011	Dworshak NFH	Magic Valley	DWOR	1,163,207	1,035,254	89.0
2011	Squaw Creek	Magic Valley	USAL	157,736	117,984	74.8
2012	Dworshak NFH	Magic Valley	DWOR	1,151,102	1,018,725	88.5
2012	Squaw Creek	Magic Valley	USAL	172,710	124,600	72.0
2013	Dworshak NFH	Magic Valley	DWOR	117,451	109,511	93.2
2013	Pahsimeroi FH	Magic Valley	USAL	1,346,847	1,249,759	92.8
2014	Dworshak NFH	Magic Valley	DWOR	513,455	311,302	60.6
2014	Pahsimeroi FH	Magic Valley	USAL	546,393	485,209	88.8
2015	Dworshak NFH	Magic Valley	DWOR	852,235	669,681	78.6
2015	Pahsimeroi FH	Magic Valley	USAL	643,900	578,866	89.9
2016	Dworshak NFH	Magic Valley	DWOR	134,203	124,082	92.4
2016	Pahsimeroi FH	Magic Valley	USAL	1,354,571	1,183,170	87.3
2017	Dworshak NFH	Magic Valley	DWOR	489,715	453,868	92.7
2017	Pahsimeroi FH	Magic Valley	USAL	541,211	469,317	86.7

Source: Magic Valley Fish Hatchery brood reports and IDFG unpublished data

9.1.2 Cause for, and disposition of surplus egg takes

After marking, (adipose fin clipping and CWT tagging) any juveniles on station that are in excess of the permitted program release levels are released into local reservoirs that are not conducive to anadromy.

9.1.3 Loading densities applied during incubation

Pahsimeroi, Sawtooth, and Clearwater fish hatcheries – Incubation flows are set at 5 to 8 gpm in vertical incubation stacks. Typically, eggs from two females are incubated per tray (approximately 10,000 to 12,000 eggs per tray).

Magic Valley Fish Hatchery – Flows in upwelling incubators are set at approximately 15 gallons per minute and are adjusted so eggs gently roll. Each incubator is capable of incubating and hatching 50,000 to 60,000 eyed steelhead eggs.

9.1.4 Incubation conditions

Pahsimeroi Fish Hatchery-. At spawning, all eggs are water hardened and disinfected with a 100ppm Argentyne solution for 60 minutes. Eggs are then poured gently into Aquaseed tubes and placed in coolers filled with SPF well water and transferred to the upper hatchery for incubation. Upon arrival at the upper hatchery, eggs are disinfected again in a 100ppm solution of Argentyne for 15 minutes and the outside of the coolers disinfected with a 100ppm solution of Argentyne for 15 minutes as well. This is part of Pahsimeroi Hatchery's strict bio-security protocol to prevent eggs and fry from contracting bacterial and viral pathogens. After disinfection, the eggs are placed into standard vertical stack incubators. From forty-eight hours post spawn until the eye up stage, eggs are treated three times a week with a 1,667ppm formalin treatment. The eggs are also treated three times a week (on alternating days) for soft shell disease by dispensing 500ml's of Argentyne through each incubator stack. At eye-up, eggs are enumerated using a Jensorter electronic picker/counter.

Sawtooth Fish Hatchery – Pathogen free well water is used for all incubation at the Sawtooth Fish Hatchery. Incubation stacks use catch basins to prevent silt and fine sand from circulating through incubation trays. Following 48 hours of incubation, eggs are treated three times per week with formalin (1,667 ppm) to control the spread of fungus. Formalin treatments are discontinued at eye-up. Once eggs reach the eyed stage of development (approximately 360 FTU), they are shocked to identify dead and unfertilized eggs. Dead and undeveloped eggs are then removed with the assistance of an automatic egg picking machine. During this process, the number of eyed and dead eggs is generated. Eyed eggs are generally shipped to receiving hatcheries when they have accumulated approximately 450 FTUs.

Clearwater Fish Hatchery- The Clearwater Fish Hatchery incubation room contains 49 double stack Heath incubators with a total of 784 trays available for egg incubation. The upper and lower half of each stack (eight trays each) has a different water supply and drain. This design aids in segregation of diseased eggs. The maximum capacity of this facility is five million green eggs. The incubation room is supplied with both reservoir water sources to provide the desired temperature for incubation at a flow of 5 to 8 gpm per one-half stack.

Isolation incubation consists of 16 double stack Heath incubators with a total of 256 trays. The maximum capacity of this facility is 1.5 million green eggs. The isolation incubation room is supplied from two reservoir water sources to provide the desired temperature for incubation with a flow of 5 to 8 gpm per stack.

Magic Valley Fish Hatchery – Incubation facilities at the Magic Valley Fish Hatchery consist primarily of forty 12-gallon upwelling incubators. Each incubator is capable of incubating and hatching 50,000 to 60,000 eyed steelhead eggs. Two incubators are placed on 8 inch aluminum square tubes that sit on the floor of the concrete vat. A total of 20 vats are available. Vats measure 40 feet long x 4 feet wide x 3 feet deep. Each vat has the capacity to rear 100,000 to 115,000 steelhead to <200 fish per pound. Water flow to incubation jars is adjusted so eggs gently roll. Temperature is tracked daily to monitor the accumulation of temperature units. Water temperature at is a constant 15.0ºC.

9.1.5 Ponding

No ponding occurs at the Pahsimeroi, Sawtooth or Clearwater fish hatcheries for the Salmon

River B-run steelhead program. Eyed-eggs are shipped to the Magic Valley Fish Hatchery in the Hagerman Valley of Idaho. Eggs are disinfected in 100 ppm Iodophor for at least 10 minutes at transfer.

Magic Valley Fish Hatchery – Fry are allowed to volitionally exit upwelling incubators and move directly into early rearing vats through approximately 1,000 FTUs. After that time, fry remaining in incubators are gently poured into vats. Fry are generally ponded between late May and mid- June.

