HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Pahsimeroi Summer Chinook Salmon
Species or Hatchery Stock:	Summer Chinook Salmon *Oncorhynchus tshawytscha* Pahsimerio stock
Agency/Operator:	Idaho Department of Fish and Game
Watershed and Region:	Pahsimeroi River / Salmon River Basin, Idaho
Date Submitted:	September 13, 2011
Date Last Updated:	March 2017

EXECUTIVE SUMMARY

The Pahsimeroi summer Chinook hatchery program was established to mitigate for anadromous fish losses caused by the construction and operation of Hells Canyon Dam Complex. The Hells Canyon Settlement Agreement[1] calls for the program to trap sufficient numbers of adult summer Chinook to permit the production of one million smolts annually. Managers expect this smolt production to produce approximately 8,000 adult summer Chinook returns to stream reaches above Lower Granite Dam after harvest of 32,000 adults. All hatchery operations and a portion of monitoring activities are funded by the Idaho Power Company (IPC). Where appropriate, other sources of funding for monitoring activities are identified.

The Pahsimeroi summer Chinook Salmon hatchery program is contained within the Pahsimeroi R population, part of the Upper Salmon River Major Population Group (MPG) of the Snake River spring/summer Chinook Salmon Evolutionarily Significant Unit (ESU). The management goals for the Pahsimeroi River summer Chinook Salmon population are to provide sustainable fishing opportunities and to enhance, recover and sustain the natural spawning population. Because the population has a unique summer run life history, it must meet the viability criteria in order for the Upper Salmon River Major Population Group (MPG) to be considered viable.

Managers have identified a strategy for Pahsimeroi summer Chinook that emphasizes the protection and enhancement of natural spawning populations as well as maintaining the current hatchery mitigation program. The program produces approximately 1.0 million yearling summer Chinook salmon smolts each year for release into the Pahsimeroi River including 65,000 smolts from an integrated component and 935,000 smolts from the segregated component. By integrating the hatchery broodstock, managers are attempting to let the natural environment drive selection in the hatchery population and therefore reduce risks associated with hatchery-origin fish spawning naturally. This strategy is expected to provide demographic and genetic benefits by: 1) increasing the abundance of fish spawning naturally, 2) increasing the extent of available spawning habitat that is utilized, and 3) providing a genetic repository for natural fish in the hatchery environment. This strategy will be particularly advantageous during years of very low natural-origin abundance.

Broodstock for the harvest component of the program are developed using hatchery-origin adults from the segregated component of the program. Broodstock for both components of the program are collected at the lower Pahsimeroi River Hatchery weir. The number of natural-origin adults used each year for broodstock and the number of integrated hatchery-origin fish allowed to spawn naturally above the weir is based on a sliding scale.

Key performance standards for the program are tracked in a targeted monitoring and evaluation program. These standards include: (1) abundance and composition of natural spawners and hatchery broodstock (pHOS, pNOB, and PNI); (2) number of smolts released; (3) in-hatchery and post-release survival rates; (4) total age specific adult recruitment, (5) harvest and (6) escapement of the natural and hatchery components; and (7) abundance, productivity, diversity

[1] In 1980, Idaho Power, the states of Idaho, Oregon, and Washington, and the National Marine Fisheries Service, signed a settlement agreement providing that the hatchery program together with agreed-upon fish production numbers constituted full and complete mitigation for all numerical losses of salmon and steelhead caused by the construction and operation of the project.

and spatial structure of the naturally spawning Chinook population in the Pahsimeroi River.

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 NAME OF HATCHERY OR PROGRAM

Hatchery: Pahsimeroi Fish Hatchery

Program: Pahsimeroi Summer Chinook

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

Pahsimeroi Summer Chinook Salmon are included in the Snake River Spring/Summer Chinook ESU (Upper Salmon River Chinook Major Population Group [MPG], and Pahsimeroi population) and were listed as threatened under the Endangered Species Act (ESA) on April 22, 1992. As defined by the ESA, the MPG includes eight extant populations: North Fork Salmon River, Lemhi River, Pahsimeroi River, Yankee Fork, Valley Creek, East Fork Salmon River, Lower Salmon River and the Salmon River Upper Mainstem above Redfish (Figure 1). The listing includes hatchery-origin offspring derived from natural-origin parents. The hatchery-origin Chinook salmon which are derived from hatchery x hatchery crosses, were also listed as threatened under the ESA, with an effective date of 8/29/05 (70 FR 37160; June 28, 2005).

1.3 RESPONSIBLE ORGANIZATION AND INDIVIDUALS

Lead Contact

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On-site Operations Lead

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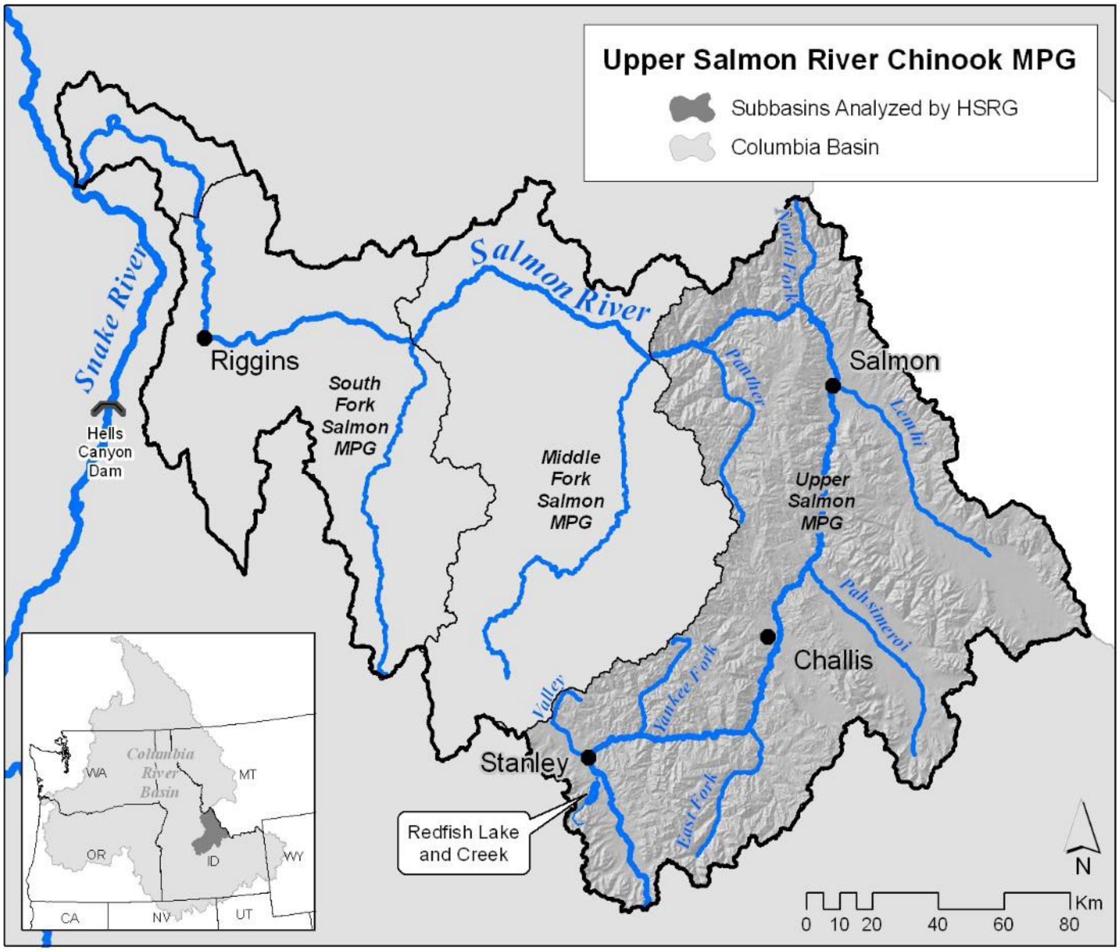

Figure 1. Upper Salmon River Chinook MGP (HSRG 2009).

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

Idaho Power Company: Facility owner and sole funding source for operation and maintenance of the Pahsimeroi Fish Hatchery. Contact information is:

Name (and title): Paul E. Abbott, Hatchery Biologist
Agency or Tribe: Idaho Power Company
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Hells Canyon Settlement Agreement Parties: Signatories to the FERC-approved agreement defining mitigation requirements for Idaho Power Company associated with construction and continuing operation of the Hells Canyon Complex. Parties include the Idaho Power Company (IPC), the National Marine Fisheries Service (NMFS), the Idaho Department of Fish and Game

(IDFG), the Oregon Department of Fish and Wildlife (ODFW), the Washington Department of Fisheries (WDF), and the Washington Department of Game (WDG) (now collectively the Washington Department of Fish and Wildlife (WDFW)).

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

The Pahsimeroi Fish Hatchery is funded by Idaho Power Company. Staffing levels include 3 FTE employees plus 37 months of seasonal labor. The annual hatchery program operational budget is $542,767 (FY16).

1.5 LOCATION(S) OF HATCHERY AND ASSOCIATED FACILITIES.

The Pahsimeroi Fish Hatchery is comprised of two separate facilities – the lower Pahsimeroi Fish Hatchery and the upper Pahsimeroi Fish Hatchery. The lower Pahsimeroi Fish Hatchery is located on the Pahsimeroi River approximately 1.6 kilometers above its confluence with the main Salmon River near Ellis, Idaho. The upper Pahsimeroi Fish Hatchery is located approximately 11.3 kilometers further upstream from the lower facility on the Pahsimeroi River. The river kilometer code for both facilities is 522.303.489.002. The hydrologic unit code for both facilities is 17060202.

1.6 TYPE OF PROGRAM.

The Pahsimeroi summer Chinook salmon hatchery is operated as a Segregated Harvest program. However, a component of the hatchery program includes an integrated conservation program intended to supplement natural spawning above the hatchery weir. The Pahsimeroi Fish Hatchery was constructed in 1968 by the IPC as part of its hatchery mitigation program to mitigate for losses of anadromous fish associated with the construction and operation of the Hells Canyon Complex. The facility originally served as a trapping and spawning facility for summer steelhead and an acclimation facility for steelhead smolts reared at IPC's Niagara Springs Fish Hatchery. However, following implementation of the Hells Canyon Settlement Agreement in 1980, the role of Pahsimeroi Fish Hatchery was expanded to include the production of one million summer Chinook salmon smolts annually.

1.7 PURPOSE (GOAL) OF THE PROGRAM

The purpose of the Pahsimeroi Summer Chinook hatchery program is to mitigate for anadromous fish losses caused by the construction and operation of Hells Canyon Complex. The Hells Canyon Settlement Agreement calls for the program to trap sufficient numbers of adult summer Chinook to permit the production of one million smolts annually. Managers expect this smolt production to produce approximately 8,000 adult summer Chinook returns to stream reaches above Lower Granite Dam after a harvest of 32,000.

1.8 JUSTIFICATION FOR THE PROGRAM

The Pahsimeroi Summer Chinook mitigation program began in 1981 to provide mitigation for lost salmon production caused by the construction and operation of the Hells Canyon Complex. In 2008, we identified a strategy for Pahsimeroi Summer Chinook hatchery program that emphasizes the protection and enhancement of the natural spawning population as well as maintaining the current hatchery mitigation program. Under this program, fish culture is performed at both the upper and lower Pahsimeroi Fish Hatchery. All hatchery operations and a portion of monitoring activities are funded by the Idaho Power Company (IPC). Where appropriate, other sources of funding for monitoring activities are identified.

The program releases approximately 1.0 million yearling summer Chinook salmon smolts each year in the Pahsimeroi River. Of the 1.0 million fish released, 65,000 juveniles are from an integrated conservation component and the remaining 935,000 are produced from the segregated harvest component of the broodstock.

Broodstock for the harvest component of the program is developed using adults from the segregated harvest component. Broodstock for the integrated component is composed exclusively of natural origin adults in most years. For years when the natural return is less than 135, integrated hatchery adults are included in the integrated broodstock. The specific number of natural-origin adults used each year for broodstock and the number of integrated hatchery-origin adults released above the weir to spawn naturally is based on a sliding scale (see Section 1.11.1).

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 NPPC "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 utilization 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 Northwest Power and Conservation Council, 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 (ISRP and ISAB 2005). 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 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 for specific to supplementation projects. The framework utilizes 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 and supplementation hatchery production and ESA listed stock status/recovery.

The NPCC (2006) has 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 later 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 and testable assumptions as 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 resident 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.
3. HATCHERY EFFECTIVENESS MONITORING FOR REGIONAL AUGMENTATION AND SUPPLEMENTATION PROGRAMS	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.
	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.

Category	Standards	Indicators
	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.
	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.

Category	Standards	Indicators
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

IPC's mitigation goal for summer Chinook salmon is to rear one million smolts for release into the Pahsimeroi River. In order to meet this smolt production target, approximately 300 males and 300 females are spawned. To account for prespawning mortality, approximately 352 pairs of adults are trapped and held for spawning. While the majority of the hatchery production at Pahsimeroi Fish Hatchery (935,000 smolts) is a segregated broodstock that supports harvest mitigation, we also prioritized developing and maintaining an integrated broodstock (65,000 smolts).

If hatcheryadults (segregated origin) return in excess of broodstock needs and fisheries are closed then up to 227 pairs of adults may be spawned to provide up to 800,000 eyed eggs for the Panther Creek hatchery program (See Panther Creek HGMP). We anticipate Panther Creek facilities and hatchery returns will be sufficient at some point in the future to eliminate this egg transfer.

Implementing the development of an integrated broodstock
In 2010 we initiated an integrated broodstock program to support supplementing the natural population upstream of the Pahsimeroi weir as recommended by the HSRG in 2008. A release goal of 65,000 yearling smolts derived primarily from Natural Origin Returns (NORs) was developed to achieve this conservation objective. The proportion of NORs in the broodstock (pNOB) and the number of hatchery fish released upstream (pHOS) will vary depending on the number of natural origin returns (Table 2). If the natural origin return in a given year is forecasted be less than 50 individuals, managers will reinitiate consultation with NOAA Fisheries.

Maintaining the integrated broodstock 2013 and beyond
The Idaho Supplementation Studies research project completed data collection in 2013. Beginning with brood year 2014, full implementation of the sliding scale was initiated. The sliding scale allows the proportion of NORs in the broodstock (pNOB) and the proportion of naturally spawning adults that is composed of HORs (pHOS) to slide with variable NOR escapement. As the numbers of NORs increase, pNOB increases and pHOS decreases resulting in a higher PNI (pNOB/(pNOB + pHOS)).

The sliding scale is intended to maintain the existing hatchery mitigation program while reducing risk to the natural population. When NOR escapements are at very low levels, guidelines are relaxed to allow a larger hatchery influence in both the hatchery and natural environments. The Pahsimeroi River upstream of the weir is managed for a minimum escapement of 300 adults. If the return of natural and integrated adults is insufficient to meet minimum escapement, segregated adults may be released upstream to spawn naturally to meet the minimum escapement objective.

Table 2. Sliding scale broodstock and weir management for the integrated broodstock program in the Pahsimeroi River. NORs= Natural origin returns.

Escapement of NORs to Pahsimeroi Weir	Number of NORs Released above PFH Weir	Number of NORs Retained For Broodstock	Maximum Percent of NORs Retained for Broodstock	Minimum Percent of Integrated Broodstock made of NORs	Maximum Percent of Fish Released Upstream that are Hatchery Origin
50-124	35-87	15-37	30%	35%	NA
125-249	88-208	38-41	30%	90%	70%
250-499	209-458	41	30%	100%	30%
500-999	459-958	41	20%	100%	25%
>1000	>958	41	20%	100%	25%

1.11.2 Proposed annual fish release levels by life stage and location.

Proposed annual fish release levels (maximum numbers) by life stage and location are summarized in Table 3.

