HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Upper Salmon River, Spring Chinook Salmon** Sawtooth Fish Hatchery
Species or Hatchery Stock:	Spring Chinook Salmon *Oncorhynchus tshawytscha*.
Agency/Operator:	Idaho Department of Fish and Game

Watershed and Region: Upper Salmon River, Idaho

Date Submitted:

Date Last Updated: April 2017

EXECUTIVE SUMMARY

The Sawtooth Fish Hatchery spring Chinook salmon hatchery program was established to mitigate for fish losses caused by the construction and operation of the four lower Snake River federal dams. The hatchery mitigation program is a federally authorized mandate to annually return 19,445 adult spring Chinook salmon to stream reaches upstream of Lower Granite Dam after harvest of 77,780 adult by commercial and sport fisheries. The program is primarily funded by the USFWS through the Lower Snake River Compensation Plan (LSRCP), which was approved by the Water Resources Development Act of 1976, (Public Law 94-587, Section 102, 94th Congress) to mitigate losses caused by the construction and operation of the four lower Snake River dams and navigation lock projects.

The Sawtooth hatchery spring Chinook Salmon program is contained within the Salmon River Upper Mainstem spring Chinook salmon population, part of the Upper Salmon River Major Population Group (MPG) of the Snake River Evolutionarily Significant Unit (ESU). The management goals for the South Fork (SF) Salmon River summer Chinook salmon population are to provide sustainable fishing opportunities and to enhance, recover and sustain the natural spawning population. Low abundance and productivity of the SF Salmon River natural population has been identified as a population risk by the Interior Columbia Technical Review Team (ICTRT).

Management of the Upper Salmon River spring Chinook hatchery program emphasizes the protection and enhancement of the natural spawning population as well as maintaining the fishery mitigation program. The balancing of fishery benefits with minimizing risk follows the two stage stepping stone integration program which was recommended for the Sawtooth Fish Hatchery spring Chinook salmon hatchery program by the Hatchery Scientific Review Group during their independent review of the program in 2008. 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 when natural-origin escapement is less than spawner escapement objectives, 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 is particularly advantageous during years of very low natural-origin abundance.

The Sawtooth Fish Hatchery (SFH) is located approximately 1.3 miles upstream of the lower boundary for the Upper Salmon River spring Chinook salmon population. The program releases approximately 2.0 million yearling spring Chinook salmon each year into the Upper Salmon River at the SFH. Currently 150,000 juveniles are produced from an integrated conservation component with the size of the integrated program changing with abundance of wild returns. In addition to the 1.7 M released into the upper Salmon River, up to 300,000 smolts are reared for release into the Yankee Fork of the Salmon River as part of cooperative supplementation effort with the Shoshone Bannock Tribes (SBT). The Yankee Fork Chinook salmon program is

covered under a separate HGMP. Plans to build a new hatchery facility (Crystal Springs) to accommodate the Yankee Fork production are currently under development (See Yankee Fork HGMP). Once this facility is constructed, the 300,000 smolts currently reared at SFH for release into the Yankee Fork will be reprogrammed for release into the upper Salmon River.

Broodstock for the segregated component are hatchery-origin adults returning from the previous segregated component releases. Adults originating from the integrated conservation component are also used as brood for the segregated component if they return in excess of what is needed to maintain the integrated component and meet escapement objectives above the weir. Measured inclusion of some adults from the integrated component of the program in the broodstock for the segregated program as part of the stepping stone program is a risk aversion action that affords the hatchery population a degree of genetic continuity with the naturally spawning population, thereby reducing adverse effects from interactions on the spawning grounds. This is important because the ability to control spawning composition is limited to the portion of the habitat upstream of the weir; however a spawning also occurs downstream of the weir.

Broodstock for the integrated component are collected at the Sawtooth 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 designed to maintain the existing harvest mitigation program while reducing risks to the natural population. Targeting a Proportionate Natural Influence (PNI) above 0.5 is expected to encourage local adaptation and potentially increase the productivity of the naturally spawning population.

This mitigation program has never achieved the escapement goal of 19,445 adults to the project area since its inception in 1985. Based on the 1997-2007 geometric mean SAR (0.37%) to Lower Granite dam, the production capacity at this facility needs to be increased to 5.25 million yearling smolts to return 19,445 adults to the project area under current Columbia River harvest schedules.