9.1.6 Fish health maintenance and monitoring

Following fertilization, eggs are typically water-hardened in a 100 ppm Iodophor solution for a minimum of 30 minutes. During incubation, eggs routinely receive scheduled formalin treatments to control the growth of fungus. Treatments are typically administered three times per week at a concentration of 1667 ppm active ingredient. Dead eggs are removed following shocking. Additional egg picks are performed as needed to remove dead eggs not identified immediately after shocking. Eggs produced at spawning hatcheries are transferred to rearing hatcheries when they have accumulated approximately 450 FTUs.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

No adverse genetic or ecological effects to listed fish are anticipated as only hatchery-origin adults are spawned.

9.2 REARING

9.2.1 Provide survival rate data (average program performance) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years or for years dependable data are available.

In-hatchery survival data for B-run steelhead incubated and reared at Magic Valley Fish Hatchery from 2005 through 2016 is displayed in Table 10 below.

Table 10. Eyed-egg to smolt survial data for Salmon River B-run steelhead reared at Magic Valley Fish Hatchery for brood years 2005-2016.

Collection Facility	Rearing Facility	Stock	Brood Year	Eyed-Egg to Smolt Survival (%)
Dworshak NFH	Magic Valley	DWOR	2005	78
Squaw Creek	Magic Valley	USAL	2005	74
Dworshak NFH	Magic Valley	DWOR	2006	88
Squaw Creek	Magic Valley	USAL	2006	89
Dworshak NFH	Magic Valley	DWOR	2007	90
Squaw Creek	Magic Valley	USAL	2007	77
Dworshak NFH	Magic Valley	DWOR	2008	86
Squaw Creek	Magic Valley	USAL	2008	88
Dworshak NFH	Magic Valley	DWOR	2009	96
Squaw Creek	Magic Valley	USAL	2009	81
Dworshak NFH	Magic Valley	DWOR	2010	86
Squaw Creek	Magic Valley	USAL	2010	92
Dworshak NFH	Magic Valley	DWOR	2011	90
Squaw Creek	Magic Valley	USAL	2011	89
Dworshak NFH	Magic Valley	DWOR	2012	93
Squaw Creek	Magic Valley	USAL	2012	90
Dworshak NFH	Magic Valley	DWOR	2013	85
Pahsimeroi FH	Magic Valley	USAL	2013	80
Dworshak NFH	Magic Valley	DWOR	2014	91
Pahsimeroi FH	Magic Valley	USAL	2014	86
Dworshak NFH	Magic Valley	DWOR	2015	75
Pahsimeroi FH	Magic Valley	USAL	2015	91
Dworshak NFH	Magic Valley	DWOR	2016	75
Pahsimeroi FH	Magic Valley	USAL	2016	85

Source: Magic Valley Fish Hatchery brood reports and IDFG unpublished data

9.2.2 Density and loading criteria (goals and actual levels)

Magic Valley Fish Hatchery - Density (DI) and flow (FI) indices are targeted to not exceed 0.30 and 1.2, respectively.

9.2.3 Fish rearing conditions

Magic Valley Fish Hatchery – Fish rear on constant 15.0ºC water. Dissolved oxygen, flows, total suspended solids, settable solids, phosphorus, and water temperature are recorded monthly. Density and flow indices are monitored on a regular basis. Rearing groups are split or moved as needed to adhere to these indices. Fish are fed in outside raceways from a traveling bridge fitted with 16 Nielson automatic feeders. Raceway cleaning takes place on an as needed basis; raceways are swept manually with brooms. Sample counts are conducted monthly and dead fish are removed daily.

9.2.4 Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

The Magic Valley Fish Hatchery rears juvenile steelhead under constant water temperature (15.0ºC) conditions and feeding schedules are designed to produce fish between 180 and 250 mm and 4.5 fish to the pound at release. Length gained per month for the first three months of culture is typically between 0.8 and 1.0 inches (20.3 to 25.4 mm). Fish gain approximately 0.65 to 0.75 inches per month (16.5 to 19.1 mm) thereafter. To meet the release size target, fish may be fed on an intermittent schedule beginning in their fourth month of culture.

9.2.5 Indicate monthly fish growth rate and energy reserve data (average program performance), if available.

See Section 9.2.4 above.

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (average program performance).

Magic Valley Fish Hatchery – Dry and semi-moist diets have been used at the Magic Valley Fish Hatchery in the past. Currently, fish are fed the Rangen 450 extruded steelhead dry diet and Skretting extruded steelhead diet. Initially the fry are fed at a rate of approximately 5% body weight per day. As fish grow, the percent body weight fed per day decreases. Fry are fed with Loudon solenoid activated feeders while located in early rearing vats. Following transfer to outside raceways, fish are fed by hand and with the assistance of the traveling bridge. First feeding fry are typically fed up to eight times per day. Prior to release, pre-smolts are typically fed three times per day. Feed conversion averages 1.00 pounds of feed fed for every pound of weight gain (from first feeding through release).

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures

Magic Valley Fish Hatchery – Routine fish health inspections are conducted by staff from the IDFG Eagle Fish Health Laboratory on a monthly basis. More frequent inspections occur if needed. Therapeutics may be used to treat specific disease agents (e.g., Oxytetracycline). Foot baths with disinfectant are used at the entrance of the hatchery early rearing building. Disinfection protocols are in place for equipment, trucks and nets. All raceways are thoroughly chlorinated after fish have been transferred for release.

9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable

No smolt development indices are developed in this program.

9.2.9 Indicate the use of "natural" rearing methods as applied in the program.

No semi-natural or natural rearing methods are applied.

9.2.10 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

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SECTION 10. RELEASE

This section describes fish release levels and release practices applied through the hatchery program.