Table 3. Proposed releases of Pahsimeroi Summer Chinook.

Life Stage	Release Location	Release Type	Annual Release Level
Yearling	Pahsimeroi River-Segregated Harvest	Volitional	935,000 smolts
Yearling	Pahsimeroi River-Integrated Conservation	Volitional	65,000 smolts

1.12 CURRENT PROGRAM PERFORMANCE, INCLUDING ESTIMATED SMOLT-TO-ADULT SURVIVAL RATES, ADULT PRODUCTION LEVELS, AND ESCAPEMENT LEVELS

Performance data for the Pahsimeroi Fish Hatchery are presented in Tables 4 and 5 below. Adult return information prior to return year 1996 includes an unknown proportion of naturally produced fish because the IDFG mass marking program did not begin until brood year 1991. Adult return information after 1995 includes only marked hatchery-origin fish. After 1995, all unmarked adults are assumed to be natural origin.

Table 4. Pahsimeroi Fish Hatchery Chinook Salmon smolt to adult survival (SAS) rates and smolt to adult return (SAR) rates to Lower Granite Dam for segregated production fish released into the Pahsimeroi River for brood years 1991-2007.

Brood Year	Release Year	Number Released	Return Years	Age at Return 1-ocean	2-ocean	3-ocean	Total Adult Production	SAS	Returns to Lower Granite Dam	SAR to Lower Graite Dam
1991	1993	291,047	94, 95, 96	6	51	0	57	0.02%	57	0.02%
1992	1994	83,958	95, 96, 97	2	29	9	40	0.05%	40	0.05%
1993	1995	No Release	96, 97, 98	--	--	--	--	--	--	--
1994	1996	No Release	97, 98, 99	--	--	--	--	--	--	--
1995	1997	122,017	98, 99, 00	19	197	13	229	0.19%	229	0.19%
1996	1998	65,648	99, 00, 01	88	189	3	280	0.43%	280	0.43%
1997	1999	No Release	00, 01, 02	--	--	--	--	--	--	--
1998	2000	No Release	01, 02, 03	--	--	--	--	--	--	--
1999	2001	197,124	02, 03, 04	161	1,145	42	1,348	0.68%	1,317	0.67%
2000	2002	419,869	03, 04, 05	913	2,957	84	3,954	0.94%	3,425	0.82%
2001	2003	909,926	04, 05, 06	428	2,032	382	2,842	0.31%	2,209	0.24%
2002	2004	984,509	05, 06, 07	58	446	208	712	0.07%	527	0.05%
2003	2005	975,252	06, 07, 08	63	388	153	604	0.06%	486	0.05%
2004	2006	1,073,951	07, 08, 09	165	831	333	1,329	0.12%	1,309	0.12%
2005	2007	978,463	08, 09, 10	1566	7,217	519	9,302	0.95%	8,269	0.85%
2006	2008	1,037,772	09, 10, 11	3,518	9,720	1,403	14,641	1.41%	12,073	1.16%
2007	2009	870,842	10, 11, 12	1,107	4,505	247	5,859	0.67%	4,216	0.48%
				Geometric Mean (99-07)				0.36%		
				Geometric Mean (91-02)				0.18%		

Source: IDFG unpublished data.

Table 5. Pahsimeroi Fish Hatchery Chinook salmon smolt to adult survival (SAS) rates and smolt to adult return (SAR) rates to Lower Granite Dam for integrated supplementation fish released into the Pahsimeroi River for brood years 1991-2002.

Brood Year	Release Year	Number Released	Return Years	Age at Return 1-ocean	2-ocean	3-ocean	Total Adult Production	SAS	Total Adult Returns to Lower Granite	SAR to Lower Graite Dam
1991	1993	83,953	94, 95, 96	1	12	0	13	0.02%	13	0.02%
1992	1994	46,552	95, 96, 97	0	5	0	5	0.01%	5	0.01%
1993	1995	147,429	96, 97, 98	5	61	34	100	0.07%	100	0.07%
1994	1996	No Release	97, 98, 99	--	--	--	--	--	--	--
1995	1997	No Release	98, 99, 00	--	--	--	--	--	--	--
1996	1998	No Release	99, 00, 01	--	--	--	--	--	--	--
1997	1999	135,669	00, 01, 02	162	806	88	1,056	0.78%	1,056	0.78%
1998	2000	53,837	01, 02, 03	42	602	206	850	1.58%	850	1.58%
1999	2001	85,939	02, 03, 04	72	94	3	169	0.20%	165	0.19%
2000	2002	89,923	03, 04, 05	115	254	7	376	0.42%	325	0.36%
2001	2003	295,992	04, 05, 06	27	131	39	197	0.07%	138	0.05%
2002	2004	124,489	05, 06, 07	4	27	16	47	0.04%	31	0.02%
				Geometric Mean (91-02)				0.11%		

Source: IDFG unpublished data.

1.13 DATE PROGRAM STARTED (YEARS IN OPERATION)

IDFG's involvement with the culture of summer Chinook salmon at Pahsimeroi Fish Hatchery dates back to 1969, with eggs collected at Pahsimeroi Fish Hatchery, shipped to IDFG's Mackay

Fish Hatchery for rearing, and then returned to Pahsimeroi Fish Hatchery for acclimation and release as sub-yearling or yearling smolts. These efforts to rear summer Chinook salmon prior to 1981 were considered experimental and not part of the FERC-mandated mitigation for the Hells Canyon Complex. Following implementation of the Hells Canyon Settlement Agreement (HCSA) in 1980, the role of Pahsimeroi Fish Hatchery was formally expanded to include the production of one million summer Chinook salmon smolts annually. The summer Chinook salmon program formally began in 1981 using eggs obtained from indigenous Pahsimeroi Summer Chinook combined with eggs received from Rapid River (Rapid River Hatchery) and Lemhi River (Hayden Creek Hatchery) spring Chinook salmon.

1.14 EXPECTED DURATION OF PROGRAM

This summer Chinook salmon program is expected to continue indefinitely to mitigate for losses of anadromous fish associated with the construction and operation of the Hells Canyon Complex.

1.15 WATERSHEDS TARGETED BY PROGRAM

Listed by hydrologic unit code – Pahsimeroi River: 17060202

1.16 INDICATE ALTERNATIVE ACTIONS CONSIDERED FOR ATTAINING PROGRAM GOALS

An alternative considered by managers is to operate Pahsimeroi Fish Hatchery as a segregated harvest program that focuses strictly on meeting harvest mitigation objectives. However, mangers are committed to using the hatchery as a conservation tool to assist in the recovery of the Pahsimeroi River natural population. Protocols are in place to monitor abundance and productivity of the hatchery and natural populations in response to the integrated supplementation efforts described in this HGMP. If these supplementation efforts do not convey a measurable benefit to the natural population, managers will reevaluate options to achieve conservation and mitigation objectives in the Pahsimeroi River.

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

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

- Section 10 Permit Number 922 authorized direct take of listed Snake River salmon associated with hatchery operations and broodstock collection at the Idaho Power Company Pahsimeroi Hatchery operated by IDFG. Expired 12/31/98;

- ESA take for non-tribal fisheries targeting adipose fin-clipped Chinook salmon in Idaho are permitted under an ESA 4(d) Limit approved in October 2011. Annual Fishery

Management Evaluation Plans are submitted as part of this permit. A condition of the Section 4(d) Limit is a review every five years of fishery performance and compliance with the limit.

- Research and monitoring activities conducted by IDFG are currently permitted under to the Endangered Species Act (ESA) 4(d) rule's research limit (50 CFR§ 223.203(b)(7)). These activities are reviewed and renewed annually.

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 in a report prepared by the Interior Columbia Technical Recovery Team (ICTRT) (ICTRT 2005). This section is summarized from that publication.

The Pahsimeroi Summer Chinook population is part of the Snake River Spring/Summer Chinook ESU which has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde / Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook. The Pahsimeroi Summer Chinook population is a summer run and is one of eight extant populations in the Upper Salmon River MPG.

The ICTRT identifies this population as “Large” based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable. Historically, it is estimated that from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004).

Adult Pahsimeroi Summer Chinook returning to the subbasin consist of both hatchery- and natural-origin fish, as there is a segregated hatchery program present at the Pahsimeroi Fish Hatchery. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened under the ESA. Spawning occurs from mid-August through late October in the lower portion of the river. Upstream habitat is fragmented or partially blocked.

The ICTRT has identified five major spawning areas (MaSA) and no minor spawning areas (MiSA) within reaches used by Pahsimeroi Summer Chinook (Figure 2). There are no modeled temperature limitations within this MaSA. Current core spawning areas are from Burstedt Lane Bridge to Dowton Lane Bridge.

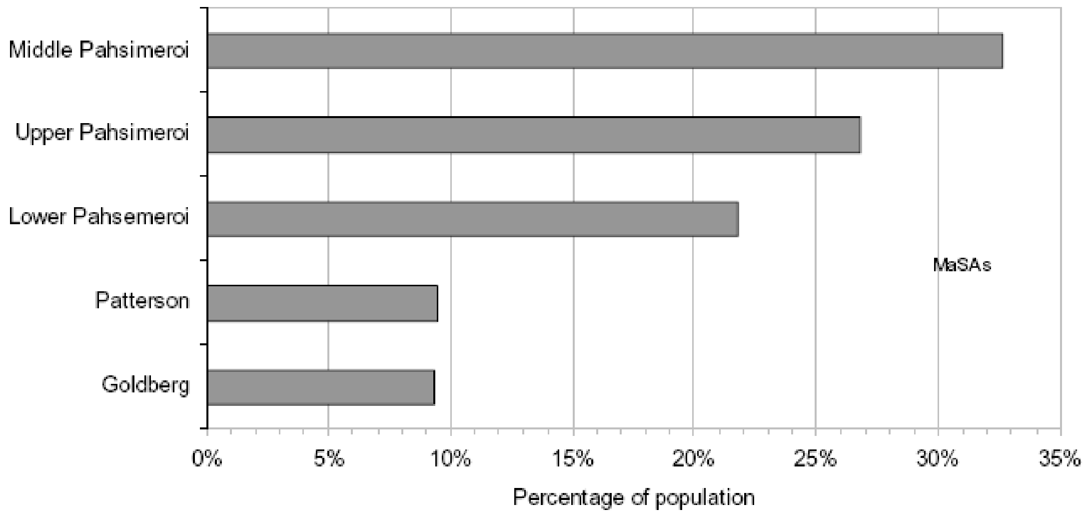

Figure 2. **Proportions of the five MaSAs that comprise the Pahsimeroi Summer Chinook population.**

Recent year natural spawners include returns originating from naturally spawning parents, and adults returning from supplementation program releases. Hatchery fish from the mitigation hatchery program now are removed from the run at the hatchery weir approximately one-half mile upstream of the river's mouth. Mark-recapture efforts indicate the weir is at least 98% effective and segregated hatchery fish are precluded from reaching the spawning area. Adult releases above the weir, prior to implementing a 100 percent-marked hatchery juvenile release management strategy in the early 1990s, included unmarked natural- and hatchery-origin fish. The percent of spawners upstream of the hatchery weir comprised of natural origin adults since 1986 is 70 percent, The most recent 10-year average (2005-2014) is 86 percent (Table 13).

IDFG monitors population abundance and origin of adults annually. Population abundance (defined as number of adults spawning in natural production areas) from 1986 to 2005 ranged from 27 fish to 763 fish (Figure 3) (ICTRT 2005). IDFG provided data for the 2015 ESA status review to NOAA through spawn year 2015. Data are available at the NOAA Salmonid Population Summary website at https://www.webapps.nwfsc.noaa.gov/apex/f?p=261:1:.

Adult Run Timing –Adults returning to the Pahsimeroi River are classified as summer-run and typically arrive two to three weeks later than spring-run adults. Run timing of natural-origin Chinook at the Pahsimeroi Fish Hatchery weir generally occurs between mid-June and the last week of September and resembles a bimodal distribution. The first mode occurs between mid-June and mid-August. The second, smaller mode generally occurs between mid-August and early October. Arrival dates for the 10th, 50th and 90th percentile of natural-origin returning adults from 1998-2013 are displayed in the Table 6.

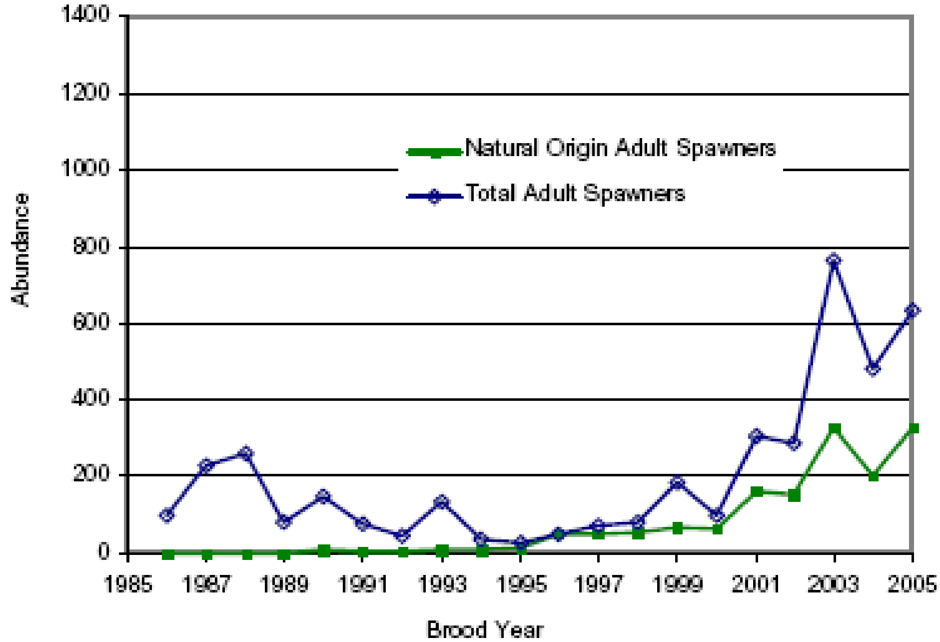

Figure 3. Pahsimeroi River spawner abundance trends 1986-2005.

Table 6. Arrival timing of natural-origin Chinook salmon at the Pahsimeroi Fish Hatchery weir.

Return Year	Natural Origin Chinook Trapped	Percent of Return		
		10%	50%	90%
1998	75	9-Jul	21-Jul	10-Sep
1999	92	10-Jul	22-Jul	1-Sep
2000	95	20-Jun	11-Jul	18-Sep
2001	246	18-Jun	8-Jul	13-Sep
2002	197	2-Jul	19-Jul	14-Sep
2003	329	1-Jul	11-Jul	14-Sep
2004	200	28-Jun	14-Jul	25-Aug
2005	328	1-Jul	15-Jul	6-Sep
2006	97	2-Jul	17-Jul	11-Sep
2007	139	25-Jun	13-Jul	10-Sep
2008	229	9-Jul	21-Jul	11-Sep
2009	324	6-Jul	16-Jul	8-Sep
2010	293	9-Jul	21-Jul	7-Sep
2011	380	19-Jul	29-Jul	1-Sep
2012	216	2-Jul	16-Jul	6-Sep
2013	376	27-Jun	22-Jul	16-Sep

Source: IDFG unpublished data

Arrival timing of hatchery-origin fish at the Pahsimeroi Fish Hatchery weir substantially overlaps with the arrival timing of natural-origin Chinook salmon. The cumulative proportion of hatchery- and natural-origin Chinook arriving at the Pahsimeroi Fish Hatchery weir from 1998-2013 is displayed in Figure 4.