Key performance standards for the program will be 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 adult recruitment, harvest and escapement of the natural and hatchery components; and (5) abundance, productivity, diversity and spatial structure of the naturally spawning spring Chinook salmon population.

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 NAME OF HATCHERY OR PROGRAM

Hatchery: Sawtooth Fish Hatchery

Program: Spring Chinook salmon

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

Sawtooth Fish Hatchery (SFH) Upper Salmon River Spring Chinook were sourced from wild chinook salmon collected in the Upper Salmon (See section 6.1 for broodstock development history). NOAA determined they "are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU" and hatchery-origin Chinook salmon in this program were listed as "Threatened" under the ESA effective 8/29/05 (70 FR 37160; June 28, 2005).The SFH program is located in the Salmon River Upper Mainstem above Redfish Lake Creek population (SRUMA; Figure 1).

1.3 RESPONSIBLE ORGANIZATION AND INDIVIDUALS

Lead Contact

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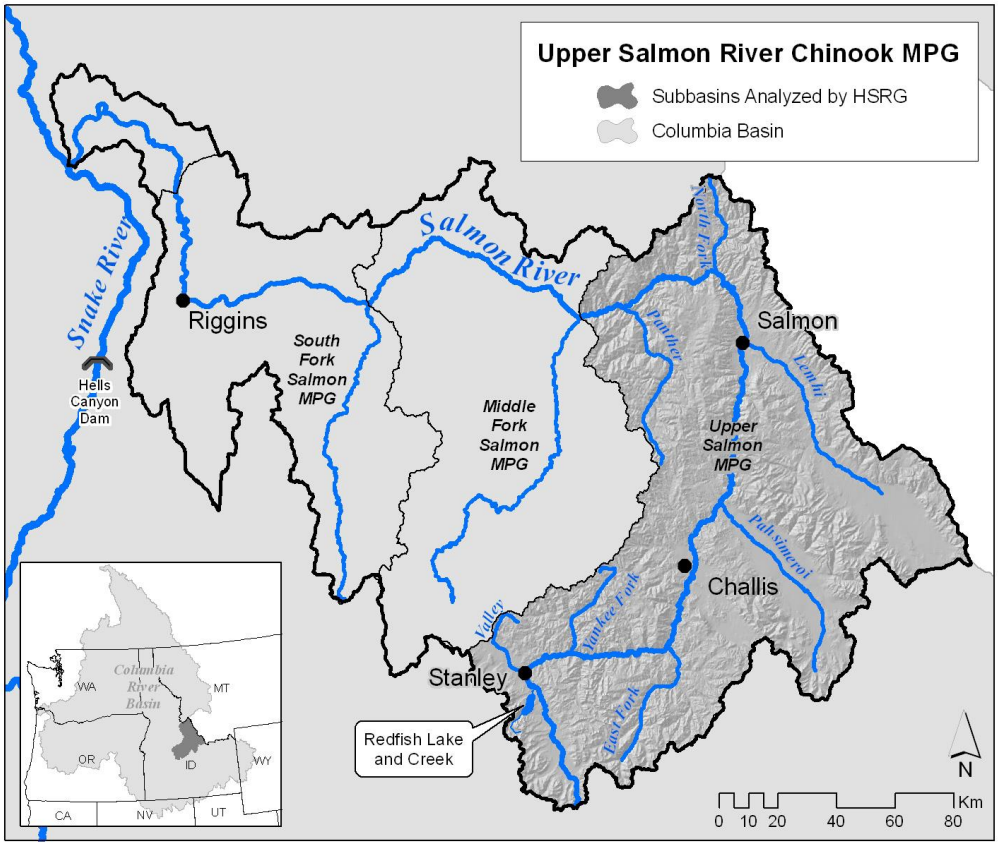

Source: HSRG 2009

Figure 1. Upper Salmon River Chinook MPG

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

IDFG, the Nez Perce Tribe (NPT), the Shoshone Bannock Tribe (SBT), the Lower Snake River Compensation Plan (LSRCP) office and the U.S. Fish and Wildlife Service (USFWS) collaboratively develop and implement production plans to meet production goals outlined in the U.S. *v* Oregon 2008-2017 Management Agreement, mitigation goals contained in settlement agreements or federal acts and agency/tribal fishery objectives. The same entities meet collaboratively to co-author Annual Operating Plans for LSRCP-funded hatchery programs and they work collaboratively in-season to meet shared broodstock needs for Salmon River hatchery programs. IDFG coordinates with the NPT and SBT, Oregon Department of Fish and Wildlife (ODFW) and Washington Department of Fish and Wildlife (WDFW) to manage state and tribal fisheries for harvest shares and ESA take. Harvest and hatchery management coordination

includes pre-season planning, scheduled weekly meetings and post-season summary meetings to share information and identify management actions required to meet tribal and state fishery objectives.