10.1 Proposed fish release levels

Table 11 below represents the current release strategy. As mentioned in Section 1.8, managers have initiated the transition to convert the program to a 100% locally adapted (USAL) Salmon River broodstock.

Table 11. Planned number of Salmon River B-run steelhead released from Magic Valley Fish Hatchery annually.

Rearing Hatchery	Lifestage	Size at Releaes (fpp)	Location	Number Released
Magic Valley	Yearling	4.5	Pahsimeroi River	248,000
Magic Valley	Yearling	4.5	Yankee Fork Salmon R.	620,000
Magic Valley	Yearling	4.5	Little Salmon River	217,000
Total				**1,085,000**

10.2 SPECIFIC LOCATION(S) OF PROPOSED RELEASE(S)

Stream, river, or watercourse:

Table 12. Release locations for steelhead reared at Magic Valley Fish Hatchery.

Stream	Release Point	GPS Waypoint	Major Watershed & Basin
Pahsimeroi River	Adult weir	44.684139; -114.039471	Salmon River
Yankee Fork Salmon R.	Dredge Ponds	44.327875; -114.721485	Salmon River
	Third Bridge	44.339038; -114.721608	Salmon River
Little Salmon River	Hazard Creek	45.18402; -116.300673	Salmon River
	Stinky Spirngs	45.150507; -116297503	Salmon River

10.3 ACTUAL NUMBERS AND SIZES OF FISH RELEASED BY AGE CLASS THROUGH THE PROGRAM

The number of B-run steelhead released by from the Magic Valley and Hagerman National fish hatcheries into the Salmon River basin from 2005-2017 is presented in Table 13 below. Since brood year 2009 all rearing has occurred at Magic Valley Fish Hatchery.

Table 13. B-run steelhead released from Magic Valley and Hagerman National fish hatcheries 2005-2017. All releases are yearling smolts.

Release Year	Rearing Facility	Stock	Average Size at Release (Fish/Lb)	Number Released
2005	Hagerman National FH	DWOR	4.5	191,414
2005	Magic Valley Fish Hatchery	DWOR	4.6	747,158
2005	Magic Valley	USAL	4.2	35,448
	2005 Total		**4.5**	**974,020**
2006	Hagerman National FH	DWOR	4.9	192,372
2006	Magic Valley Fish Hatchery	DWOR	4.3	735,324
2006	Magic Valley Fish Hatchery	USAL	4.4	31,015
	2006 Total		**4.5**	**958,711**
2007	Hagerman National FH	DWOR	4.5	195,073
2007	Magic Valley Fish Hatchery	DWOR	4.4	614,383
2007	Magic Valley Fish Hatchery	USAL	4.9	127,266
	2007 Total		**4.5**	**936,722**
2008	Hagerman National FH	DWOR	4.7	179,036
2008	Magic Valley Fish Hatchery	DWOR	4.7	690,321
2008	Magic Valley Fish Hatchery	USAL	4.2	62,314
	2008 Total		**4.6**	**931,671**
2009	Hagerman National FH	DWOR	4.6	171,094
2009	Magic Valley Fish Hatchery	DWOR	4.9	714,349
2009	Magic Valley Fish Hatchery	USAL	4.8	57,464
	2009 Total		**4.8**	**942,907**
2010	Magic Valley Fish Hatchery	DWOR	5.0	864,239
2010	Magic Valley Fish Hatchery	USAL	4.6	95,023
	2010 Total		**4.9**	**959,262**
2011	Magic Valley Fish Hatchery	DWOR	5.1	811,341
2011	Magic Valley Fish Hatchery	USAL	5.0	91,525
	2011 Total		**5.1**	**902,866**
2012	Magic Valley Fish Hatchery	DWOR	4.7	869,566
2012	Magic Valley Fish Hatchery	USAL	4.9	98,655
	2012 Total		**4.7**	**968,221**
2013	Magic Valley Fish Hatchery	DWOR	4.4	950,313
2013	Magic Valley Fish Hatchery	USAL	4.5	112,571
	2013 Total		**4.5**	**1,062,884**
2014	Magic Valley Fish Hatchery	DWOR	4.5	138,195
2014	Magic Valley Fish Hatchery	USAL	4.5	931,522
	2014 Total		**4.5**	**1,069,717**
2015	Magic Valley Fish Hatchery	DWOR	4.5	284,070
2015	Magic Valley Fish Hatchery	USAL	4.4	416,580
	2015 Total		**4.5**	**700,650**
2016	Magic Valley Fish Hatchery	DWOR	4.5	499,090
2016	Magic Valley Fish Hatchery	USAL	4.5	524,000
	2016 Total		**4.5**	**1,023,090**
2017	Magic Valley Fish Hatchery	DWOR	4.4	93,240
2017	Magic Valley Fish Hatchery	USAL	4.4	999,200
	2017 Total		**4.4**	**1,092,440**

Source: IDFG unpublished data

10.4 ACTUAL DATES OF RELEASE AND DESCRIPTION OF RELEASE PROTOCOLS

Releases of B-run steelhead released from the Magic Valley and Hagerman National fish hatcheries generally occurs during the month of April (Table 14). Since brood year 2009, rearing has only occurred at Magic Valley Fish Hatchery.

Table 14. Timing of B-run steelhead releases from Magic Valley and Hagerman National fish hatcheries, 2005-2017.