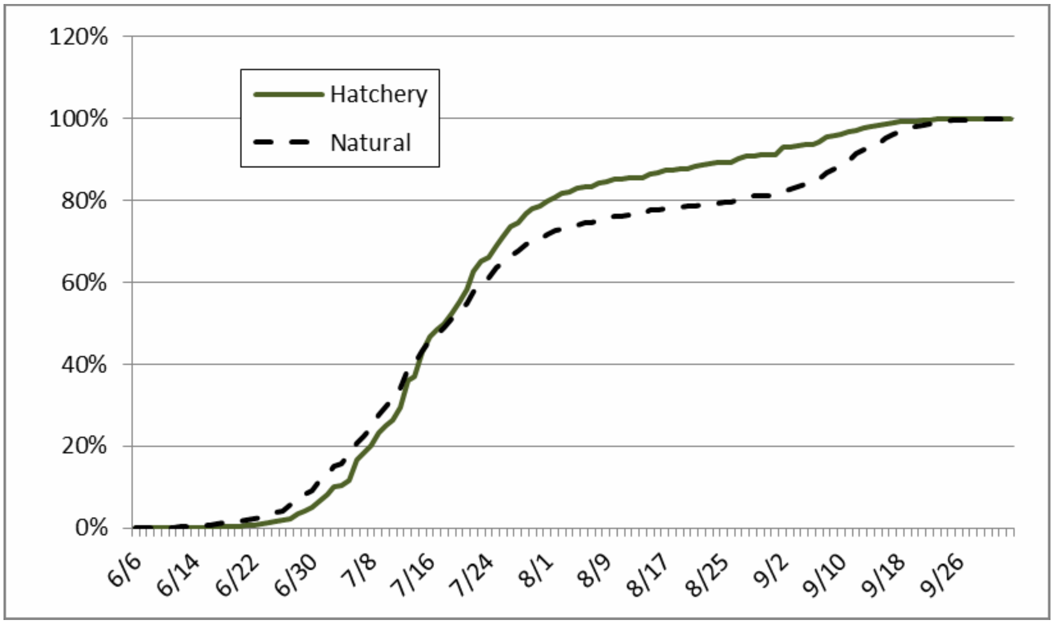

Figure 4. Average cumulative run timing of hatchery- and natural-origin Chinook at the Pahsimeroi River weir 1998 through 2013 (Source: IDFG unpublished data)

Adult Age Structure – Spring- and summer-run Chinook salmon in the Snake River ESU are comprised of four age classes (1, 2, 3, and 4 ocean) with the majority returning after two or three years in the ocean. Using dorsal fin ray aging techniques, Kiefer et al. (2002, 2004) and Copeland et al. (2004) estimated the ocean age proportions of natural-origin spring/summer run Chinook salmon passing upstream of Lower Granite Dam (Table 7). They found that, while age structure was variable from year to year, the majority of returning adults for most years were composed of two-ocean returns.

Table 7. Estimated age composition of wild/natural spring/summer Chinook Salmon passing Lower Granite Dam for return years 1998-2012.

Return Year	1-Ocean	2-Ocean	3-Ocean	4-Ocean
1998	2%	11%	83%	3%
1999	8%	74%	15%	3%
2000	17%	78%	5%	0%
2001	4%	93%	3%	0%
2002	1%	53%	44%	1%
2003	7%	19%	72%	2%
2004	6%	84%	10%	0%
2005	4%	65%	30%	1%
2006	3%	76%	21%	0%
2007	13%	43%	44%	0%
2008	14%	69%	17%	0%
2009	21%	61%	18%	0%
2010	5%	89%	7%	0%
2011	15%	55%	30%	1%
2012	5%	64%	29%	1%
Average	**8%**	**62%**	**29%**	**1%**

Source: Follow Idaho Fish Home website (https://fishandgame.idaho.gov/content/article/application-follow-idaho-salmon-home-fish)

Ages for natural-origin Chinook returning to the Pahsimeroi River are determined based on length frequency and are composed of three age classes (1, 2, and 3 ocean). While it is likely that a few four-ocean adults return to Pahsimeroi River, overlapping length frequencies of three- and four-ocean adults precludes being able to distinguish the two age classes based on length frequency alone. From 1998 through 2013, the average age structure for natural-origin Chinook salmon returning to the Pahsimeroi River was 11.0 percent one-ocean, 67.0 percent two-ocean, and 22.0 percent three-ocean (Table 8).

Table 8. Estimated age class structure of natural-origin Chinook salmon captured at the Pahsimeroi Fish Hatchery weir 1998-2013. Ocean-age is displayed as a percent of the return.

Return Year	Number of Natural Adults	1-Ocean	2-Ocean	3-Ocean
1998	75	0%	51%	49%
1999	92	13%	86%	1%
2000	95	24%	60%	16%
2001	246	4%	71%	24%
2002	197	5%	59%	37%
2003	329	12%	57%	31%
2004	200	13%	81%	7%
2005	328	6%	88%	6%
2006	97	25%	54%	22%
2007	139	8%	49%	43%
2008	229	12%	68%	20%
2009	324	10%	77%	12%
2010	293	8%	84%	8%
2011	380	7%	60%	33%
2012	216	5%	67%	28%
2013	376	29%	54%	18%
Average	**226**	**11%**	**67%**	**22%**

Source: IDFG unpublished data.

Size Range of Returning Adults- Natural-origin adults returning to the Pahsimeroi River generally range in size from 50-105 cm fork length. The majority of returning adults are in the 70-90 cm size class but this proportion varies depending on year class strength. Average length at age for male and female Chinook Salmon trapped at Pahsimeroi Fish Hatchery weir 1998-2013 is summarized in Table 9.

Table 9. Estimated average length (cm) at age for natural-origin male and female summer Chinook Salmon captured at Pahsimeroi R. weir for return years 1998-2013.

	Females		Males		
Return Year	Age 4	Age 5	Age 3	Age 4	Age 5
1998	83.2	92.8		78.9	96.5
1999	78.4		52.3	80.6	95.0
2000	77.9	82.4	57.5	75.4	90.4
2001	79.6	84.5	57.1	77.2	87.9
2002	78.5	89.1	58.2	76.0	96.3
2003	78.6	93.5	56.5	79.6	94.9
2004	76.0	87.5	55.0	75.5	100.2
2005	76.6	90.1	50.2	79.4	95.3
2006	74.8	87.9	61.5	81.7	95.7
2007	75.2	87.9	54.9	75.6	93.3
2008	79.0	90.0	56.0	74.0	94.0
2009	79.1	87.7	59.0	79.9	94.7
2010	78.5	90.5	60.4	78.6	97.5
2011	71.5	81.5	53.0	75.6	94.5
2012	77.9	90.6	48.4	71.1	97.4
2013	75.7	88.2	51.4	72.3	85.3
Average	**77.5**	**88.3**	**55.4**	**77.0**	**94.3**

Source: IDFG unpublished data

Adult Sex Ratio – Sex ratio of natural-origin adults returning to Pahsimeroi River varies from year to year but generally is near 50:50. From 1998-2013, natural-origin males averaged 57 percent of the return including one-ocean jacks and 51 percent of the return excluding one-ocean jacks (Table 10).

Table 10. Percent of natural-origin Chinook salmon returns to Pahsimeroi Fish Hatchery that was composed of males (including and excluding jacks).

Year	Percent of natural-origin return	
	Jacks Included	Jacks Excluded
1998	49%	49%
1999	55%	49%
2000	64%	53%
2001	52%	50%
2002	56%	54%
2003	48%	41%
2004	50%	43%
2005	49%	46%
2006	52%	36%
2007	58%	54%
2008	62%	57%
2009	55%	50%
2010	61%	58%
2011	57%	54%
2012	59%	57%
2013	77%	67%
Average	**57%**	**51%**

Source: IDFG unpublished data

Juvenile Life History and Migration Timing – Naturally produced juvenile Chinook salmon in the Pahsimeroi River emerge from their redds during the late winter and early spring months. In addition to juveniles migrating to the ocean as yearling smolts, some Pahsimeroi River juvenile Chinook salmon exhibit a life history strategy of migrating as subyearling smolts. A consistent pattern of sub-yearling migrants has been documented through the use of Passive Integrated Transponder (PIT) tags. PIT-tag detection data has shown that a significant proportion of juveniles tagged as sub-yearlings during the first spring following emergence (May-June) are detected at Snake and Columbia River dam detection facilities the same year (Lutch et al. 2003). This is likely due to the higher productivity and the increased growth rate of juveniles in the Pahsimeroi River.

Emigration timing of natural-origin Chinook salmon from the Pahsimeroi River that originated from spawners in 2002 is displayed in Figure 5 and is typical of other brood years. The first pulse (sub-yearling parr) generally occurs from May through June, the second pulse (sub-yearling pre-smolt) occurs from October through November and the final pulse (yearling smolt) occurs from March through April of the following year. The trap is typically operated from the first of March through late-November, so fish emigrating between December and February are not accounted for.

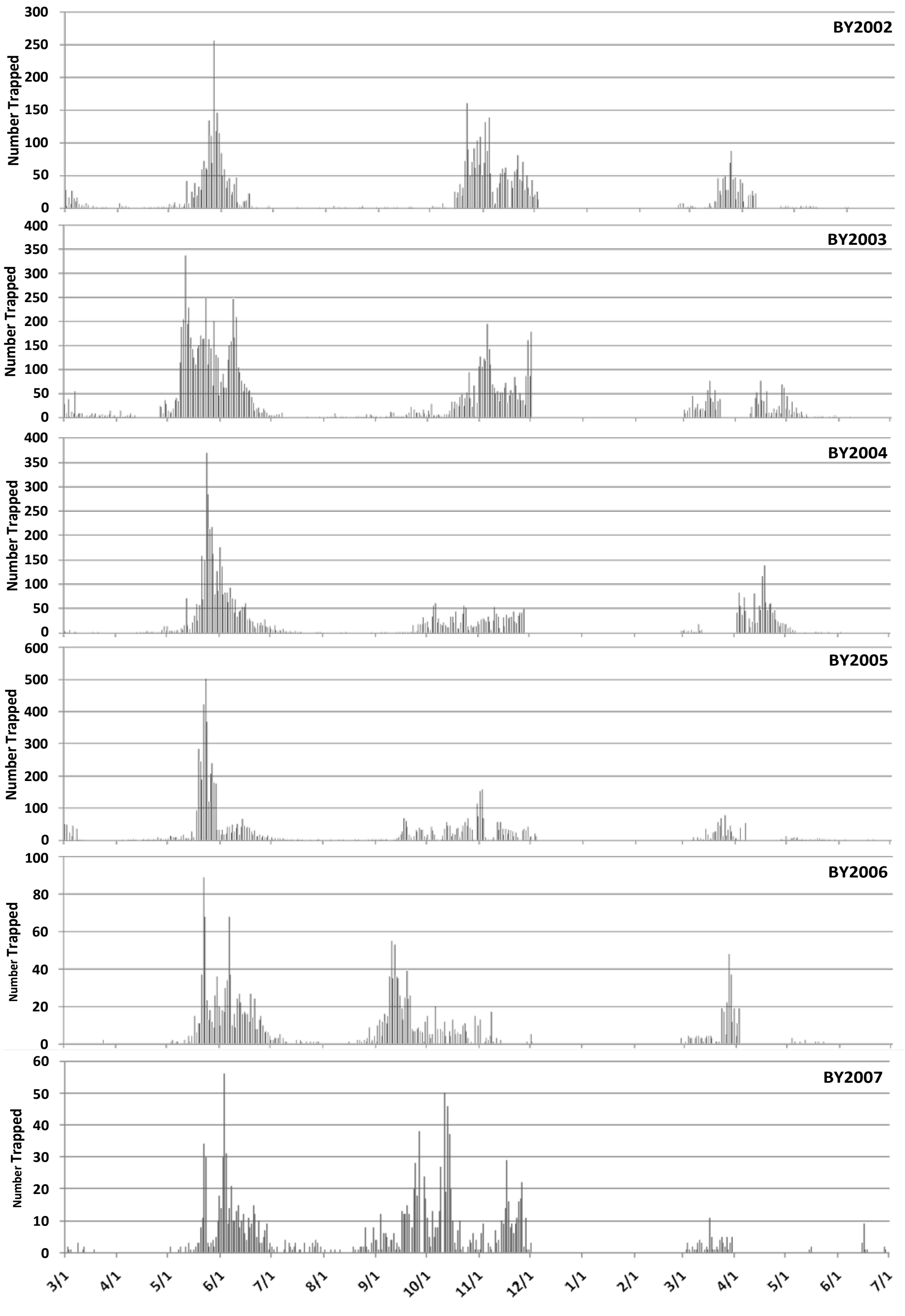

Figure 5. Emigration timing of Brood Year 2002-2007 natural-origin Chinook salmon captured with a screw trap near the Pahsimeroi Fish Hatchery

weir (IDFG, unpublished data).

The seaward migration timing of natural-origin Chinook salmon from the Pahsimeroi River is variable depending on the life stage at which the juveniles leave the Pahsimeroi River. Juveniles that migrate as sub-yearling smolts arrive at Lower Granite Dam typically between early June and mid-July (Table 11). Juveniles that emigrate from the Pahsimeroi as sub-yearling pre-smolts and yearling smolts typically arrive at Lower Granite Dam from early to late April.

Table 11. Number (N) of PIT-tagged natural-origin juvenile Chinook salmon detected at Lower Granite Dam and the dates at which the first and last fish were detected and the dates at which 10%, 50%, and 90% were detected.

BY	Stage	N	1st Det.	10%	50%	90%	Last Det.
2007	S	120	4/5/2009	4/20/2009	4/26/2009	5/3/2009	5/19/2009
	Y	17	4/13/2009	4/19/2009	4/23/2009	5/5/2009	5/8/2009
	Z	46	5/14/2008	6/10/2008	6/29/2008	7/5/2008	7/12/2008
2006	S	101	4/19/2008	4/26/2008	5/5/2008	5/11/2008	5/22/2008
	Y	63	4/21/2008	4/23/2008	5/2/2008	5/9/2008	5/19/2008
	Z	21	5/8/2007	6/29/2007	5/9/2007	5/14/2007	6/18/2007
2005	S	162	4/3/2007	4/15/2007	4/20/2007	5/3/2007	5/16/2007
	Y	91	4/5/2007	4/14/2007	4/20/2007	5/3/2007	5/7/2007
	Z	253	5/25/2006	6/2/2006	6/14/2006	6/23/2006	7/10/2006
2004	S	144	4/7/2006	4/16/2006	4/26/2006	5/7/2006	5/19/2006
	Y	354	4/14/2006	4/22/2006	4/30/2006	5/8/2006	7/1/2006
	Z	250	5/24/2005	6/1/2005	6/9/2005	6/19/2005	7/5/2005
2003	S	365	4/8/2005	4/21/2005	4/28/2005	5/6/2005	5/21/2005
	Y	489	4/7/2005	4/25/2005	5/5/2005	5/16/2005	6/18/2005
	Z	505	5/29/2004	6/11/2004	6/22/2004	7/4/2004	7/19/2004
2002	S	269	4/1/2004	4/14/2004	4/25/2004	5/5/2004	5/14/2004
	Y	345	4/6/2004	4/15/2004	5/25/2004	6/17/2004	7/14/2004
	Z	383	5/28/2003	6/4/2003	6/21/2003	7/8/2003	10/1/2003
2001	S	209	4/3/2003	4/13/2003	4/24/2003	5/6/2003	5/30/2003
	Y	298	3/28/2003	4/18/2003	4/27/2003	5/18/2003	7/6/2003
	Z	284	5/30/2002	6/13/2002	6/26/2002	7/7/2002	8/24/2002
2000	S	19	4/16/2002	4/18/2002	4/27/2002	5/8/2002	5/13/2002
	Y	25	4/13/2002	4/16/2002	4/25/2002	6/18/2002	7/1/2002
	Z	66	6/7/2001	6/14/2001	7/4/2001	7/15/2001	8/25/2001
1999	S	342	4/17/2001	4/29/2001	5/5/2001	5/12/2001	5/27/2001
	Y	62	4/23/2001	4/27/2001	5/2/2001	5/16/2001	6/19/2001
	Z	225	5/30/2000	6/19/2000	7/2/2000	7/17/2000	8/19/2000

Note: Y= fish tagged as yearlings, S= fish tagged as sub-yearlings, Z= fish tagged as sub-yearling migrant smolts.
Source: IDFG unpublished data.