Specific relationships and coordinated efforts with other agencies are as follows:

- USFWS – LSRCP Office: Administers the Lower Snake River Compensation Plan as authorized by the Water Resources Development Act of 1976.
- SBT – The SBT receive up to 300,000 spring Chinook salmon smolts for an ongoing supplementation program in the Yankee Fork Salmon River. (Yankee Fork Program covered in a separate HGMP).

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

1.4.1 Sawtooth Fish Hatchery (SFH)

U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan funded.
Staffing level: 5 permanent staff and 76 months of temporary worker time.
Annual budget: $892,714 (FY14). Annual budget for SFH includes funding for trapping, spawning and early incubation of summer steelhead that is part of the LSRCP mitigation program.

1.5 LOCATION(S) OF HATCHERY AND ASSOCIATED FACILITIES

Overview – Broodstock are collected at the Sawtooth Hatchery weir located near the headwaters of the Salmon River at an elevation of 6,600 feet and approximately 400 river miles upstream from the mouth of the Salmon River. All adult trapping, spawning, incubation, and rearing occur at the Sawtooth Fish Hatchery. Smolts are released into the Upper Salmon River upstream of the hatchery weir, 300,000 smolts are released into the Yankee Fork Salmon River as part of a cooperative supplementation program with the Shoshone-Bannock Tribes (see the Yankee Fork HGMP).

Sawtooth Fish Hatchery –is located on the upper Salmon River approximately 8.0 kilometers south of Stanley, Idaho. The river kilometer code for the facility is 503.303.617. The hydrologic unit code for the facility is 17060201.

East Fork Salmon River Satellite – The East Fork Salmon River Satellite is located on the East Fork Salmon River approximately 29 kilometers upstream from the mouth. The river kilometer code for the facility is 522.303.552.029. The hydrologic unit code for the facility is 17060201. No Chinook salmon hatchery production or releases occur at the East Fork facility. Natural Chinook salmon are pass volitionally when the trap is not operated.

1.6 TYPE OF PROGRAM

Integrated Harvest (see section 1.8 and 1.11.

1.7 PURPOSE (GOAL) OF PROGRAM

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

"…[to]….. provide the number of salmon and steelhead trout needed in the Snake River system to help maintain commercial and sport fisheries for anadromous species on a sustaining basis in the Columbia River system and Pacific Ocean" (NMFS & USFWS 1972 p14)

Specific mitigation goals for the LSRCP were established in a three step process. First the adult escapement that occurred prior to construction of the four dams was estimated. Second an estimate was made of the reduction in adult escapement (loss) caused by construction and operation of the dams (e.g. direct mortality of smolt). Last, a catch to escapement ratio was used to estimate the future production that was forgone in commercial and recreational fisheries as result of the reduced spawning escapement and habitat loss. Assuming that the fisheries below the project area would continue to be prosecuted into the future as they had in the past, LSRCP adult return goals were expressed in terms of the adult escapement back to, or above the project area. Other than recognizing that the escapements back to the project area would be used for hatchery broodstock , no other specific priorities or goals were established in the enabling legislation or supporting documents regarding how these fish might be used.

For spring Chinook salmon the escapement above Lower Granite Dam prior to construction of these dams was estimated at 122,200 adults. Based on a 15% mortality rate for smolts transiting each of the four dams (48% total mortality) the expected reduction in adults subsequently returning to the area above Lower Granite Dam was 58,700. This number established the LSRCP escapement mitigation goal. This reduction in natural spawning escapement was estimated to result in a reduction in the coast wide commercial/tribal harvest of 176,100 adults, and a reduction in the recreational fishery harvest of 58,700 adults below the project area. In summary the expected total number of adults that would be produced as part of the LSRCP mitigation program was 293,500.