Release Year	Rearing Facility	Stock	Release dates
2005	Hagerman National Fish Hatchery	DWOR	4/8-5/2
2005	Magic Valley Fish Hatchery	DWOR	3/17-4/22
2005	Magic Valley Fish Hatchery	USAL	4/5
2006	Hagerman National Fish Hatchery	DWOR	4/5-4/28
2006	Magic Valley Fish Hatchery	DWOR	4/11-5/2
2006	Magic Valley Fish Hatchery	USAL	4/10
2007	Hagerman National Fish Hatchery	DWOR	3/26-5/2
2007	Magic Valley Fish Hatchery	DWOR	4/10-4/27
2007	Magic Valley Fish Hatchery	USAL	4/26
2008	Hagerman National Fish Hatchery	DWOR	4/7-5/9
2008	Magic Valley Fish Hatchery	DWOR	4/7-4/22
2008	Magic Valley Fish Hatchery	USAL	4/24
2009	Hagerman National Fish Hatchery	DWOR	4/8-4/14
2009	Magic Valley Fish Hatchery	DWOR	4/6-4/24
2009	Magic Valley Fish Hatchery	USAL	4/23-4/24
2010	Magic Valley Fish Hatchery	DWOR	4/13-4/27
2010	Magic Valley Fish Hatchery	USAL	4/28-4/29
2011	Magic Valley Fish Hatchery	DWOR	4/13-4/26
2011	Magic Valley Fish Hatchery	USAL	4/26
2012	Magic Valley Fish Hatchery	DWOR	4/19-5/2
2012	Magic Valley Fish Hatchery	USAL	5/2
2013	Magic Valley Fish Hatchery	DWOR	4/17-4/26
2013	Magic Valley Fish Hatchery	USAL	4/18
2014	Magic Valley Fish Hatchery	DWOR	4/22
2014	Magic Valley Fish Hatchery	USAL	4/17-5/1
2015	Magic Valley Fish Hatchery	DWOR	4/20-4/27
2015	Magic Valley Fish Hatchery	USAL	4/17-4/23
2016	Magic Valley Fish Hatchery	DWOR	4/18-5/2
2016	Magic Valley Fish Hatchery	USAL	4/19-5/2
2017	Magic Valley Fish Hatchery	DWOR	4/18
2017	Magic Valley Fish Hatchery	USAL	4/11-4/27

Source: IDFG unpublished data

10.5 Fish transportation procedures, if applicable

Yearlings are crowded in raceways and pumped into 5,000 gallon transport trucks using an 8-inch Magic Valley Heliarc pump and dewatering tower. Transport water temperature is chilled to approximately 7.2ºC. Approximately 5,000 pounds of fish are loaded into each truck. Transport duration to release sites is ranges from 4 to 9 hours. Trucks are equipped with oxygen and fresh flow agitator systems. Fish are not fed for up to four days prior to loading and transporting.

10.6 Acclimation procedures (methods applied and length of time)

Smolts released into the Yankee Fork Salmon River include both approximately 400,000 smolts as a direct release at the confluence of Jordan Creek and Yankee Fork and 220,000 smolts as semi-acclimated in a pond system connected to the Yankee Fork. Semi-acclimated smolts emigrate volitionally (Pond Series 1 approximately 5.5 km upstream from confluence of Yankee Fork and the mainstem Salmon River).

10.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults

All smolts released from this program are marked and/or tagged to allow identification of hatchery origin adults. All harvest mitigation fish are marked with an adipose fin clip. Upper Salmon River B-run juveniles released into the Pahsimeroi River have intact adipose fins, but will be coded wire tagged to allow identification when they return as adults. This marking strategy will allow them to escape mark-selective fisheries to meet broodstock goals as well as to be differentiated from Pahsimeroi stock steelhead at the Pahsimeroi weir. Of the smolts released into Yankee Fork Salmon River, 220,000 have intact adipose fins but are 100% Coded Wire Tagged.

To evaluate emigration success and adult migration timing and survival to main stem dams, smolts are representatively tagged with PIT-tags.

10.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels

Smolt release numbers will not exceed 10% of the production target for each program. Fish in excess of this amount may be released into local reservoirs that are not conducive to anadromy.

10.9 Fish health certification procedures applied pre-release

Between 45 and 30 days prior to release, a 60 fish pre-liberation sample is taken from each rearing lot to assess the prevalence of viral replicating agents and to detect the pathogens responsible for bacterial kidney disease and whirling disease. In addition, an organosomatic index is developed for each release lot. Diagnostic services are provided by the IDFG Eagle Fish Health Laboratory.

10.10 EMERGENCY RELEASE PROCEDURES IN RESPONSE TO FLOODING OR WATER SYSTEM FAILURE

Emergency procedures are in place to guide activities in the event of a potential catastrophic event. Plans include a trouble shooting and repair process followed by the implementation of an emergency action plan if the problem cannot be resolved. The initial emergency action is to consolidate fish into an area that is not directly affected by flooding or water system failure, transfer fish to other rearing hatcheries in the Hagerman Valley, and provide supplemental oxygenation.

10.11 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC AND ECOLOGICAL EFFECTS TO LISTED FISH RESULTING FROM FISH RELEASES.

Actions taken to minimize adverse effects on listed fish include:

- Continuing fish health practices to minimize the incidence of infectious disease agents. Follow IHOT, AFS, and PNFHPC guidelines.
- Reducing the number of steelhead released in the primary upper Salmon River salmon production area, which includes the Salmon River from Warm Springs Creek upstream to the headwaters of the Salmon and East Fork Salmon rivers. Hatchery-produced, B-run releases were eliminated in the East Fork Salmon River.
- Minimizing the number of smolts in the release population which are larger than 225 mm (or about 4 fpp).
- Continuing to reduce effect of the release of large numbers of juvenile steelhead at a single site by spreading the release over a number of days.
- Programming time of release to mimic natural fish for releases, given the constraints of transportation.
- Continuing research to improve post-release survival of steelhead to potentially reduce numbers released to meet management objectives.
- Monitoring hatchery effluent to ensure compliance with National Pollutant Discharge Elimination System permit.
- Continuing to externally mark hatchery steelhead released for harvest purposes with an adipose fin clip.
- Continuing Hatchery Evaluation Studies (HES) to provide comprehensive monitoring and evaluation for LSRCP steelhead.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1 MONITORING AND EVALUATION OF PERFORMANCE INDICATORS PRESENTED IN SECTION 1.10

IDFG's monitoring of hatchery programs is designed to evaluate benefits and risks of the programs and to inform adaptive management to maximize program benefits and reduce risks. Hatchery monitoring programs evaluate specific performance indicators in the following categories; Legal Mandates, Implementation and Compliance, Hatchery Effectiveness Monitoring, Operations, and Socioeconomic Effectiveness (see Table 1, Section 1.9) using quantitative and qualitative information. The table describes standards and indicators for each category. Links to documents describing the monitoring efforts are provided where additional detail may be warranted.