Hatchery Juvenile Releases – Hatchery-origin yearling smolts are volitionally released from two holding ponds at the upper Pahsimeroi Fish Hatchery in late March to mid-April and releases coincide with the migration timing of their natural-origin counterparts. Table 12 shows the release dates of hatchery-origin Chinook released from the Pahsimeroi Fish Hatchery from 1995-2014.

Table 12. Volitional release date for yearling Chinook salmon smolts released from the Pahsimeroi Fish Hatchery.

Year Released	Life Stage Released	Release Date
1995	Yearling Smolt	4/11-4/14
1996	No Release	No Release
1997	Yearling Smolt	4/8- 4/21
1998	Yearling Smolt	4/15-5/4
1999	Yearling Smolt	4/14-4/19
2000	Yearling Smolt	4/12-4/17
2001	Yearling Smolt	4/15-4/21
2002	Yearling Smolt	4/15-4/22
2003	Yearling Smolt	3/29-4/7
2004	Yearling Smolt	4/11-4/21
2005	Yearling Smolt	3/22-3/25
2006	Yearling Smolt	3/13-3/30
2007	Yearling Smolt	3/9-3/25
2008	Yearling Smolt	3/31-4/18
2009	Yearling Smolt	3/30-4/10
2010	Yearling Smolt	3/30-4/9
2011	Yearling Smolt	4/1-4/22
2012	Yearling Smolt	4/1-4/18
2013	Yearling Smolt	4/5-4/17
2014	Yearling Smolt	4/9-4/23

Source: Pahsimeroi Fish Hatchery Brood Year reports and IDFG unpublished data.

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

The listed population directly affected by the Pahsimeroi Fish Hatchery program is the Pahsimeroi (SRPAH) Chinook salmon population.

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

All juvenile Chinook salmon releases from the Pahsimeroi Fish Hatchery occur within the SRPAH population area. However, listed populations that could be incidentally affected by Pahsimeroi Fish Hatchery adult strays include the remaining seven Chinook salmon populations within the Upper Salmon River MPG. To a lesser extent, Chinook salmon MPGs downstream of the Upper Salmon River MPG potentially could be affected by the Pahsimeroi Fish Hatchery program.

Other ESA listed populations include the Snake River sockeye salmon ESU (listed as Endangered in 1991), Snake River Basin steelhead ESU (listed at threatened in 1997) and bull trout (listed as threatened in 1998).

Assessment of the level of risk that the hatchery program has on the natural population (criteria based on Appendix C of the NOAA fisheries Supplemental Comprehensive Analysis (SCA)).

Abundance: The program currently releases 6.5% of the total smolts as an integrated broodstock to supplement the natural population above the weir to increase the abundance of fish spawning naturally. This will be particularly advantageous in years of very low natural-origin abundance. A sliding scale was developed to reduce the risk associated with reducing the number of natural-origin fish spawning in the wild.

Incidental mortality associated with the operation of the adult trapping facility is not considered a risk by managers. Between 1997 and 2008 only 6 natural-origin adult Chinook salmon were killed as a direct result of trapping and handling operations.

Productivity: The Pahsimeroi Fish Hatchery weir is approximately 0.5 miles upstream from the mouth of the Pahsimeroi River. There is limited spawning habitat below the weir; almost all spawning occurs above the weir. This allows managers to control the composition of spawners in the Pahsimeroi River population. Productivity is monitored through age composition of adult returns combined with adult abundance.

Spatial Structure: The hatchery program is not expected to pose risk to the spatial structure of the Pahsimeroi population. Annual spawning ground surveys consistently reveal that spawners are utilizing the extent of the habitat that is available and expanding into newly connected habitat. During years of very low natural-origin abundance, the integrated hatchery program will provide an opportunity to maintain or increase the extent of available habitat that is used.

Diversity: Since the inception of the hatchery program (1969), broodstock for the Pahsimeroi program has been composed of summer run adults collected in the Pahsimeroi River. However, from 1981 through 1984, spring run Chinook juveniles from Rapid River Fish Hatchery and Hayden Creek (in the Lemhi River) were also released into the Pahsimeroi River. Attempts were made to keep the broodstock separate when they returned as adults, based on return timing, but it is likely that there was some infusion of Rapid River and Lemhi River fish into the Pahsimeroi stock during that period.

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 Pahsimeroi Summer Chinook as a "large" population based on historical habitat potential (ICTRT 2005). A Chinook population classified as large has a mean minimum abundance threshold criteria of 1,000 naturally produced spawners with a sufficient intrinsic productivity to achieve a 5 percent or less risk of extinction over a 100-year timeframe.

IDFG provides annual updates to NOAA Fisheries to document abundance and productivity of the wild Chinook Salmon in the Pahsimeroi population. Data are available from the NOAA Salmonid Population Summary Website and the Current (1990-2014) abundance (number of adults spawning in natural production areas) has ranged from 29 in 1995 to 822 in 2003 (Table

13). Annual abundance estimates for the Pahsimeroi River are based on weir counts. The most recent 10-year geometric mean abundance (2005-2014) is 381(Table 13).

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.

Table 13. Abundance and productivity metrics for the Pahsimeroi summer Chinook Salmon population (1990-2014).

Spawn Year	Total Adult Spawners (H+N) Including Jacks	Natural Spawners Including Jacks	Percent of Spawners that are Hatchery Origin (pHOS)	Recruits per Spawner
1990	134	6	95%	0.05
1991	68	5	92%	0.41
1992	46	46	0%	1.39
1993	123	123	0%	0.67
1994	39	30	23%	4.71
1995	29	16	45%	4.14
1996	53	53	0%	1.52
1997	54	54	0%	6.41
1998	87	56	36%	1.69
1999	190	72	62%	2.11
2000	106	68	36%	3.09
2001	329	175	47%	0.77
2002	322	169	48%	0.55
2003	822	354	57%	0.16
2004	517	215	58%	0.49
2005	681	353	48%	0.65
2006	186	104	44%	2.23
2007	166	148	11%	2.08
2008	224	224	0%	0.88
2009	499	485	3%	
2010	330	308	7%	
2011	436	423	3%	
2012	234	234	0%	
2013	391	354	9%	
2014	667	559	16%	

Source: IDFG unpublished data

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.

Estimates of Pahsimeroi Summer Chinook productivity are presented in Table 13. The IDFG provides updates to NOAA for the 5 year ESA status reviews. Data are available at the NOAA Salmonid Population Summary website at https://www.webapps.nwfsc.noaa.gov/apex/f?p=261:1:.

Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data. (***Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).***

Table 13 includes the number of natural- and hatchery-origin adults released upstream of the Pahsimeroi Fish Hatchery weir. Because not all hatchery fish were marked prior to brood year 1991, an unknown proportion of unmarked returning adults before 1996 were of hatchery-origin. Beginning in 1996, all unmarked fish were assumed to be natural-origin. IDFG provides data for the 5 year ESA status reviews to NOAA. Data are available at the NOAA Salmonid Population Summary website at https://www.webapps.nwfsc.noaa.gov/apex/f?p=261:1:.

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.

Estimated take by activity for hatchery operations and programmatic maintenance are provided in Appendix A; Tables A1, A2.

Hatchery Activities - ESA-listed, summer Chinook salmon are trapped during broodstock collections periods at the Pahsimeroi River trap. The trap operations goal is to trap 100% of the natural-origin and hatchery-origin adults returning to the Pahsimeroi River.

Programmatic Maintenance

The Pahsimeroi River flows through a valley which is heavily influenced by livestock and agricultural activity. The river transports and deposits a great deal of sediment which can hamper normal hatchery operation. As such, in-river maintenance of the hatchery diversion dams and intake structures, intake canals, adult fish weir and fish ladder is a common requirement. A description of each maintenance task follows.

Hatchery diversion dam and water source intake*:* The various wooden, steel and concrete structures which constitute the diversion dam and water source intake at both the upper and lower Pahsimeroi Hatchery sites may become compromised simply from age and exposure to changing weather conditions. Hatchery personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs such as stoplog replacement may be completed in place by workers using hand tools, while more extensive repairs may require portions of these structures to be temporarily removed for repair or replacement. Should removal of these structures be necessary, a crane or similar lifting device operated from the stream bank would be employed. Heavy equipment will not enter the stream channel. In some instances it may be necessary to construct a small cofferdam to isolate the work area from the river to facilitate repair work. Cofferdams would be constructed from sheet piling or ecology blocks lined with heavy mil plastic sheeting, thereby reducing the potential for sediment to escape and be transported downstream.

Throughout the year, gravel, sediment and small woody debris is deposited in the vicinity of the hatchery diversion dams and water supply intake structures at both the upper and lower Pahsimeroi Hatchery sites. The accumulation of sediment and debris has the potential to restrict the volume of water that can be diverted to the hatchery. Materials must be removed annually to ensure an uninterrupted supply of water for fish culture operation. The diversion dams and water source intake structures may become damaged by the seasonal movement and deposition of sediment and large woody debris. These structures may need to be temporarily removed for repair or replacement.

Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clam shell type excavation bucket mounted to a crane, to a tracked or rubber tired excavator. In all cases, excavation equipment will not enter the stream channel. Access within the wetted perimeter of the stream will be limited to workers using hand tools or guiding the operation of the heavy equipment. In some instances it may be desirable to construct small cofferdams using ecology blocks lined with heavy mil plastic sheeting to isolate the work area from the river channel thereby reducing the potential for sediment to escape and be transported downstream.

The diversion dams and water source intakes are located within the migration and spawning habitat of ESA listed summer Chinook salmon and steelhead. A small number of listed bull trout have also been observed migrating through this section of the Pahsimeroi River. Direct effects to individual adult or juvenile summer Chinook salmon, steelhead and bull trout are a concern during all in-river maintenance activities. Effects could include disturbance and displacement of fish as a result of personnel or heavy equipment working near the river channel. A small sediment plume will likely be created as a result of substrate disturbance. This plume will persist for a short distance downstream and could affect embryonic life stages of Chinook salmon and steelhead. To minimize impacts to incubating Chinook salmon or steelhead, all work will be completed whenever possible within a work window of July 1 (post-steelhead fry emergence) to August 15 (pre-Chinook salmon spawning) previously established by NOAA Fisheries for similar construction projects within the vicinity of the Pahsimeroi Hatchery (HDR/Fishpro 2005). Should isolation of the work area with coffer dams also involve dewatering, hatchery personnel would electrofish the site to capture and relocate any listed species present within the coffered work zone. All excavated material will be removed from the river and loaded into a truck for off site disposal.

***Water source intake canals and fish bypass screens**:* Just as gravel, sediment and small woody debris is deposited in the vicinity of river water intake structures at the upper and lower hatchery sites, similar material is deposited within the canals that deliver surface water to the various fish culture containers. This accumulation of sediment and debris has the potential to restrict the flow of water diverted to the hatchery and interfere with the operation of fish bypass screens and pipes designed to protect natural-origin salmon and steelhead from entrainment into the hatchery. Materials must be removed annually to ensure an uninterrupted supply of water for fish culture operation. Removal of accumulated sediment or woody debris is accomplished using a bulldozer to move material to an excavator positioned on the canal bank. The excavator can remove material from the canals and deposit it on site or in transport vehicles for offsite disposal.

The two fish bypass screens and associated pipes located within the river water intake canals also require annual maintenance. This involves removing the screens for inspection and repair of seals, drive sprockets, chains and bearings, as well as lubrication of moving parts.

Both of the maintenance activities described here can be completed when the hatchery facility is out of operation. Therefore, to limit potential impact to listed species, slide gates can be closed and the intake canal dewatered and isolated from the river channel before any maintenance work commences. As such, Chinook salmon, steelhead or bull trout that may be present in the vicinity of the hatchery are not disturbed as a result of this action. Further, sediment generated from this activity cannot be discharged to the river where it could impact embryonic life stages. To minimize impacts to the small number of listed species that may inhabit the water source intake canals, hatchery personnel will electrofish the canal during the dewatering process to capture and safely release all fish to the Pahsimeroi River.

Should the bypass pipes which return entrained fish to the river become plugged with sediment or woody debris, they may require cleaning with high pressure water nozzles. Unlike other maintenance activities described in this section, this activity does result in some sediment and woody debris being flushed directly into the river channel. A small sediment plume will likely be created. The volume of material flushed from the pipe is expected to be less than ¼ cubic yard of material. A sediment plume will persist for a short distance downstream and could affect embryonic life stages of Chinook salmon and steelhead. By necessity, work will be completed in the spring (during steelhead egg incubation) and in the fall (during Chinook salmon egg incubation). While the actions described here have potential to affect embryonic life stages of Chinook salmon and steelhead, the frequency (once every 5-10 years), duration (1hour) and magnitude (less than ¼ cubic yard of material moved, sediment plume persisting for less that 50 yards downstream) of the action is thought to be insignificant.

***Adult fish weir**:* Following periods of high flow, sand, gravel and woody debris accumulates in front of the adult fish weir and entrance to the fish ladder and trap used for capturing adult summer Chinook salmon and steelhead returning to the hatchery. This accumulation of material restricts river flow and may encourage bank erosion, resulting in further sedimentation or damage to hatchery structures and equipment.

Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clamshell type excavation bucket mounted to a crane, to a tracked or rubber tired excavator. In all cases, excavation equipment will not enter the stream channel. Access within the wetted perimeter of the stream will be limited to workers guiding the operation of the crane or excavator. Excavated material will be loaded into a truck and hauled off site for disposal. A small, short duration, sediment plume is anticipated during the excavation process.

The adult fish trap and fish ladder is located within the migration corridor of summer Chinook salmon, steelhead and bull trout.

Aside from damages or loss of functionality related to high water events, the integrity of the adult weir may be compromised simply by age and exposure to changing weather conditions. Hatchery personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs may be completed in place by workers using hand tools, while more extensive repairs may require individual weir panels to be temporarily removed for repair or replacement. Should removal of these structures exceed the lifting capability of hatchery personnel, a crane or similar device operated from the stream bank would be employed. Heavy equipment will not enter the stream channel. In some instances it may be necessary to construct a small cofferdam to isolate the work area from the river to facilitate repair work. Cofferdams would be constructed from sheet piling or ecology blocks lined with heavy mil plastic sheeting, thereby reducing the potential for sediment to escape and be transported downstream.

Direct effects to individual adult or juvenile summer Chinook salmon, steelhead and bull trout are a concern during these maintenance activities. Effects could include disturbance and displacement of fish as a result of personnel or heavy equipment working near the river channel. To minimize potential impacts to embryonic life stages of Chinook salmon or steelhead, all work will be completed whenever possible within a work window of July 1 (post steelhead fry emergence) to August 15 (pre Chinook salmon spawning) previously established by NOAA Fisheries for similar construction projects within the vicinity of the Pahsimeroi Hatchery (HDR/Fishpro 2005). No machinery is placed in the river channel thus eliminating any risk of fuel or oil contamination. The removal of materials as described herein may occur as frequently as once each year depending upon the magnitude of spring runoff. Should isolation of the work area with coffer dams also involve dewatering, hatchery personnel would electrofish the site to capture any listed species present within the coffered work zone and release them safely to the Pahsimeroi River.