Component	Number of Adults
Escapement above Lower Granite Dam	58,700
Commercial Harvest	176,100
Recreational Harvest	58,700
Total	293,500

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

- The survival rates (SARs) observed over the history of the SFH Chinook Salmon program have been significantly less than the average rate used to plan the size of that mitigation hatchery production and, as a result, adult returns have been far fewer than the mitigation goal.
- The listing of Spring Chinook under the Endangered Species Act has resulted in significant curtailment of commercial, recreational and tribal fisheries throughout the mainstem Columbia River. This has resulted in a higher percentage of the annual run returning to the project area. Nevertheless, SFH adult returns to the project area have never met the mitigation goal.
- The U.S. v. Oregon court stipulated Fishery Management Plan has established specific hatchery production agreements between the states, tribes and federal government. This agreement has substantially diversified the spring Chinook hatchery program by adding new off station releases sites and stocks designed to meet short term conservation objectives.

The upper Salmon River spring Chinook salmon mitigation program was designed to escape 19,445 adults back to the project area after a harvest of 77,800. While recognizing the overarching purpose and goals established for the LSRCP, and realities' regarding changes since the program was authorized, the following objectives for the beneficial uses of adult returns have been established for the period through 2017:

1. To contribute to the recreational, commercial and/or tribal fisheries in the mainstem Columbia River consistent with agreed to abundance based harvest rate schedules established in the 2008 – 2017 U.S. vs. Oregon Management Agreement.
2. To collect approximately 1040 adult broodstock to perpetuate this hatchery program (see sections 6-8 for more detail).
3. To provide recreational and tribal fisheries annually (see Section 3.3 for more detail).
4. To utilize hatchery-origin adults for supplementing the natural population.

To maximize the beneficial uses of fish that return to the project area that are not used for broodstock, harvest or natural spawning, managers have developed agreements to share and

distribute these fish equally between tribal and non-tribal entities. Specific objectives are established annually as part of a preseason co-manager meeting between the states, tribes and federal agencies to prioritize the distribution of fish, Specific dispositions may include:

a. Recycling fish back through terminal fisheries
b. Tribal subsistence
c. Donations to food banks and charitable organizations
d. Outplanting for natural spawning
e. Nutrient enhancement

1.8 JUSTIFICATION FOR THE PROGRAM

The upper Salmon River spring Chinook salmon hatchery program is part of the Lower Snake River Compensation Plan (LSRCP), a congressionally mandated program pursuant to PL 94-587. The purpose of the LSRCP is to replace adult salmon, steelhead and rainbow trout lost by construction and operation of four hydroelectric dams on the Lower Snake River.

Chinook salmon production from Sawtooth Fish Hatchery is intended to mitigate for lost harvest opportunity associated with impacts to fish survival and productivity associated with construction of the Lower Snake River dams, we also prioritize conservation of the natural population. An integrated component of the hatchery production is used to increase the abundance of fish spawning naturally, increase the extent of available spawning habitat utilized, and provide a genetic repository for natural fish. By integrating the hatchery broodstock, managers are also attempting to let the natural environment drive selection in the hatchery population thereby reducing risks associated with hatchery-origin fish spawning naturally. **The intent is stepwise full integration of the entire production when annual returns of natural origin spawners are sufficient.**

Integrating the hatchery program is intended to minimize the impacts and risks of hatchery production to the local and adjacent natural populations. Implementing a stepping stone integrated hatchery program at the Sawtooth Fish Hatchery will not by itself substantially offset impacts of the Lower Snake River Hydrosystem dams to natural population productivity and viability.

The Sawtooth Fish Hatchery program releases approximately 1.7 million yearling spring Chinook salmon each year into the Upper Salmon River. Currently 150,000 smolts are produced in integrated component and 300,000 smolts are released into the Yankee Fork of the Salmon River as part of a cooperative supplementation program with the SBT. (see the Yankee Fork HGMP for details). Plans to build a new hatchery facility (Crystal Springs) to accommodate the Yankee Fork production are currently under development. Once this facility is constructed, the 300,000 smolts currently reared at SFH for release into the Yankee Fork will be reprogrammed for release into the upper Salmon River mainstem.

Broodstock for the harvest component of the program will be developed using adults from the segregated harvest component. Adults from the integrated conservation component will be incorporated into the segregated releases as described in the sliding scale (): 1) maintain the

Comment [LH1]: Cite sliding scale

150,000 integrated component and 2) meet escapement objectives above the weir.