11.1.1 Describe plans and methods proposed to collect data necessary to respond to each Performance Indicator identified for the program

Specific performance indicators are described in Table 15. Performance indicators are reported annually in Hatchery Steelhead Annual and Brood Year Reports Available for download here:

2015 Calendar Year Report:
https://www.fws.gov/lsnakecomplan/Reports/IDFG/Eval/Res17-05Warren2015Calendar%20Year%20Hatchery%20Steelhead%20Report.pdf

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-10WarrenBY2007Steelhead%20Hatchery%20Evaluations%20Report.pdf

Wild steelhead monitoring is reported annually in the steelhead Natural Production Monitoring Program reports available for download here.

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-20Stark2015%20Idaho%20Adult%20Steelhead%20Monitoring.pdf

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-07Apperson%20Idaho%20Anadromous%20Emigrant%20Monitoring%202014%20and%202015%20A nnual%20Report.pdf

Table 15. Standardized performance indicators and definitions for status and trends and hatchery effectiveness monitoring (Galbreath et al. 2008).

Performance Measure		Definition
Abundance	Adult Escapement to Tributary	Number of adults (including jacks) that have escaped to a certain point (i.e. - mouth of stream). Population based measure. Calculated with mark recapture methods from weir data adjusted for redds located downstream of weirs and in tributaries, and maximum net upstream approach for DIDSON and underwater video monitoring. Provides total escapement and wild only escapement. [Assumes tributary harvest is accounted for]. Uses TRT population definition where available
	Fish per Redd	Number of fish divided by the total number of redds. Applied by: The population estimate at a weir site, minus broodstock and mortalities and harvest, divided by the total number of redds located upstream of the weir.
	Female Spawner per Redd	Number of female spawners divided by the total number of redds above weir. Applied in 2 ways: 1) The population estimate at a weir site multiplied by the weir derived proportion of females, minus the number of female prespawn mortalities, divided by the total number of redds located upstream of the weir, and 2) DIDSON application calculated as in 1 above but with proportion females from carcass recoveries. Correct for mis-sexed fish at weir for 1 above.
	Index of Spawner Abundance - redd counts	Counts of redds in spawning areas in index area(s) (trend), extensive areas, and supplemental areas. Reported as redds and/or redds/km.
	Spawner Abundance	In-river: Estimated number of total spawners on the spawning ground. Calculated as the number of fish that return to an adult monitoring site, minus broodstock removals and weir mortalities and harvest if any, subtracts the number of female prespawning mortalities and expanded for redds located below weirs. Calculated in two ways: 1) total spawner abundance, and 2) wild spawner abundance which multiplies by the proportion of natural origin (wild) fish. Calculations include jack salmon. In-hatchery: Total number of fish actually used in hatchery production. Partitioned by gender and origin.
	Hatchery Fraction	Percent of fish on the spawning ground that originated from a hatchery. Applied in two ways: 1) Number of hatchery carcasses divided by the total number of known origin carcasses sampled. Uses carcasses above and below weirs, 2) Uses weir data to determine number of fish released above weir and calculate as in 1 above, and 3) Use 2 above and carcasses above and below weir.
	Ocean/Mainstem Harvest	Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin.
	Harvest Abundance in Tributary	Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin.
	Index of Juvenile Abundance (Density)	Parr abundance estimates using underwater survey methodology are made at pre-established transects. Densities (number per 100 m2) are recorded using protocol described in Thurow (1994). Hanken & Reeves estimator.
	Juvenile Emigrant Abundance	Gauss software is (Aptech Systems, Maple Valley, Washington) is used to estimate emigration estimates. Estimates are given for parr pre-smolts, smolts and the entire migration year. Calculations are completed using the Bailey Method and bootstrapping for 95% CIs. Gauss program developed by the University of Idaho (Steinhorst 2000).
	Smolts	Smolt estimates, which result from juvenile emigrant trapping and PIT tagging, are derived by estimating the proportion of the total juvenile abundance estimate at the tributary comprised of each juvenile life stage (parr, presmolt, smolt) that survive to first mainstem dam. It is calculated by multiplying the life stage specific abundance estimate (with standard error) by the life stage specific survival estimate to first mainstem dam (with standard error). The standard error around the smolt equivalent estimate is calculated using the following formula; where X = life stage specific juvenile abundance estimate and Y = life stage specific juvenile survival estimate: $Var(X \cdot Y)$ $= E(X)^2 \cdot Var(Y) + E(Y)^2 \cdot Var(X) + Var(X) \cdot Var(Y)$
	Run Prediction	This will not be in the raw or summarized performance database.