River bank stabilization: While infrequent, extreme high runoff events have the potential to erode the stream bank in the vicinity of the hatchery, causing localized flooding, damage to hatchery buildings or the interruption of water supplied to the hatchery. To respond to threats of this nature it may be necessary to place fill material or rip rap within the river channel to control bank erosion. All materials used in such efforts would be clean (washed) rock to limit the introduction of sediment to the river channel. Machinery used for rock placement would be operated from outside the wetted perimeter of the stream to avoid the possibility of fuel or oil entering the water. Direct effects to individual adult or juvenile spring Chinook salmon, steelhead and bull trout are a concern during these maintenance activities. Effects could include disturbance and displacement of fish as a result of personnel or heavy equipment working near the river channel. At certain times of year impacts to embryonic life stages resulting from stream bank stabilization activities are also a concern; however, considering that such stabilizations activities would likely be done in response to extreme high river flows and localized flooding, the turbidity generated from the action would likely be less than what is already present in the river.

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

Table 14 lists the take of listed natural-origin adult summer Chinook salmon associated with weir operation and broodstock collection 1991-2014.

Table 14. Take of natural-origin Chinook salmon associated with trapping and broodstock collection at the Pahsimeroi Fish Hatchery adult trap 2001-2014.

Return Year	Number Trapped	Trapping/ Holding Mortalities	Number Spawned	Total Mortality	Percent Mortality of Trapped Fish
1991	243			0	0.0%
1992	129			0	0.0%
1993	169			0	0.0%
1994	28			0	0.0%
1995	15	0	0	0	0.0%
1996	49	0	0	0	0.0%
1997	85	0	26	26	30.6%
1998	75	4	19	23	30.7%
1999	92	2	23	25	27.2%
2000	95	3	29	32	33.7%
2001	246	6	77	83	33.7%
2002	199	2	41	43	21.6%
2003	329	1	0	1	0.3%
2004	200	0	0	0	0.0%
2005	328	0	0	0	0.0%
2006	97	0	0	0	0.0%
2007	139	0	0	0	0.0%
2008	229	0	0	0	0.0%
2009	324	0	0	0	0.0%
2010[a]	293	0	26	26	0.0%
2011[a]	377	0	21	21	0.0%
2012[a]	216	0	19	19	0.0%
2013	374	2	42	44	11.8%
2014	619	1	68	69	11.1%

Source: Data taken from Pahsimeroi Fish Hatchery brood year and run year reports.

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).

Projected take by activity for hatchery operations and programmatic maintenance are provided in Appendix A; Tables A1 and A2.

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 natural-origin summer Chinook salmon will exceed projected take levels presented in Tables A1 and A2(see Appendix 1). However, in the unlikely event that stated levels of take are exceeded, the IDFG will consult with NMFS Sustainable Fisheries Division or Protected Resource Division staff and agree to an action plan. We assume that any contingency plan will include a provision to discontinue the associated activities.

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.

The Pahsimeroi Fish Hatchery summer Chinook salmon program is part of the Idaho Power Company's mitigation program that was established by the 1980 Hells Canyon Settlement agreement. Hatchery operations are in alignment with meeting mitigation obligations.

The IDFG participated in the development of the APRE document and is familiar with concepts and principals therein. This program is largely consistent with APRE language.

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

- 2008-2017 Management Agreement for Upriver Spring Chinook, Summer Chinook and Sockeye pursuant to United States of America v. State of Oregon, U.S. District Court, District of Oregon.

- 1980 Hells Canyon Settlement Agreement. The Pahsimeroi Summer Chinook program is part of IPC's mitigation obligation under the FERC license for anadromous fish losses caused by the construction and operation of the Hells Canyon Complex (Brownlee, Oxbow, and Hells Canyon dams) on the Snake River. Hatchery operations are in alignment with meeting mitigation obligations.

3.3 RELATIONSHIP TO HARVEST OBJECTIVES

Explain whether artificial production and harvest management have been integrated to provide as many benefits and as few biological risks as possible to the listed species. Reference any harvest plan that describes measures applied to integrate the program with harvest management.

Harvest management of Pahsimeroi Summer Chinook is integrated into the artificial propagation program in an effort to meet both conservation and mitigation goals. By maintaining a uniquely marked hatchery-origin group, IDFG fisheries managers are able to allow harvest opportunities when adult escapement is in excess of broodstock needs while still providing protection to the listed natural population. When sport harvest seasons occur, creel survey programs are implemented to monitor the take of listed Chinook salmon.

The Hells Canyon Settlement Agreement defined mitigation goals in terms of smolts released. State and Tribal co-managers have established near and long term expectations for adult returns to Idaho Power facilities based on the smolt to adult return rates used to size the production capacity of the LSRCP hatcheries. State, tribal and federal co-managers work co-operatively to develop annual production and mark plans that are consistent with original LSRCP and Hells Canyon Settlement Agreement, the US vs. OR 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.

State and Tribal co-managers confer pre-season relative to assessing forecasted levels of abundance of both hatchery and natural fish in the fisheries. Forecasts are used to project likely non-tribal and tribal harvest shares. Incidental take rates applicable to fisheries are projected based on forecasted natural populations addressed in the 2000 Biop. 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 program 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. In-season, state, tribal, and federal co-managers conduct weekly teleconferences in concert with web-based data sharing tools to confer about harvest and incidental take levels and the disposition of fish captured at the hatchery traps in excess of broodstock needs. 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 benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years, if available

Fisheries benefiting from the Pahsimeroi Fish Hatchery program include tribal and non-tribal fisheries in the mainstem Columbia River, Snake River, and Salmon River . A summary of estimated adult harvest from 1997-2012 is listed in Table 15.

Table 15. Estimated harvest and escapement of adipose clipped summer Chinook Salmon released from Pahsimeroi Fish Hatchery for return years 1997-2012.

Return Year	Escapement[a]	Upper Salmon R. Harvest (non-Tribal)	Upper Salmon R. Harvest (Tribal)	Lower Salmon R. Harvest (non-tribal)	Ocean, Columbia, and Snake River Harvest (Tribal and non-Tribal	Total Havest	Total Return	Exploitation Rate
1997[b]	9	0	0	0	0	0	9	0.0%
1998	19	0	0	0	0	0	19	0.0%
1999[b]	285	0	0	0	0	0	285	0.0%
2000[b]	364	0	0	0	0	0	364	0.0%
2001[b]	851	0	0	0	0	0	851	0.0%
2002[b]	851	0	0	0	0	0	851	0.0%
2003	2,233	0	0	0	31	31	2,264	1.4%
2004	2,898	0	0	0	529	529	3,427	15.4%
2005	1,732	0	0	0	442	442	2,174	20.3%
2006	593	0	0	0	298	298	891	33.4%
2007	599	0	0	0	162	162	761	21.3%
2008	2,404	0	0	0	146	146	2,550	5.7%
2009	8,899	1,657	4	501	1,059	3,221	12,120	26.6%
2010	7,179	1,885	0	186	2,201	4,272	11,451	37.3%
2011	3,439	892	0	35	1,981	2,908	6,347	45.8%
2012	644	0	0	0	211	211	855	24.7%

[a] includes trapped fish and carcasses recovered upstream and downstream of the hatchery weir.

[b] fish were not tagged with CWT so estimates of harvest in mixed stock fisheres are not available

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 subbasin and other areas. The NMFS has not developed a recovery plan specific to Snake River Chinook salmon, but the Salmon River spring Chinook program is operated consistent with existing Biological Opinions.

3.5 ECOLOGICAL INTERACTIONS

Describe salmonid and non-salmonid fishes or other species that could (1) negatively impact program; (2) be negatively impacted by program; (3) positively impact program; and (4) be positively impacted by program. Give most attention to interactions between listed and "candidate" salmonids and program fish.

Potential adverse effects to listed salmon could occur from the release of hatchery-produced summer Chinook salmon juveniles through the following interactions: predation, competition, behavior modification, and fish health.

Competition/Predation/Behavioral Modifications

The IDFG does not believe that the release of juvenile summer Chinook salmon in the Pahsimeroi River will affect listed sockeye salmon in the free-flowing migration corridor.

Adults and juveniles of these two runs of salmon are temporally and spatially separated, with juvenile sockeye having later outmigration timing than summer Chinook salmon released in late March to mid-April. The NMFS (1994) agreed that there appeared to be some separation in run timing in the migration corridor, which minimizes effects to listed sockeye salmon.

Although it is possible that both hatchery-produced summer Chinook salmon smolts and fall Chinook salmon fry could be present in the Snake River at the same time, we believe that hatchery smolts released in late March and April will be out of the Snake River production area when fall Chinook salmon emerge in late April and early May (IFRO 1992). Because of their larger size, summer Chinook salmon smolts migrating through the lower Salmon and Snake rivers will probably be using different habitat than emerging fall Chinook salmon fry (Everest 1969). Thus, we assume that there is no effect to fall Chinook salmon juveniles in the production area or free-flowing migration corridor from the summer Chinook salmon releases in the Pahsimeroi River. Fall Chinook salmon adults would be temporally and spatially separated from summer Chinook salmon adults returning from the release as well.

Hatchery-produced smolts are spatially separated from listed species during early rearing, so effects are likely to occur only in the migration corridor after release. Perry and Bjornn (1992) documented that natural, Chinook salmon fry movement in the upper Salmon River began in early March, peaked in late April and early May, and then decreased into the early summer as the fish grew to parr size. Average mean length of spring Chinook salmon fry ranged from 32.9 – 34.9 mm through late April in the upper Salmon River. Mean fry size increased to 39.8 mm by mid-June (Perry and Bjornn 1992). Assuming that hatchery-produced Chinook salmon smolts could feed on prey up to 1/3 of their body length, natural fry would be in a size range to be potential prey. However, emigration from release sites generally occurs within a few days and the IDFG does not believe that hatchery-produced smolts would convert from a hatchery diet to a natural diet in such a short time (USFWS 1992, 1993).

The release of a large number of prey items, which may concentrate predators, has been identified as a potential effect on listed salmon and steelhead. Hillman and Mullan (1989) reported that predaceous rainbow trout (>200 mm) concentrated on wild salmon within a moving group of hatchery-produced age-0 Chinook salmon juveniles. Releasing fish over a number of days is expected to minimize the risk associated with this situation.

The literature suggests that the effects of behavioral or competitive interactions between hatchery-produced and natural Chinook salmon juveniles would be difficult to evaluate or quantify (USFWS 1992, 1993). There is limited information describing adverse behavioral effects of summer releases of hatchery-produced Chinook salmon fingerlings (age 0) on natural Chinook salmon fingerlings. Hillman and Mullan (1989) reported that larger hatchery-produced fingerlings apparently "pulled" smaller Chinook salmon from their stream margin stations as the hatchery fish drifted downstream. The hatchery-produced fish were approximately twice as large as the natural juveniles. In this study, spring releases of steelhead smolts had no observable effect on natural Chinook salmon fry or smolts. However, effects of emigrating yearling, hatchery-produced Chinook salmon on natural Chinook salmon fry or yearlings is unknown. There may be potential for the larger hatchery-produced fish, presumably migrating in large schools, to "pull" natural Chinook salmon juveniles with them as they migrate. It this occurs, effects of large, single-site releases on natural survival may be adverse. We do not know if this occurs, or the magnitude of the potential effect. In the upper Salmon River, IDFG biologists observed Chinook salmon fry in typical areas during steelhead sampling in April – June, 1992 even though 1.27 million spring Chinook salmon smolts had been released in mid-March (IDFG 1993).

The IDFG believes that competition for food, space, and habitat between hatchery-produced Chinook salmon smolts and natural fry and smolts should be minimal due to: 1) spatial segregation, 2) foraging efficiency of hatchery-produced fish, 3) rapid emigration in free flowing river sections, and 4) differences in migration timing. If competition occurs, it would be localized at sites of large group releases (Petrosky 1984).

Chinook salmon habitat preference criteria studies have illustrated that spatial habitat segregation occurs (Hampton 1988). Larger hatchery-produced juvenile fish select deeper water and faster velocities than smaller natural origin juvenile fish. This mechanism should help minimize competition between emigrating hatchery-produced Chinook salmon and natural fry in free-flowing river sections.

The time taken for hatchery-produced juvenile Chinook salmon to adjust to the natural environment reduces the effect of hatchery-produced fish on natural fish. Foraging and habitat selection deficiencies of hatchery-produced fish have been noted (Ware 1971; Bachman 1984; Marnell 1986). Various behavior studies have noted the inefficiency of hatchery-produced fish when placed in the natural environment (including food selection). Because of this, and the time it takes for hatchery-produced fish to adapt to their new environment, the IDFG believes competition between hatchery-produced and natural-origin Chinook salmon is minimal; particularly soon after release.

The IDFG does not believe that the combined release of hatchery Chinook salmon in the upper Salmon River exceeds the carrying capacity of the free-flowing migration corridor. Food, space, and habitat should not be limiting factors in the Salmon River and free-flowing Snake River.

The summer smolt outmigration of naturally produced Chinook salmon is generally more protracted than the hatchery-produced smolt outmigration. Data illustrating arrival timing at Lower Granite Dam support this observation (Kiefer 1993). This factor may lessen the potential for competition in the river.

<u>Fish Health</u>

Infectious diseases can be horizontally transmitted between hatchery fish and natural listed species. Unsanitized surface water can introduce pathogens into fish hatcheries. Rearing conditions in the hatchery (e.g., fish density, water quality, presence of chronic or acute stressors) can contribute to the spread of infectious pathogens among fish within the hatchery. In a review of the literature, Steward and Bjornn (1990) stated that there was little evidence to suggest that horizontal transmission of disease from hatchery-produced smolts to natural fish is widespread in the production area or free-flowing migration corridor.

The IDFG monitors the health status of hatchery-produced summer Chinook salmon from the time adults are ponded until juveniles are released as smolts. Sampling protocols follow those recommended by the Pacific Northwest Fish Health Protection Committee (PNFHPC) and as described by the American Fisheries Society (AFS) Fish Health Section Blue Book. Sampling protocols are described in detail in the Salmon River AOP.

All pathogens require a critical level of challenge dose to establish an infection in their host. Factors of dilution, low water temperature, and low population density in the upper Salmon River minimize the potential for disease transmission to naturally-produced Chinook salmon. However, none of these factors completely eliminate the risk of transmission (Pilcher and Fryer 1980; Lee and Evelyn 1989; LaPatra et al. 1990). Even with consistent monitoring, it is difficult to attribute a particular occurrence of disease to actions of the Pahsimeroi Summer Chinook program in the Pahsimeroi River.

Reduction in Fitness

There are potential adverse effects to listed adult summer Chinook salmon and their progeny from the release of hatchery summer Chinook salmon upstream of the Pahsimeroi Fish Hatchery weir for natural spawning. None will result in direct mortality of adults. These effects could include changes in fitness, growth, survival and disease resistance of the listed population. The effects may result in decreased productivity or long-term adaptability (Kapuscinski and Jacobson 1987; Bowles and Leitzinger 1991). These changes are more likely when the hatchery and natural stocks are not genetically similar or locally adapted. However, some increase in natural production can be expected when hatchery-reared fish are sufficiently similar to wild fish and natural rearing habitats are not at capacity (Reisenbichler 1983). We believe this is the case with the Pahsimeroi River, recognizing that releasing hatchery summer Chinook salmon to spawn naturally can increase natural production, but not necessarily productivity.

There is potential that returning hatchery-produced adults pose a genetic risk to listed salmon by straying. Strays or wandering adults may spawn with natural adults. This is most likely to occur just below the Pahsimeroi Fish Hatchery weir. Idaho Department of Fish and Game information collected from PIT- and coded wire-tags indicate that hatchery-produced adults of Pahsimeroi origin rarely, if at all, are identified at other stream or hatchery locations.