This approach, referred to as a two-stage stepping stone program, was recommended by the Hatchery Scientific Review Group during their independent review of the program in 2008. The stepping stone program is a risk aversion action that affords the hatchery population a degree of genetic continuity with the naturally spawning population, thereby reducing adverse effects of interactions on the spawning grounds. This is important because the ability to control spawning composition is limited to the portion of the habitat upstream of the weir used to collect broodstock; however a significant amount of spawning also occurs below the weir. All releases from both hatchery program components will occur upstream of the weir.

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Broodstock for the integrated component is composed of integrated hatchery-origin and natural origin adult returns. The 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 designed to maintain the existing harvest mitigation program while reducing risks to the natural population.

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.

Comment [3]: oes the data need to change to 2015?

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 discussed 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 (2008).

Category	Standards	Indicators
1. **LEG**	1.1. Program contributes to fulfilling tribal trust responsibility mandates and	1.1.1. Total number of fish harvested in Tribal fisheries targeting this program.

AL MA NDA TES	treaty rights, as described in applicable agreements such as under U.S. v. OR and U.S. v. Washington.	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. IMP LEM ENT ATI ON AND CO MPL IAN CE	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. HAT CHE RY EFFE CTIV ENE SS MO NIT ORI NG REG	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.

IONAL FOR AUGMENTATION AND SUPPLEMENTATION PROGRAMS	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.
4. OPERATI	4.1. Artificial production facilities are operated in compliance with all applicable fish health guidelines and	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

ON OF ARTIFICIAL PRODUCTION FACILITIES	facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.	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.

1.1 LIST OF PROGRAM "PERFORMANCE INDICATORS", DESIGNATED BY "BENEFITS" AND "RISKS."

1.10.1 "Performance Indicators" addressing benefits.

Evaluation of the Upper Salmon River Spring Chinook Salmon Hatchery Program utilizes the performance standards and associated performance indicators in sections 1.9 and 11.1.1. In addition to yearly evaluations, the LSRCP performs a comprehensive review of their hatchery programs in the Snake Basin to include adaptive management recommendations addressing the benefits and risks of the program. The recommendations will incorporate the findings from studies conducted on the Upper Salmon River, including the Idaho Supplementation Studies project and other hatchery programs that may lead to greater program benefits to the natural Upper Salmon River population and attainment of mitigation level adult returns.

1.10.2 "Performance Indicators" addressing risks.

Evaluation of the Upper Salmon River Program utilizes the performance standards and associated performance indicators in sections 1.9 and 11.1.1. In addition to yearly evaluations, the LSRCP performs a comprehensive review of their hatchery programs in the Snake Basin to include adaptive management recommendations addressing the benefits and risks of the program. The recommendations will incorporate the findings from studies conducted on the Upper Salmon River and other hatchery programs that may lead to risks to the natural Upper Salmon River population.

1.11 EXPECTED SIZE OF PROGRAM

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

Approximately 525 female and 525 male spring Chinook are spawned to meet current program management objectives of producing 2.0 million smolts. To account for pre-spawning mortality, approximately 537 pairs of adults are trapped and held. Of the 2.0M smolts produced, 1.7 million are released into the mainstem Salmon River near the Sawtooth Fish Hatchery and up to 300,000 smolts are released into the Yankee Fork Salmon River as part of the SBT Yankee Fork Chinook Salmon Program (see Yankee Fork spring Chinook salmon HGMP). Broodstock for the 300,000 yearling smolts for the Yankee Fork Salmon may be a combination of adults trapped in the Yankee Fork Salmon River and at the Sawtooth Fish Hatchery.

To meet harvest mitigation objectives within the upper Salmon River Basin as a whole, the hatchery production goals of state and tribal cooperators include the intent of fully utilizing available hatchery rearing space within the basin. There are occasional years when hatchery returns to the Sawtooth Hatchery trap exceed broodstock needs yet returns to the IPC Pahsimeroi Hatchery facility fall short of full broodstock needs and some portion of the hatchery rearing space cannot be filled. If the shortfall leaves discrete rearing vessels (early rearing vats and associated final rearing raceways) unutilized, state and tribal cooperators may elect to attempt to fill that vacancy with fish originating from adults spawned at Sawtooth Hatchery in excess of brood required to fill that facility. These fish would be reared separately from Pahsimeroi origin

fish. They would be, 100 percent ad-clipped and coded-wire tagged with a unique tag code and, as smolts, transported back to Sawtooth Hatchery for release. Juvenile migration survival and adult returns specific to this release group will be monitored and evaluated according to indicators and standards outlined in Section 11 of this document.