Survival – Productivity	Smolt-to-Adult Return Rate	The number of adult returns from a given brood year returning to a point (stream mouth, weir) divided by the number of smolts that left this point 1-5 years prior. Calculated for wild and hatchery origin conventional and captive brood fish separately. Adult data applied in two ways: 1) SAR estimate to stream using population estimate to stream, 2) adult PIT tag SAR estimate to escapement monitoring site (weirs, LGR), and 3) SAR estimate with harvest. Accounts for all harvest below stream. *Smolt-to-adult return rates* are generated for four performance periods; tributary to tributary, tributary to tributary, tributary to first mainstem dam, first mainstem dam to first mainstem dam, and first mainstem dam to tributary. *First mainstem dam to first mainstem dam S*AR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the estimated number of PIT tagged juveniles at first mainstem dam. Variances around the point estimates are calculated as described above. *Tributary to tributary SAR* estimates for natural and hatchery origin fish are calculated using PIT tag technology as well as direct counts of fish returning to the drainage. PIT tag SAR estimates are calculated by dividing the number of PIT tag adults returning to the tributary (by life stage and origin type) by the number of PIT tagged juvenile fish migrating from the tributary (by life stage and origin type). Overall PIT tag SAR estimates for natural fish are then calculated by averaging the individual life stage specific SAR's. Direct counts are calculated by dividing the estimated number of natural and hatchery-origin adults returning to the tributary (by length break-out for natural fish) by the estimated number of natural-origin fish and the known number of hatchery-origin fish leaving the tributary. *Tributary to* first mainstem dam SAR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the number of PIT tagged juveniles tagged in the tributary. There is no associated variance around this estimate. The adult detection probabilities at first mainstem dam are near 100 percent. First mainstem dam *to tributary* SAR estimates are calculated by dividing the number of PIT tagged adults returning to the tributary by the estimated number of PIT tagged juveniles at first mainstem dam. The estimated number of PIT tagged juveniles at first mainstem dam is calculated by multiplying lifestage specific survival estimates (with standard errors) by the number of juveniles PIT tagged in the tributary. The variance for the estimated number of PIT tagged juveniles at first mainstem dam is calculated as follows, where X = the number of PIT tagged fish in the tributary and Y = the variance of the lifestage specific survival estimate: $Var(X \cdot Y) = X^2 \cdot Var(Y)$ The variance around the SAR estimate is calculated as follows, where X = the number of adult PIT tagged fish returning to the tributary and Y = the estimated number of juvenile PIT tagged fish at first mainstem dam : $Var\left(\frac{X}{Y}\right) = \left(\frac{EX}{EY}\right)^2 \cdot \left(\frac{Var(Y)}{(EY)^2}\right)$
	Progeny-per- Parent Ratio	Adult to adult calculated for naturally spawning fish and hatchery fish separately as the brood year ratio of return adult to parent spawner abundance using data above weir. Two variants calculated: 1) escapement, and 2) spawners.
	Recruit/spawner (R/S)(Smolt Equivalents per Redd or female)	Juvenile production to some life stage divided by adult spawner abundance. Derive adult escapement above juvenile trap multiplied by the prespawning mortality estimate. Adjusted for redds above juv. Trap. *Recruit per spawner* estimates, or *juvenile abundance (can be various life stages or locations) per redd/female*, is used to index population productivity, since it represents the quantity of juvenile fish resulting from an average redd (total smolts divided by total redds) or female. Several forms of juvenile life stages are applicable. We utilize two measures: 1) juvenile abundance (parr, presmolt, smolt, total abundance) at the tributary mouth, and 2) smolt abundance at first mainstem dam.
	Pre-spawn Mortality	Percent of female adults that die after reaching the spawning grounds but before spawning. Calculated as the proportion of "25% spawned" females among the total number of female carcasses sampled. ("25% spawned" = a female that contains 75% of her egg compliment].
	Juvenile Survival to first mainstem dam	Life stage survival (parr, presmolt, smolt, subyearling) calculated by CJS Estimate (SURPH) produced by PITPRO 4.8+ (recapture file included), CI estimated as 1.96*SE. Apply survival by life stage to first mainstem dam to estimate of abundance by life stage at the tributary and the sum of those is total smolt abundance surviving to first mainstem dam . Juvenile survival to first mainstem dam = total estimated smolts surviving to first mainstem dam divided by the total estimated juveniles leaving tributary.

	Juvenile Survival to all Mainstem Dams	*Juvenile survival to first mainstem dam and subsequent Mainstem Dam(s)*, which is estimated using PIT tag technology. Survival by life stage to and through the hydrosystem is possible if enough PIT tags are available from the stream. Using tags from all life stages combined we will calculate (SURPH) the survival to all mainstem dams.
	Post-release Survival	Post-release survival of natural and hatchery-origin fish are calculated as described above in the performance measure "Survival to first mainstem dam and Mainstem Dams". No additional points of detection (i.e screwtraps) are used to calculate survival estimates.
Distribution	Adult Spawner Spatial Distribution	Extensive area tributary spawner distribution. Target GPS red locations or reach specific summaries, with information from carcass recoveries to identify hatchery-origin vs. natural-origin spawners across spawning areas within populations.
	Stray Rate (percentage)	Estimate of the number and percent of hatchery origin fish on the spawning grounds, as the percent within MPG, and percent out of ESU. Calculated from 1) total known origin carcasses, and 2) uses fish released above weir. Data adjusted for unmarked carcasses above and below weir.
	Juvenile Rearing Distribution	Chinook rearing distribution observations are recorded using multiple divers who follow protocol described in Thurow (1994).
	Disease Frequency	Natural fish mortalities are provided to certified fish health lab for routine disease testing protocols. Hatcheries routinely samples fish for disease and will defer to then for sampling numbers and periodicity
Genetic	Genetic Diversity	Indices of genetic diversity – measured within a tributary) heterozygosity – allozymes, microsatellites), or among tributaries across population aggregates (e.g., FST).
	Reproductive Success (Nb/N)	Derived measure: determining hatchery:wild proportions, effective population size is modeled.
	Relative Reproductive Success (Parentage)	Derived measure: the relative production of offspring by a particular genotype. Parentage analyses using multilocus genotypes are used to assess reproductive success, mating patterns, kinship, and fitness in natural pop8ulations and are gaining widespread use of with the development of highly polymorphic molecular markers.
	Effective Population Size (Ne)	Derived measure: the number of breeding individuals in an idealized population that would show the same amount of dispersion of allele frequencies under random genetic drift or the same amount of inbreeding as the population under consideration.
Life History	Age Structure	Proportion of escapement composed of adult individuals of different brood years. Calculated for wild and hatchery origin conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries. Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated.
	Age–at–Return	Age distribution of spawners on spawning ground. Calculated for wild and hatchery conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries.
	Age–at–Emigration	Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated.
	Size-at-Return	Size distribution of spawners using fork length and mid-eye hypural length. Raw database measure only.
	Size-at-Emigration	Fork length (mm) and weight (g) are representatively collected weekly from natural juveniles captured in emigration traps. Mean fork length and variance for all samples within a lifestage-specific emigration period are generated (mean length by week then averaged by lifestage). For entire juvenile abundance leaving a weighted mean (by lifestage) is calculated. Size-at-emigration for hatchery production is generated from pre release sampling of juveniles at the hatchery.
	Condition of Juveniles at Emigration	Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).