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

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. The intake canal is equipped with NOAA Fisheries-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 approximately 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. This water is pumped to a 10,000 gallon holding tank and gravity-fed to the two locations. 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 and early rearing of summer Chinook salmon occur 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 located within the hatchery building. Well water temperature is a constant 50° F.

Surface water is supplied to two concrete rearing ponds from a diversion in the Pahsimeroi River. Water is diverted down an open concrete canal before entering a buried pipe for delivery to the rearing ponds. NOAA Fisheries-approved rotating drum screens are installed at the intake canal to prevent entrainment of wild fish into the hatchery facility. IPC holds a water right to divert 20 cfs of river water at the upper Pahsimeroi Fish Hatchery, allowing approximately 10 cfs of flow to each rearing pond. Current 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).

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

Hatchery intakes at both the upper and lower Pahsimeroi Fish Hatchery facilities are equipped with NOAA Fisheries-approved rotating drum screens designed to prevent wild fish from being entrained at hatchery water intake diversions. Additionally, all effluent water discharged to the Pahsimeroi River is monitored regularly for compliance with NPDES standards.

SECTION 5 FACILITIES

5.1 BROODSTOCK COLLECTION FACILITIES (OR METHODS)

Adult summer Chinook salmon 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-ft long x 16-ft wide x 6-ft deep. The trap is situated between two additional concrete ponds (each measuring 70-ft long x 16-ft wide x 6-ft deep) that are used as the adult holding ponds. Summer Chinook salmon return to Pahsimeroi Fish Hatchery from June through early October. Fish volitionally migrate into the adult trap where they are manually sorted into the adult holding ponds. The trap is checked daily and fish are processed three times per week. All fish are handled in accordance with protocols established by NOAA Fisheries. 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 (DESCRIPTION OF PEN, TANK TRUCK, OR CONTAINER USED)

Generally, adult transportation at the lower Pahsimeroi Fish Hatchery is unnecessary, as hatchery-produced adults are trapped and spawned on site. However, in the event that adult summer Chinook salmon return in excess of specific program needs, an adult transportation vehicle (equipped with oxygen and a fresh flow agitator system) may be used to transfer fish to a variety of locations to maximize sport-fishing opportunities.

5.3 BROODSTOCK HOLDING AND SPAWNING FACILITIES

Broodstock are held in two concrete adult holding ponds (each measuring 70-ft long x 16-ft wide x 6-ft deep) that are located on either side of the adult trap described in Section 5.1. Roughly 24 cfs of the 40 cfs diverted into the intake canal is available to supply water to these two holding ponds. Each of the two ponds provide approximately 6,720 cubic feet of holding space. Holding capacity for the adult trap and holding ponds is approximately 2,000 adult summer Chinook salmon. Chinook salmon spawning commences in late August and continues through early October on a twice-per-week basis.

5.4 INCUBATION FACILITIES

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). Summer Chinook salmon eggs are incubated to swim-up in this location and then are transferred to nearby early rearing vats.

5.5 REARING FACILITIES

All early rearing occurs at the upper Pahsimeroi Fish Hatchery within the hatchery building. The vat room consists of 18 fiberglass vats measuring 82-feet long x 4-feet wide x 3-feet deep that are supplied with unchilled (50° F) well water. Fish are reared in these vats on unchilled well water until they reached approximately 100fpp, at which point they are mass marked and transferred to outdoor rearing ponds supplied with water from the Pahsimeroi River.

5.6 ACCLIMATION/RELEASE FACILITIES

Final rearing of Pahsimeroi Fish Hatchery summer Chinook salmon occurs in two concrete rearing ponds located at the upper Pahsimeroi Fish Hatchery. Each pond measures 210-feet long x 40-feet wide x 3.5-feet deep and is supplied with 10 cfs of water (20 cfs total) diverted from the Pahsimeroi River. Yearling summer Chinook salmon smolts are volitionally released from these ponds directly to the Pahsimeroi River in late-March to mid-April.

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

Brood year 2002 Pahsimeroi Fish Hatchery summer Chinook salmon experienced a mortality event shortly after being volitionally released from the upper Pahsimeroi Fish Hatchery rearing ponds in April, 2004. While the volitional release from the holding ponds went well, a large number of these fish entered the intake canal at the lower hatchery facility where they became trapped and died. Various IPC, IDFG and NOAA Fisheries staff conducted an investigation into the matter in the days following the mortality. Based on the available information, it appears that record low discharge from the Pahsimeroi River (ongoing drought conditions exacerbated by the start-up of numerous irrigation diversions) caused a larger than normal number of fish to enter the intake canal that supplies river water to the lower hatchery facility. The canal is equipped with NOAA Fisheries-approved rotating drum screens and a 12-inch bypass pipe, which under normal operating conditions, allows fish to return to the river. Investigators speculated that the bypass pipe was plugged with debris causing fish to accumulate in the canal overnight. As densities increased, the fish became stressed and died. IDFG estimated the total mortality at approximately 30,000 hatchery-reared smolts. Once spawning was complete and the intake canal was dry, IPC made structural changes to the bypass pipe and removed a Parshall flume to prevent this from reoccurring. The Parshall flume reduced the area within the canal where fish could linger before exiting via the bypass pipe so the flume was removed and a broad crested weir was installed immediately downstream of the diversion to provide fish more usable space within the canal. IPC modified the end of the concrete roller screen channel to incorporate a 45-degree bend that is completely visible and accessible to the hatchery staff for inspection and debris removal. This allowed elimination of a 45-degree bend from the 12-inch bypass pipe to prevent debris from getting stuck in the pipe. Finally, IPC installed a 10-inch-diameter orifice plate to reduce the bypass pipe opening, limiting the size of debris entering the pipe to ensure that anything entering the pipe could fit through the existing 12-inch pipe. During subsequent years, IDFG has staggered the smolt releases from the rearing ponds to help prevent large groups of fish from moving downstream all at once.

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.

Lower Pahsimeroi Fish Hatchery - The lower Pahsimeroi Fish Hatchery has 2 full-time employees residing at the facility for security purposes. The adult trap and holding ponds are gravity fed from the Pahsimeroi River and are therefore not subject to water supply interruption. Protocols are in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

Upper Pahsimeroi Fish Hatchery –Upper Pahsimeroi Fish Hatchery is equipped with numerous water level, temperature, flow, and power failure alarms. An audible horn and telephone dialer alert staff, both on and off site, to abnormal conditions. A 450 kW standby generator capable of powering all critical life support equipment is installed to compensate for interruptions in utility power lasting more than 7 seconds. Protocols are established by IDFG to guide their response to emergency situations and a full-time hatchery employee resides less than one mile from the hatchery site. Additional protocols exist to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1 SOURCE OF BROODSTOCK

Since 1992, the broodstock source for the Pahsimeroi Fish Hatchery summer Chinook salmon program is exclusively from adults returning to the Pahsimeroi River. A detailed description of the historical sources of broodstock is provided in Section 6.2.1 below.

6.2 SUPPORTING INFORMATION

6.2.1 History of Broodstock

Culture of summer Chinook salmon at Pahsimeroi Fish Hatchery dates back to 1969, with eggs collected from summer Chinook salmon at Pahsimeroi Fish Hatchery, shipped to IDFG's Mackay Hatchery for rearing, and then returned to Pahsimeroi Fish Hatchery for acclimation and release as subyearlings or yearling smolts. Indigenous Pahsimeroi Summer Chinook were solely used for propagation from 1969 until 1981. However, efforts to rear summer Chinook salmon prior to 1981 were considered experimental and not part of IPC's FERC-mandated mitigation for the Hells Canyon Complex. The Pahsimeroi Fish Hatchery summer Chinook salmon mitigation program began in 1981, with the collection of eggs collected from four indigenous Pahsimeroi River female summer Chinook salmon and the receipt of 616,823 spring Chinook salmon eggs from IPC's Rapid River Fish Hatchery (Rapid River FH). From brood year 1981 through 1984, Rapid River FH spring Chinook salmon stock and IDFG's Hayden Creek Hatchery (Lemhi River) spring Chinook salmon stock were used in an effort to achieve smolt production goals and expedite the return of harvestable numbers of Chinook salmon to the Salmon and Pahsimeroi rivers. Summer Chinook salmon production also continued during this period. Spring Chinook salmon culture was short-lived since IDFG began phasing out the use of this stock in 1985. The Chinook salmon program at Pahsimeroi Fish Hatchery converted back solely to a summer Chinook salmon program with the last adult spring Chinook salmon returning in 1989. From 1985 to 1989, IDFG continued to spawn returning spring Chinook salmon but excluded them from the hatchery inventory by transferring the eggs to other locations. In order to meet management goals, which included the return of a sufficient number of adult summer Chinook salmon to the Pahsimeroi drainage to produce one million hatchery summer Chinook salmon smolts and the return of at least 1,060 adult summer Chinook salmon for natural spawning (IDFG 1992), IDFG transferred surplus South Fork Salmon River (SFSR) summer Chinook salmon eggs from IDFG's McCall Fish Hatchery to Pahsimeroi Fish Hatchery. Brood years 1987-1988 were a combination of summer Chinook salmon eggs collected from adults at the Pahsimeroi weir and eggs collected from adults at the SFSR weir. The use of SFSR eggs was discontinued in consideration of possible behavioral and genetic differences between the two populations. In 1986, IDFG began releasing roughly one-third of returning adult summer Chinook salmon upstream of the barrier weir to spawn naturally in the Pahsimeroi River in an effort to maintain a natural population of summer Chinook salmon in the Pahsimeroi River. During years when broodstock needs were met, even more fish were passed upstream to spawn, up to the carrying capacity estimate. Further summer Chinook salmon program changes occurred in 1992, when Pahsimeroi Summer Chinook were listed as threatened by NOAA Fisheries under the ESA.

In addition to broodstock developed as part of the mitigation effort for Pahsimeroi Fish Hatchery, from 1991 through 2002, broodstock was constructed for the purpose of creating juvenile treatment release groups for the ISS and as such, a portion of the rearing space at the upper Pahsimeroi Fish Hatchery was devoted for this purpose. As part of the experimental design, original supplementation broodstock was created by crossing naturally produced adults with hatchery-origin fish. When progeny from those fish returned as adults they were spawned with natural-origin adults to create the next generation of supplementation broodstock. Supplementation juveniles were differentially marked from the general production fish and were not intended for selective sport or tribal harvest. The last supplementation broodstock was created using adults that returned in 2002. During the entire ISS study duration, all naturally produced fish, with the exception of those used to create the supplementation broodstock, were released above the weir to spawn naturally. In 2010 we initiated an integrated broodstock component in the hatchery that is used to supplement natural spawning above the adult weir consistent with recommendations from the HSRG. Numbers of natural adults used in the broodstock and released above the weir are based on a sliding scale that is driven by the number of natural-origin returns (See Sliding Scale in Section 1.11.1).

6.2.2 Annual size of broodstock

In order to meet the smolt production target of 1.0M yearling smolts, approximately 300 males and 300 females are spawned. To account for prespawning mortality, approximately 352 pairs of adults are trapped and held for spawning. Of these, approximately 20 pairs of adults are spawned to produce 65,000 yearling smolts for the integrated portion of the program, and the remaining adults are used to produce 935,000 yearling smolts for the segregated portion of the program. If hatchery-origin adipose fin-clipped adults return in excess of broodstock needs after fisheries have been closed then adults from the segregated broodstock may be used to provide eggs to the Panther Creek Hatchery program. See Panther Creek Chinook HGMP for program details.

6.2.3 Past and proposed level of natural fish in broodstock

Prior to 1995, most returning hatchery-origin adults were indistinguishable from natural-origin returns due to the lack of a mark or tag on hatchery-origin returns. Between 1968 and 1995, broodstocks were a mixture of hatchery and natural-origin returns. Between 1995 and 2002, some natural-origin adults were brought into the hatchery to create supplementation broodstock for the ISS research project. Between 2003 and 2009, all natural-origin adults were released above the weir to spawn naturally and the broodstock was 100% hatchery-origin. Beginning in brood year 2010, managers incorporated natural-origin adults into the broodstock to maintain an integrated smolt release in the Pahsimeroi River. The specific number of natural-origin fish retained for the integrated portion of the broodstock is determined using a sliding scale that is driven by the size of the natural-origin return(see Sliding Scale in Section 1.11.1). The number of natural-origin adults brought into the hatchery from 1995-2014 is listed in Table 16.

Table 16. Broodstock collection history for the Pahsimeroi Fish Hatchery program 1995-2014.

Return Year	Natural adults trapped at Pahsimeroi R. weir	Natural Fish Spawned		Hatchery Fish Spawned		Total Males Spawned	Total Females Spawned
		Males	Females	Males	Females		
1995	15	0	0	35	17	35	17
1996	49	0	0	18	18	18	18
1997	85	17	9	23	23	40	32
1998	75	13	6	13	7	26	13
1999	92	13	10	66	69	79	79
2000	95	18	11	105	112	123	123
2001	246	43	34	297	306	340	340
2002	199	17	21	247	245	264	266
2003	329	0	0	275	346	275	346
2004	200	0	0	347	368	347	368
2005	328	0	0	352	341	352	341
2006	97	0	0	212	289	212	289
2007	139	0	0	178	215	178	215
2008	229	0	0	345	345	345	345
2009	324	0	0	316	316	316	316
2010	293	26	0	237	291	263	291
2011	377	21	0	259	325	280	325
2012	216	19	0	254	286	273	286
2013	374	21	24	241	238	262	262
2014	619	34	34	266	266	300	300

Source: Pahsimeroi Fish Hatchery Brood and Run reports and IDFG unpublished data

6.2.4 Genetic or ecological differences

Describe any known genotypic, phenotypic, or behavioral differences between current or proposed hatchery stocks and natural stocks in the target area.

Genetic data comparing the hatchery and natural population within the Pahsimeroi River is limited. Natural-origin fish have been incorporated into the hatchery broodstock since the inception of the Pahsimeroi Fish Hatchery. In a study comparing the reproductive success of natural- and supplementation-origin adults using 10 microsatellite loci, F_{ST} values across all loci were low (0.003-0.12), indicating little to no population differentiation between the natural and supplementation adults (Leth 2005). Additionally, allele frequencies and allelic richness was similar for both groups. With respect to phenotypic or behavioral differences, results of the reproductive success study indicated there was no significant difference in the contribution of each parental group (supplementation or natural) to juvenile offspring and the parental cross types (e.g., hatchery male x natural female) that gave rise to the sampled juvenile offspring were not significantly different than would be expected under random mating.

An examination of the genetic variation and structure of Chinook salmon populations in Snake River using 13 microsatellite loci indicated that Chinook salmon populations are regionally structured within subbasins and that wild and hatchery adults from the Pahsimeroi River cluster tightly with other wild and hatchery populations in the upper Salmon River (E.F. Salmon River, W.F. Yankee Fork, and mainstem Salmon River-Sawtooth adult weir) (Narum et al. 2007).

6.2.5 Reasons for choosing broodstock

Pahsimeroi River indigenous summer Chinook salmon stock have been the primary source for broodstock since 1985 when IDFG began phasing out the additional use of spring Chinook salmon stock in this program. Reasons for choosing this summer Chinook salmon stock include: availability, genetic lineage, life history pattern, local adaptability, and less risk posed to upper Salmon River stocks. Pahsimeroi summer Chinook salmon are part of the Snake River Basin anadromous stocks that are considered unique among Columbia River stocks.

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

Managers implemented an integrated broodstock program at Pahsimeroi Fish Hatchery for supplementing natural spawning above the weir. Likewise, it will also maintain a genetic repository for wild fish within the hatchery allowing managers more flexibility with regards to supplementing natural spawners with hatchery fish when the abundance of NORs is low. Broodstock management is based on a sliding scale (see Section 1.11.1) that will enable managers to maintain the existing harvest mitigation program while reducing risks to the natural population.

SECTION 7. BROODSTOCK COLLECTION

7.1 LIFE-HISTORY STAGE TO BE COLLECTED

Adult Chinook salmon collected at the Pahsimeroi Fish Hatchery weir are the sole source of broodstock for this program. No eggs or juveniles are collected to carry out this program.

7.2 COLLECTION OR SAMPLING DESIGN

Adult summer Chinook salmon collection occurs at the lower Pahsimeroi Fish Hatchery and is facilitated by a removable barrier weir that spans the Pahsimeroi River. Flow conditions in the Pahsimeroi River are low enough during spring runoff that the weir can be installed well before adults arrive and can be kept in operation through the entire adult return period. Adults return to the hatchery in June through early October and are spawned in August through early October. Broodstock are selected randomly from ripe fish and represent adults collected throughout the entire adult migration.

IDFG also maintains an integrated broodstock program at Pahsimeroi Fish Hatchery. The number of hatchery and natural adults that are either retained for broodstock or released to spawn naturally are based on a sliding scale (See section 1.11.1).

7.3 IDENTITY OF BROODSTOCK

Since brood year 1991, all hatchery produced fish released from Pahsimeroi Fish Hatchery have been marked and/or tagged enabling the differentiation of hatchery- and natural-origin adult returns. Managers intend to continue this marking strategy. Additionally, hatchery-origin fish released as part of the integrated component are marked differentially from the segregated hatchery-origin fish intended for harvest mitigation.

7.4 PROPOSED NUMBER TO BE COLLECTED

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

Approximately 352 female and 352 male summer Chinook salmon are needed annually to meet program objectives for the Pahsimeroi Fish (see Sec 6.2.2 above). Of these, approximately 20 pairs are needed to develop the integrated component of the broodstock. The number of NORs retained for the integrated broodstock is based on a sliding scale (see Section 1.11.1)

7.4.2 Broodstock collection levels for the last twelve years

Broodstock collection levels for Pahsimeroi Fish Hatchery's summer Chinook salmon program are summarized in Table 16 (Section 6.2.3 above).

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

Integrated adults will be released above the weir in accordance with the sliding scale in section 1.11.1. Segregated adults will in excess of brood needs may be recycled through active fisheries, distributed to tribal C&S, foodbanks, or nutrient enhancement or spawned to provide eggs for the Panther Creek Program. Segregated fish will only be released for natural spawning above the weir if the combination of natural and integrated adults available for natural spawning is less than the minimum natural spawning escapement goal.

7.6 FISH TRANSPORTATION AND HOLDING METHODS

No adult fish transportation is necessary. See Sections 5.2 and 5.3 for a description of the trapping and holding facilities. Upon removal from the trap, adults are identified by sex, examined for fin clips and/or tags, measured to the nearest centimeter fork length, and, if warranted, intraperitoneally (IP) injected with antibiotic medication to reduce bacterial infection levels and limit mortality during holding.

7.7 DESCRIBE FISH HEALTH MAINTENANCE AND SANITATION PROCEDURES APPLIED

Adults may be injected with antibiotic medication at trapping (e.g., erythromycin at a rate of 10-20 mg/kg body weight) to reduce infection levels of *Renibacterium salmoninarum* (Rs, the causative agent of Bacterial Kidney Disease [BKD]), limit associated pre-spawning mortality, limit horizontal transmission from of Rs from adults released to spawn naturally, and reduce the chance of vertical transmission to the progeny of these fish. All applications of antibiotics will be administered with appropriate veterinary oversight. During the holding period, ponded adults may be treated with an external sanitizing compound (e.g., 167 ppm formalin for 1 hour) to reduce mortality caused by fungal infections or external parasites. Specific treatment plans are described annually in the Pahsimeroi sections of the Salmon River AOP.

Fish health monitoring at spawning includes sampling for viral, bacterial and parasitic disease agents. Ovarian fluid samples and tissue samples are collected to test for viral replicating agents. Kidney samples are collected from all females spawned and tested for *Renibacterium salmoninarum* to facilitate an ELISA-based BKD management program. Head wedges are taken from a portion of the adults spawned and tested for *Myxobolus cerebralis*, the causative agent of whirling disease. If warranted, necropsies are performed on pre-spawn mortalities by IDFG's Eagle Fish Health Laboratory staff. For detailed descriptions of broodstock fish health management and monitoring, see the Pahsimeroi sections of the Salmon River AOP.

7.8 DISPOSITION OF CARCASSES

During the spawning season, all carcasses not suitable for donation to the public, tribal entities, or charities are either transported to a rendering plant offsite or used for nutrient enhancement.

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

Adverse genetic risk is minimized through operation of the weir to prevent segregated fish from reaching the spawning habitat. The ratio of integrated adults on the spawning ground is managed using the sliding.

SECTION 8. MATING

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

8.1 SELECTION METHOD

Broodstock are retained throughout the run to represent the full spectrum of the population. Fish are spawned in a 1: l sex ratio as they ripen, although males are kept and may potentially be used a second time if necessary

8.2 MALES

Generally, males are used only once for spawning. In cases where skewed sex ratios exist (fewer males than females), or in situations where males mature late, males may be used twice. Jack males are limited to 10 percent of all males spawned.

8.3 FERTILIZATION

Eggs are placed into containers followed by sperm. Following fertilization, one cup of spring water is added to each bucket to activate the sperm and allowed to set for 2 minutes. Eggs are then carried into the hatchery building where they are allowed to water harden in a solution of iodophor per label directions. At the conclusion of each spawn day eggs are transported from the lower Pahsimeroi Fish Hatchery to the upper Pahsimeroi Fish Hatchery in 75 quart coolers and loaded into Marisource vertical flow incubator trays. Each incubator will contain the eggs from one female. All carcasses are then frozen. Once pathology reports are received, hatchery staff segregate and/or cull eggs based on established ELISA-based culling criteria for BKD management. For additional detail, see the Salmon River AOP.

8.4 CRYOPRESERVED GAMETES

The Nez Perce Tribe (NPT) has collected milt from naturally produced and artificially propagated adult male summer Chinook salmon as part of the Salmonid Gamete Preservation Program (BPA Project# 199703800).

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

With veterinary oversight, prior to ponding or release, adults may receive antibiotic medication to reduce bacterial infection levels and limit mortality. In addition, adults may be treated with an external sanitizing compound to reduce fungal infections and parasite infestation and limit associated pre-spawn mortality. During spawning, ELISA optical density values for female broodstock are used to establish criteria for ELISA-based egg culling and/or segregation. See Salmon River AOP/SOP for details.

SECTION 9. INCUBATION AND REARING

This section describes management goals (e.g., "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock.

9.1 INCUBATION

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

Green egg take and survival to eyed-egg for Pahsimeroi Fish Hatchery summer Chinook Salmon for brood years 1991-2012 is listed in Table 17.

Table 17. Pahsimeroi Fish Hatchery summer Chinook Salmon egg take and survival information for brood years 1991-2012.

Brood Year	Green Eggs	Eyed Eggs	Survival to Eyed Stage
1991	437,157	422,766	96.7%
1992	172,139	168,065	97.6%
1993	167,200	158,500	94.8%
1994[a]	0	0	--
1995	157,938	144,971	91.8%
1996	85,660	80,143	93.6%
1997	171,836	155,360	90.4%
1998	74,105	59,014	79.6%
1999	371,354	300,685	81.0%
2000	633,906	560,658	88.4%
2001	1,700,097	1,508,269	88.7%
2002	1,293,123	1,173,958	90.8%
2003	1,257,180	1,098,831	87.4%
2004	1,620,513	1,448,328	89.4%
2005	1,335,191	1,070,317	80.2%
2006	1,349,657	1,274,218	94.4%
2007	1,007,091	977,737	97.1%
2008	1,630,995	1,428,514	87.6%
2009	1,382,982	1,269,143	91.8%
2010	1,403,204	1,280,204	91.2%
2011	1,549,597	1,383,716	89.3%
2012	1,414,470	1,265,687	89.5%

[a] All Chinook salmon trapped in 1994 were released upstream of the adult weir to spawn naturally.

Source: Pahsimeroi Fish Hatchery Summer Chinook Salmon Brood Year and Run Reports.

9.1.2 Cause for, and disposition of surplus egg takes

Eggs in excess of needs for the segregated program may be transferred to the Panther Creek program or destroyed. Eggs in excess of need for the integrated program may be transferred to Panther Creek or destroyed.

9.1.3 Loading densities applied during incubation

All eggs are incubated in Marisource 16-tray vertical flow incubator stacks. Each tray is loaded with the eggs from one female, averaging 4,599 eggs per incubator tray. Incubator flows are set at approximately 6 gpm pursuant to IHOT recommendations.

9.1.4 Incubation conditions

All summer Chinook salmon egg incubation occurs at the upper Pahsimeroi Fish Hatchery. The incubation room includes twenty 16-tray stacks of Marisource vertical flow incubators supplied with 120 gpm of chilled (40° F) and unchilled (50° F) pathogen-free well water (240 gpm total). A 200-gallon head tank provides thermal buffering for any temperature fluctuation. Each incubator stack uses a catch basin to prevent silt and fine sand from circulating through the incubation trays. Eggs are incubated to swim-up in the incubation room and then moved to fiberglass vats inside the hatchery building.

9.1.5 Ponding

Fry are held in incubation trays until they reach the swim-up stage of development at approximately 1,870 Fahrenheit temperature units (FTUs). At swim-up, fry average 1.34-inches in length and 1,254 fish per pound (fpp). Based on average first and last spawn dates, fry ponding begins around mid-January and continues until around the first of March. Fry are ponded directly into fiberglass rearing vats (84-ft. L x 4-ft. W x 3-ft. D) inside the hatchery building. Vats will have Michigan style baffles at 4-foot intervals for the length of the vats to assist with removal of solid waste. Programmable fluorescent lighting simulates a natural photoperiod. Density and flow indices will be maintained to not exceed 0.30 lbs/ft3/in and 1.14 gpm/ ft3/in. Fish will be reared in the vats until they are approximately 100fpp before being transferred to two final outdoor rearing ponds.

9.1.6 Fish health maintenance and monitoring

Following fertilization, eggs are rinsed with well water and then water-hardened in a solution of iodophor per label instructions. From 48 hours after spawning until eye-up, eggs are treated three times per week with a 1,667-ppm formalin treatment to prevent fungal growth on the eggs and three times per week with a 100-ppm iodophor flush treatment to prevent soft shell disease. At eye-up (approximately 504 FTUs), the eggs are shocked twice by dropping them into a bucket of water from a height of approximately 16 inches. Dead eggs are then picked and enumerated with a Jensorter electronic counter/picker. See Salmon River AOP for details.

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

Following the documented protocols and incubating eggs destined for supplementation and production releases in separate incubation trays will minimize risk to listed fish during incubation. To offset potential risk from overcrowding and disease transmission, only eggs from one female are placed in individual incubation trays. Utilizing pathogen-free well water for incubation and early rearing eliminates exposure of fry and fingerlings to the whirling disease pathogen.

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.

Pahsimeroi Fish Hatchery Summer Chinook salmon survival rates by hatchery life stage for brood years 1991-2012 are listed in Table 18.

Table 18. Pahsimeroi Fish Hatchery summer Chinook salmon survival information by hatchery life stage for brood years 1991-2012.

Brood Year	Number of Eyed-Eggs in Incubation	Fry		Fingerlings		Smolts	
		Number Transferred to Vats	Percent Survival from Eyed-Eggs	Number Transferred to Raceways	Percent Survival from Eyed-Eggs	Number Released	Percent Survival From Eyed-Egg
1991	422,766	NA	--	380,870	90.1%	375,000	88.7%
1992	168,065	NA	--	131,319	78.1%	130,510	77.7%
1993	158,500	151,951	95.9%	148,793	93.9%	147,429	93.0%
1994	0	0	--	0	--	0	--
1995	144,971	137,713	95.0%	123,820	85.4%	116,811	80.6%
1996	80,143	75,502	94.2%	65,783	82.1%	65,648	81.9%
1997	155,360	148,572	95.6%	135,845	87.4%	135,669	87.3%
1998	59,014	56,043	95.0%	53,920	91.4%	53,837	91.2%
1999	300,685	291,884	97.1%	283,555	94.3%	283,063	94.1%
2000	560,658	521,706	93.1%	509,571	90.9%	508,340	90.7%
2001	1,272,086	1,247,530	98.1%	1,210,883	95.2%	1,205,018	94.7%
2002	1,173,958	1,153,830	98.3%	1,138,502	97.0%	1,108,028	94.4%
2003	1,098,831	1,036,946	94.4%	1,012,074	92.1%	975,252	88.8%
2004	1,156,201	1,110,201	96.0%	1,075,640	93.0%	1,073,951	92.9%
2005	1,070,317	1,040,248	97.2%	989,127	92.4%	987,460	92.3%
2006	1,155,674	1,124,731	97.3%	1,042,638	90.2%	1,037,772	89.8%
2007	977,737	954,798	97.7%	934,489	95.6%	870,842	89.1%
2008	1,233,683	1,197,799	97.1%	1,183,064	95.9%	1,069,719	86.7%
2009	1,169,143	1,113,998	95.3%	1,070,112	91.5%	1,030,063	88.1%
2010	1,098,318	1,059,912	96.5%	1,039,887	94.7%	1,026,849	93.5%
2011	1,109,375	1,063,800	95.9%	1,025,330	92.4%	1,005,873	90.7%
2012	1,140,017	1,079,746	94.7%	1,065,970	93.50%	968,204	84.9%

Data Source: Pahsimeroi Fish Hatchery Brood Year and Run Year reports and IDFG unpublished data.

9.2.2 Density and loading criteria (goals and actual levels)

The maximum DI at upper Pahsimeroi Fish Hatchery for the fiberglass early rearing vats is 0.30 lbs/ft3/in (assuming a maximum inventory of 1,008,700 fish at 63.8 fpp or 3.55 inches). For the concrete final rearing ponds, the maximum DI 0.20 lbs/ft3/in (assuming a maximum inventory of 1,000,000 fish at 15 fpp or 5.75 inches).

9.2.3 Fish rearing conditions

Swim-up fry are transferred from incubation trays to indoor fiberglass vats at approximately 1,870 FTUs or 1,254 fpp. Vats contain Michigan style baffles positioned every 4 feet for the length of the vat. Initial flows in the vats will be typically set at approximately 60 gpm per vat. As fish grow, flows will be increased up to a maximum of approximately 240 gpm per vat. All water to the vats will be supplied from three production wells. Water temperature during early rearing is a constant 50° F. Dissolved oxygen enters the rearing vats at 95 percent saturation for this elevation and temperature or approximately 9.11 mg/L.

Fish are transferred to the concrete rearing ponds when they reach approximately 100 fpp. The rearing ponds are supplied by surface water from the Pahsimeroi River. Initial pond flows are set at approximately 2,250 gpm (5 cfs) per pond. As fish grow, flows are increased accordingly to a maximum of 4,500 gpm (10 cfs per pond or 20 cfs total). Surface water temperatures from the Pahsimeroi River during final rearing to release as smolts typically range between 37.7 and 53.1 degree F. Dissolved oxygen entering the concrete rearing ponds from the intake canal typically ranges between approximately 8.42 mg/L and 10.87 mg/L at 95 percent saturation but does drop below 5mg/L during mid-summer.

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.

Juvenile summer Chinook salmon are reared for approximately 18 months before being released as full-term yearling smolts from the upper Pahsimeroi Fish Hatchery. A condition factor (C) of 3.0 (where C=W*10,000/L3) was used where calculations were necessary to project growth to release in April. These projections are summarized in Table 19.

9.2.5 Indicate monthly fish growth rate and energy reserve data (average program performance)

Average monthly growth rate for brood years 2012-2015 are listed in Table 19

Table 19. Average monthly fish size of summer Chinook Salmon reared at Pahsimeroi Fish Hatchery for brood years 2012-2015.