	Percent Females (adults)	The percentage of females in the spawning population. Calculated using 1) weir data, 2) total known origin carcass recoveries, and 3) weir data and unmarked carcasses above and below weir. Calculated for wild, hatchery, and total fish.
	Adult Run-timing	Arrival timing of adults at adult monitoring sites (weir, DIDSON, video) calculated as range, 10%, median, 90% percentiles. Calculated for wild and hatchery origin fish separately, and total.
	Spawn-timing	This will be a raw database measure only.
	Juvenile Emigration Timing	Juvenile emigration timing is characterized by individual life stages at the rotary screw trap and Lower Granite Dam. Emigration timing at the rotary screw trap is expressed as the percent of total abundance over time while the median, 0%, 10, 50%, 90% and 100% detection dates are calculated for fish at first mainstem dam.
	Mainstem Arrival Timing (Lower Granite)	Unique detections of juvenile PIT-tagged fish at first mainstem dam are used to estimate migration timing for natural and hatchery origin tag groups by lifestage. The actual Median, 0, 10%, 50%, 90% and 100% detection dates are reported for each tag group. Weighted detection dates are also calculated by multiplying unique PIT tag detection by a life stage specific correction factor (number fish PIT tagged by lifestage divided by tributary abundance estimate by lifestage). Daily products are added and rounded to the nearest integer to determine weighted median, 0%, 50%, 90% and 100% detection dates.
Habitat	Physical Habitat	TBD
	Stream Network	TBD
	Passage Barriers/Diversions	TBD
	Instream Flow	USGS gauges and also staff gauges
	Water Temperature	Various, mainly Hobo and other temp loggers at screw trap sights and spread out throughout the streams
	Chemical Water Quality	TBD
	Macroinvertebrate Assemblage	TBD
	Fish and Amphibian Assemblage	Observations through rotary screwtrap catch and while conducting snorkel surveys.
In-Hatchery Measures	Hatchery Production Abundance	The number of hatchery juveniles of one cohort released into the receiving stream per year. Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Method dependent upon marking program (census obtained when 100% are marked).
	In-hatchery Life Stage Survival	In-hatchery survival is calculated during early life history stages of hatchery-origin juvenile Chinook. Enumeration of individual female's live and dead eggs occurs when the eggs are picked. These numbers create the inventory with subsequent mortality subtracted. This inventory can be changed to the physical count of fish obtained during CWT or VIE tagging. These physical fish counts are the most accurate inventory method available. The inventory is checked throughout the year using 'fish-per-pound' counts. Estimated survival of various in-hatchery juvenile stages (green egg to eyed egg, eyed egg to ponded fry, fry to parr, parr to smolt and overall green egg to release) Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Life stage at release varies (smolt, presmolt, parr, etc.).
	Size-at-Release	Mean fork length measured in millimeters and mean weight measured in grams of a hatchery release group. Measured during prerelease sampling. Sample size determined by individual facility and M&E staff. Life stage at release varies (smolt, presmolt, parr, etc.).
	Juvenile Condition Factor	Condition Factor (K) relating length to weight expressed as a ratio. Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).
	Fecundity by Age	The reproductive potential of an individual female. Estimated as the number of eggs in the ovaries of the individual female. Measured as the number of eggs per female calculated by weight or enumerated by egg counter.
	Spawn Timing	Spawn date of broodstock spawners by age, sex and origin, Also reported as cumulative timing and median dates.
	Hatchery Broodstock Fraction	Percent of hatchery broodstock actually used to spawn the next generation of hatchery F1s. Does not include prespawn mortality.
	Hatchery Broodstock Prespawn Mortality	Percent of adults that die while retained in the hatchery, but before spawning.
	Female Spawner ELISA Values	Screening procedure for diagnosis and detection of BKD in adult female ovarian fluids. The enzyme linked immunosorbent assay (ELISA) detects antigen of *R. salmoninarum.*
	In-Hatchery Juvenile Disease Monitoring	Screening procedure for bacterial, viral and other diseases common to juvenile salmonids. Gill/skin/ kidney /spleen/skin/blood culture smears conducted monthly on 10 mortalities per stock

	Length of Broodstock Spawner	Mean fork length by age measured in millimeters of male and female broodstock spawners. Measured at spawning and/or at weir collection. Is used in conjunction with scale reading for aging.
	Prerelease Mark Retention	Percentage of a hatchery group that have retained a mark up until release from the hatchery. Estimated from a sample of fish visually calculated as either "present" or "absent"
	Prerelease Tag Retention	Percentage of a hatchery group that have retained a tag up until release from the hatchery - estimated from a sample of fish passed as either "present" or "absent". ("Marks" refer to adipose fin clips or VIE batch marks).
	Hatchery Release Timing	Date and time of volitional or forced departure from the hatchery. Normally determined through PIT tag detections at facility exit (not all programs monitor volitional releases).
	Chemical Water Quality	Hatchery operational measures included: dissolved oxygen (DO) - measured with DO meters, continuously at the hatchery, and manually 3 times daily at acclimation facilities; ammonia (NH_3) nitrite (NO_2), -measured weekly only at reuse facilities (Kooskia Fish Hatchery).
	Water Temperature	Hatchery operational measure (Celsius) - measured continuously at the hatchery with thermographs and 3 times daily at acclimation facilities with hand-held devices.