Month	Fish Per Pound (FPP)	Length (inches)
February	510	1.8
March	268	2.3
April	135	2.9
May	92	3.2
June	60	3.7
July	44	4.1
August	35	4.4
September	26	4.8
October	19	5.4
November	18	5.4
December	18	5.5
January	18	5.5
February	17	5.7
March	14	6.0

Source: IDFG unpublished data

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

Juvenile summer Chinook salmon are fed a dry pelleted diet produced by various manufacturers. Conversion rate from first ponding to release averages 1.3 pounds of food fed for each pound of weight gain. Food types used, application rates and feed conversions by rearing period from swimup to smolt release are presented in Table 20.

Table 20.Feeding schedule for summer run Chinook salmon reared at Pahsimeroi Fish Hatchery.

Rearing Period	Food Type[1]	Application Schedule (# feedings/day)	Feeding Rate Range (% B.W./day)	Food Conversion During Period
February, March, April	#0/#1/#2 Bio-Pro 2 Starter	12 hour belt (continuous) & supplemental hand feeding	1.5% - 2.0%	0.7
May, June	1.2 mm Bio-Pro 2 Fry	12 hour belt (continuous) & supplemental hand feeding, 12 hour clock (once/hour), & supplemental hand feeding	1.0% - 1.5%	0.85
Jul, Aug, Sep, Oct	2.0 mm Bio-Vita Fry, 2.5mm Bio Vita Fry	12 hour clock (once/hour)	0.8% - 1.1%	0.85
Nov	2.5 mm Bio-Vita Fry	12 hour clock (once/hour)	0.5% - 0.6%	1
Dec, Jan, Feb	2.5 mm Bio Vita Fry	As water temperature allows	N/A	1.2-1.8
March	2.5mm Bio Pro 2 Fry	12 hour clock (once/hour)	0.5% - 0.6%	0.9-1.0

Source: IDFG unpublished data

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures

IDFG Eagle Fish Health Laboratory staff conducts routine fish health inspections on a regular basis and respond to requests for diagnostic evaluations. If disease agents are suspected or identified, more frequent inspections will be conducted. Recommendations for treating specific disease agents are developed by the Idaho Department of Fish and Game Fish Health Laboratory in Eagle, ID, in consultation with veterinary professionals as appropriate. Therapeutics may be used to treat specific disease agents either via a medicated feed treatment (i.e., Oxytetracycline) or an external bath (i.e., formalin). If deemed necessary, juveniles may receiveantibiotic-medicated feed treatments for BKD management or control of other bacterial infections. Disinfection protocols are in place for equipment, trucks and nets as described by hatchery protocol and biosecurity audits. The hatchery building at the upper Pahsimeroi Fish Hatchery has foot baths containing disinfectant at each building entrance. All raceways are thoroughly cleaned and air dried after fish have been transferred outside to the final rearing ponds. Rearing ponds also are thoroughly cleaned and air dried after smolts are released. Biosecurity audits and Fish Health Improvement Plans will be updated on a regular basis.

9.2.8 Smolt development indices, 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

None. However some natural food items are present in the river water supply. Additionally, predator avoidance behaviors may be strengthened in the hatchery population by the presence of avian and mammalian predators that occasionally visit the outdoor rearing ponds.

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

ELISA optical density values for broodstock females are used to establish BKD management criteria for egg culling and/or segregationneeds. Juveniles may receive antibiotic-medicated feed treatment for BKD management or control of other bacterial infections. Fish are reared at conservative density and flow indices (< 0.3 and < 1.5, respectively). Egg incubation and early rearing occurs on well water to limit exposure to pathogens, particularly *Myxobolus cerebralis*, the causative agent of whirling disease. The IDFG Eagle Fish Health Laboratory establishes fish health monitoring, disease treatment, and sanitation procedures as described in the Salmon River AOP/SOP. Fish are reared to yearling smolt size and allowed to volitionally leave the rearing ponds to mimic the natural fish emigration strategy.

SECTION 10. RELEASE

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

10.1 PROPOSED FISH RELEASE LEVELS

Proposed fish release levels from the Pahsimeroi Fish Hatchery are listed in Table 21.

Table 21. Proposed fish release levels from the Pahsimeroi Fish Hatchery.

Age Class	Number Released	Size (fpp)	Release Date	Location
Yearling	935,000	15	late-March/mid-April	Pahsimeroi River- Segregated
Yearling	65,000	15	late-March/mid-April	Pahsimeroi River-Integrated supplementation

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

Stream, river, or watercourse: Pahsimeroi River (hydrologic unit code = 17060202)

- Release point: Upper Pahsimeroi Fish Hatchery rearing ponds (river kilometer code = 522.303.489.002)

- Major watershed: Salmon River
- Basin or Region: Salmon River Basin

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

The numbers and sizes of fish released by age class at the Pahsimeroi Fish Hatchery for brood years 1991 through 2012 are listed in Tables 22-24.

Table 22. Juvenile summer Chinook Salmon releases from Pahsimeroi Fish Hatchery for brood years 2001-2012. These releases are part of the segregated harvest mitigation program in the Pahsimeroi R.

Brood Year	Number Released	Month Released	Year Released	Average Size (fpp)
1991	291,047	April	1993	13.4
1992	83,958	April	1994	13.6
1993	82,683	April	1995	12.3
1994	0	--	--	--
1995	122,017	April	1997	7.2
1996	65,648	April	1998	11.1
1997	0	--	--	--
1998	0	--	--	--
1999	197,124	April	2001	8
2000	418,417	April	2002	10.8
2001	909,926	April	2003	15.2
2002	983,843	April	2004	13.9
2003	975,252	March-April	2005	18.1
2004	1,073,951	March	2006	22.1
2005	987,460	April	2007	16.5
2006	1,037,772	Mar-April	2008	14.9
2007	870,842	Mar-April	2009	11.3
2008	1,169,701	Mar-April	2010	25
2009	1,030,028	April	2011	14.1
2010	847,580	April	2012	14.4
2011	838,664	April	2013	13.8
2012	827,321	April	2014	12.75
Averages	**582,420**			**14.1**

Source: Pahsimeroi Fish Hatchery brood year and run year reports.

Table 23. Juvenile summer Chinook Salmon releases from Pahsimeroi Fish Hatchery for brood years 1991-2002. These releases were part of the Idaho Supplementation Studies (ISS) research project in the Pahsimeroi River.

Brood Year	Number Released	Month Released	Year Released	Average Size (fpp)
1991	83,953	April	1993	13.1
1992	46,552	April	1994	13.7
1993	64,746	April	1995	12.3
1994	0	--	--	--
1995	0	--	--	--
1996	0	--	--	--
1997	135,669	April	1999	10
1998	53,837	April	2000	10.9
1999	85,939	April	2001	8.3
2000	89,923	April	2002	10.8
2001	295,992	April	2003	15.2
2002	124,489	April	2004	15.4
Average	**81,758**			**12.2**

Source: Pahsimeroi Fish Hatchery brood year and run year reports.

Table 24. Juvenile spring Chinook salmon releases from Pahsimeroi Fish Hatchery for brood years 2010-2012. These releases are part of the integrated supplemention program in the Pahsimeroi R.

Brood Year	Number Released	Month Released	Year Released	Average Size (fpp)
2010	179,269	April	2012	14.4
2011	167,209	April	2013	14
2012	142,506	April	2014	12.75
Average	**162,995**			**13.7**

Source: Pahsimeroi Fish Hatchery brood year and run year reports.

10.4 ACTUAL DATES OF RELEASE AND DESCRIPTION OF RELEASE PROTOCOLS

Yearling smolts are volitionally released from late-March through mid-April. Releases are planned to coincide with rising water flows in the Pahsimeroi River. Rearing pond screens and dam boards are removed allowing fish to volitionally emigrate from the ponds to the Pahsimeroi River. After approximately 14 days, fish that do not volitionally emigrate are forced out. Annual adjustments to release dates may occur based on water conditions, smolt size, and other environmental conditions.

10.5 FISH TRANSPORTATION PROCEDURES, IF APPLICABLE

No fish transportation is necessary as all fish are volitionally released to the Pahsimeroi River directly from the rearing ponds.

10.6 ACCLIMATION PROCEDURES (METHODS APPLIED AND LENGTH OF TIME)

For the Pahsimeroi summer Chinook salmon program, acclimation occurs for approximately 10 months while fish are being reared in the final rearing ponds. Water is supplied to these ponds via an intake canal/pipeline directly from the Pahsimeroi River.

10.7 MARKS APPLIED, AND PROPORTIONS OF THE TOTAL HATCHERY POPULATION MARKED, TO IDENTIFY HATCHERY ADULTS

Beginning with brood year 1991, all hatchery produced juveniles have been marked and or tagged to allow differentiation from naturally produced fish (Table 26). All fish from the segregated part of the program are marked with an adipose fin clip. To evaluate emigration success and timing to mainstem dams and to evaluate specific survival studies, PIT-tags are inserted in production release groups annually. Coded wire tags may be used as a mark for various evaluations and out of basin harvest monitoring. Smolts released as part of integrated the program are 100% CWT tagged but adipose fins are kept intact so they

10.8 DISPOSITION PLANS FOR FISH IDENTIFIED AT THE TIME OF RELEASE AS SURPLUS TO PROGRAMMED OR APPROVED LEVELS

Surplus smolts are not produced by this program.

10.9 FISH HEALTH CERTIFICATION PROCEDURES APPLIED PRE-RELEASE

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

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

A 450 kW standby generator is installed to power all well pumps and critical equipment during a utility power failure. Well pumps and motors are sized to sustain all fish if any one of the three wells becomes disabled. Therefore, emergency release procedures during early (indoor) rearing are not deemed necessary. An emergency release procedure for evacuating fish from the final rearing ponds involves simply removing rearing pond screens and allowing fish to exit to the Pahsimeroi River.

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:

1. Continuing fish health practices to minimize the impact of infectious disease agents. Follow IHOT, AFS, and PNFHPC guidelines. See Salmon River AOP for details.

2. Differential marking of integrated and segregated smolts.

3. Continued monitoring of natural smolt production.

4. Attempting to program time of release to mimic natural fish emigration for Pahsimeroi River smolt releases.

5. Continuing to use broodstock that exhibit life history characteristics similar to locally

evolved stocks.

6. Continuing to apply ELISA-based broodstock management for BKD. Incubate each female's progeny separately and also segregate/cull eggs/progeny for rearing based on ELISA values. Continue development of culling and rearing segregation guidelines and practices, relative to BKD. See Salmon River AOP/SOP for details. 7. Monitoring hatchery effluent to ensure compliance with National Pollutant Discharge Elimination System permit.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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 27. Performance indicators are reported annually in Hatchery Chinook Salmon Annual and Brood Year Reports Available for download here:

2014 Calendar Year Report:
https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-05Sullivan2014CalendarYearHatchery%20Chinook%20Salmon%20LSRCP%20and%20IPC%20Monitoring%20and%20Evaluations.pdf

2008 Brood Year Report:
https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res15-19SullivanBY2008ChinookHatcheryEvaluations%20Report.pdf

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

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-12Stiefel2015%20Adult%20Chinook%20Salmon%20Monitoring.pdf

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

Results of the Idaho Supplementation Studies Report are available for download here:

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res15-18Venditti1991-2014IdahoSupplementationStudiesCompletionReport.pdf

Economic Indicators are prepared and reported based on surveys completed by the U.S. Fish and Wildlife service within the last decade, anglers in Idaho expend more than $200 million dollars annually on salmon and steelhead fisheries. This is more than an order of magnitude greater than the cost of the program. Production costs per juvenile released in Idaho's anadromous fish hatcheries are comparable to other programs of similar size and intent in the Columbia River Basin.

Table 27. Standardized performance indicators and definitions for status and trends and hatchery effectiveness monitoring (Galbreath et al. 2008; appendix C).

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).

Survival – Productivity

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.

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 thetributary.

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 :

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.
Hatchery Measur	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, premolt, 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, premolt, 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

*Provide the following information for any research programs conducted in **direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the independent assessment of the effects of the research program on listed fish.** If applicable, correlate with research indicated as needed in any ESU hatchery plan approved by the co-managers and NOAA Fisheries. Attach a copy of any formal research proposal addressing activities covered in this section. Include estimated take levels for the research program with take levels provided for the associated hatchery program in Table 1.*

12.1 OBJECTIVE OR PURPOSE

Indicate why the research is needed, its benefit or effect on listed natural fish populations, and broad significance of the proposed project.

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 AND THE ATTACHED "TAKE TABLE" (TABLE 1B)

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

Include all references cited in the HGMP. In particular, indicate hatchery databases used to provide data for each section. Include electronic links to the hatchery databases used (if feasible), or to the staff person responsible for maintaining the hatchery database referenced (indicate email address). Attach or cite (where commonly available) relevant reports that describe the hatchery operation and impacts on the listed species or its critical habitat. Include any EISs, EAs, Biological Assessments, benefit/risk assessments, or other analysis or plans that provide pertinent background information to facilitate evaluation of the HGMP.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE 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

See Biological Assessment on USFWS Listed Species for Salmon and Steelhead Hatchery Programs in the Salmon Basin.

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

General Species Description, Status, and Habitat Requirements

Population Status and Distribution by Core Area

APPENDIX A

Table A1. Estimated take of listed salmonid species from hatchery activities.

Listed species affected: Summer Chinook salmon ESU/Population: Snake River ESU, Pahsimeroi R. Activity: Adult trapping and broodstock Collection				
Location of hatchery activity: Hatchery weir/trap Dates of activity: June – Early October, yearly Hatchery program operator: Todd Garlie				
	Annual Take of Listed Fish By Life Stage (Number of Fish)			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)			Entire run	
Removal (e.g. broodstock) e)			See Sliding Scale in Section 1.11.1. Fish removed for broodstock are killed as a result of spawning	
Intentional lethal take f)				
Unintentional lethal take g)			Pre-spawn mortality varies from 2-12%. Trapping and handling mortality is less than ½% of fish handled	
Other Take (specify) h)				

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.
h. Other takes not identified above as a category.

Table A2. Estimated take of listed salmonids resulting from hatchery programmatic maintenance activities. Estimated take for both Chinook salmon and steelhead are presented. Ck= Chinook salmon, Sthd= steelhead.

Listed species affected: spring/summer Chinook salmon and Snake River Summer Steelhead ESU/Population: Snake River/Pahsimeroi River Activity: Hatchery Programmatic Maintenance (See Section 2.2.3 for description of activities) Location of activity: Pahsimeroi Fish Hatchery (upper and lower facilities)					
		Annual Take of Listed Fish By Species and Life Stage (Number of Fish)			
Maintenance Activity	Type of Take	Ck/Sthd Egg & Fry	Ck/Sthd Juvenile & Smolt	Ck/Sthd Adult	Ck/Sthd Carcass
Hatchery Diversion Dam and Water Source Intake	Observe or harass a)				
	Capture, handle, and release c)		50/5		
	Unintentional lethal take g)		1/0		
	Other Take (specify) h)				
Water source intake canals and fish bypass screens	Observe or harass a)				
	Capture, handle, and release c)		50/5		
	Unintentional lethal take g)		1/0		
	Other Take (specify) h)				
Adult Fish Weir	Observe or harass a)				
	Capture, handle, and release c)		50/5		
	Unintentional lethal take g)		1/0		
	Other Take (specify) h)				
River Bank Stabilization	Observe or harass a)				
	Capture, handle, and release c)				
	Unintentional lethal take g)				
	Other Take (specify) h)				
TOTAL	Observe or harass a)				
	Capture, handle, and release c)		150/15		
	Unintentional lethal take g)		3/0		
	Other Take (specify) h)				