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program

Prioritization of monitoring activities will, in part, be guided by ESA requirements, best management practices consistent with recommendations from the HRT and HSRG, regionally identified hatchery effectiveness monitoring priorities, and the feasibility of completing certain monitoring activities. We do not necessarily intend to pursue funding to address all applicable indicators.

SECTION 12. RESEARCH

12.1 OBJECTIVE OR PURPOSE

Currently no research associated with this hatchery program is being conducted.

12.2 COOPERATING AND FUNDING AGENCIES

12.3 PRINCIPLE INVESTIGATOR OR PROJECT SUPERVISOR AND STAFF

12.4 STATUS OF STOCK, PARTICULARLY THE GROUP AFFECTED BY PROJECT, IF DIFFERENT THAN THE STOCK(S) DESCRIBED IN SECTION 2

12.5 TECHNIQUES: INCLUDE CAPTURE METHODS, DRUGS, SAMPLES COLLECTED, TAGS APPLIED

12.6 DATES OR TIME PERIOD IN WHICH RESEARCH ACTIVITY OCCURS

12.7 CARE AND MAINTENANCE OF LIVE FISH OR EGGS, HOLDING DURATION, TRANSPORT METHODS

12.8 EXPECTED TYPE AND EFFECTS OF TAKE AND POTENTIAL FOR INJURY OR MORTALITY

12.9 LEVEL OF TAKE OF LISTED FISH: NUMBER OR RANGE OF FISH HANDLED, INJURED, OR KILLED BY SEX, AGE, OR SIZE, IF NOT ALREADY INDICATED IN SECTION 2.

12.10 ALTERNATIVE METHODS TO ACHIEVE PROJECT OBJECTIVES

12.11 LIST SPECIES SIMILAR OR RELATED TO THE THREATENED SPECIES; PROVIDE NUMBER AND CAUSES OF MORTALITY RELATED TO THIS RESEARCH PROJECT

12.12 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE ECOLOGICAL EFFECTS, INJURY, OR MORTALITY TO LISTED

FISH AS A RESULT OF THE PROPOSED RESEARCH ACTIVITIES.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE FRESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

SECTION 15 PROGRAM EFFECTS ON OTHER (NON-ANADROMOUS SALMONID) ESA-LISTED POPULATIONS

A Biological Opinion (01E1FW00-2017-F-1079) was developed by the USFWS to address effects on non-anadromous populations associated with this HGMP.

15.1 LIST ALL ESA PERMITS OR AUTHORIZATIONS FOR ALL NON-ANADROMOUS SALMONID PROGRAMS ASSOCIATED WITH THE HATCHERY PROGRAM

15.2 DESCRIPTION OF NON-ANADROMOUS SALMONID SPECIES AND HABITAT THAT MAY BE AFFECTED BY HATCHERY PROGRAM

15.3 ANALYSIS OF EFFECTS

15.4 ACTIONS TAKEN TO MITIGATE FOR POTENTIAL EFFECTS

15.5 REFERENCES

Appendix A

Table 1. Estimated take of listed hatchery-origin steelhead at Pahsimeroi Fish Hatchery during adult trapping and broodstock collection.

Listed species affected: Hatchery Origin (DWOR/USAL stock) Summer steelhead ESU/Population: Snake River DPS Activity: Adult Trapping/Broodstock collection				
Location of hatchery activity: Pahsimeroi Fish Hatchery Dates of activity: Feb-May Hatchery program operator: Doug Engemann (IDFG)				
	Annual Take of Listed Fish By Life Stage (Number of Fish)			
Type of Take	Egg/Fry	Juvenile	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)			900	
Intentional lethal take f)				
Unintentional lethal take g)			5	
Other Take (specify) h) Carcass tissue sampling				

Table 2. Estimated take of listed hatchery- and natural-origin steelhead at the Yankee Fork Salmon River weir during adult trapping and broodstock collection.

Listed species affected: Hatchery and Natural Origin Summer steelhead ESU/Population: Snake River DPS Activity: Adult Trapping/Broodstock collection				
Location of hatchery activity: Yankee Fork Weir Dates of activity: March-May Hatchery program operator: Lytle Denney (SBT)				
	Annual Take of Listed Fish By Life Stage (Number of Fish)			
Type of Take	Egg/Fry	Juvenile	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)			Natural- 60	
Removal (e.g. broodstock) e)			Hatchery-2,000	
Intentional lethal take f)				
Unintentional lethal take g)			Natural-1 Hatchery- 20	
Other Take (specify) h) Carcass tissue sampling				

Table 3. Estimated take of listed hatchery- and natural-origin steelhead in the Yankee Fork Salmon River during hook and line broodstock collection.

Listed species affected: Hatchery and Natural Origin Summer steelhead ESU/Population: Snake River DPS Activity: Hook and Line Broodstock collection				
Location of hatchery activity: Yankee Fork Salmon River Dates of activity: March-May Hatchery program operator: Lytle Denney (SBT)				
	Annual Take of Listed Fish By Life Stage (Number of Fish)			
Type of Take	Egg/Fry	Juvenile	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)			Natural- 142	
Removal (e.g. broodstock) e)			Hatchery-220	
Intentional lethal take f)				
Unintentional lethal take g)			Natural- 8 Hatchery- 11	
Other Take (specify) h) Carcass tissue sampling				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.