Implementing the development of an integrated broodstock

The Sawtooth Hatchery Upper Salmon River Spring Chinook Salmon hatchery program has both conservation and harvest objectives. Presently the returns of natural origin fish from the Upper Salmon River population are depressed and limit our ability to fully integrate (at recommended PNI levels) all hatchery production. An approach described by the HSRG as a "stepping-stone program" is being implemented. The purpose of this type of program is to integrate a "subset" of the hatchery population. The approach is designed to maintain genetic integrity of the population, augment numbers of adults spawning in the habitat, and to use integrated adults in excess of broodstock and habitat needs as spawners within the segregated program.

In 2010 we initiated the development of an integrated stepping stone broodstock as part of the Upper Salmon River Spring Chinook Salmon Hatchery program in the upper Salmon River as recommended by the HSRG in 2008. A release goal of 150,000 smolts derived primarily from natural-origin returns (NORs) was established. Broodstock composition is guided by the use of a sliding scale that is based on the abundance of natural origin adults and reflects the portion of the population upstream of the Sawtooth weir (Table 2). The proportion of natural origin fish in the broodstock (pNOB) and the number of hatchery fish released upstream (pHOS) will vary depending on the number of natural origin returns. If the natural origin return in a given year is forecasted be less than 50 individuals, managers will reinitiate consultation with NOAA Fisheries.

Ideally, adults spawned to create the integrated program would have been derived using 100% NORs for the first generation. However, due to ongoing supplementation research (Bowles and Leitzinger, 1991) in the upper Salmon River, managers decided to reduce the number of NORs retained for broodstock to avoid confounding research results. All spawn crosses used to create the integrated smolts for brood years 2010-2012 were hatchery-origin by natural-origin (HxN). The 150,000 integrated smolts are marked differentially (100% CWT, no-fin clip) from the segregated harvest component (100% Ad-clip). However, as the program moves towards full integration, the marking and tagging strategy for the integrated smolts will change to allow for the harvest of integrated adults.

Maintaining the Integrated (stepping stone) broodstock 2013 and Beyond

Beginning with brood year 2014, full implementation of the sliding scale was initiated. Using a sliding scale enables simultaneous management of both the smaller integrated brood for conservation and the larger segregated brood for fishery mitigation during the first phase of the stepping stone program. The sliding scale allows the proportion of NORs in the broodstock (pNOB) and the proportion of naturally spawning adults that is composed of hatchery origin returns (pHOS) to slide with variable NOR escapement. As the number of NORs increases,

pNOB increases and pHOS decreases resulting in a higher PNI (pNOB/(pNOB+pHOS)). In order to reduce risk associated with segregated fish spawning unintended downstream of the Sawtooth weir, we have prioritized including integrated hatchery fish into the segregated component of the hatchery program if the return of integrated hatchery fish exceeds numbers needed to meet broodstock needs for the integrated program and spawning escapement objectives upstream of the weir.

Table 2. Sliding scale broodstock and weir management for the integrated broodstock program in the Upper Salmon River (Sawtooth Fish Hatchery). NOR = natural origin returns, pHOS= proportion of spawners upstream of Sawtooth weir that are hatchery origin spawners.

NOR Return to Weir		NORs Released Above Weir		Maximum Number of NORs Held for Brood		Max % of NORs Retained for Brood	Max. pHOS
50	124	30	74	20	50	40.0%	NA
125	349	75	281	50	68	40.0%	NA
350	699	278	627	72	72	25.0%	0.45
700	999	579	878	121	121	25.0%	0.45
1,000	1,299	759	1,058	241	241	25.0%	0.35
1,300	1,599	818	1,117	482	482	40.0%	0.35
1,600	2,000	781	1,181	819	819	52.0%	0.35

While the ultimate management target is for a long term average PNI of 0.67, the low and variable natural origin returns dictate near-term adaptive management that results in levels less than 0.67. When NOR escapements are low, guidelines are relaxed to allow a larger hatchery influence in both the hatchery and natural environments (Table 2). The Salmon River mainstem 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 the minimum escapement, segregated adults may be released upstream to spawn naturally to meet the minimum escapement objective.

The integrated hatchery program in the Upper Salmon River is a stepping stone program with the ultimate goal of full integration of the entire hatchery production. The initial size of the size of integrated portion of the SFSR hatchery program was constrained to 150,000 smolts in order to maintain a high proportion of natural fish in the broodstock and avoid removing too many natural adults from the natural environment.

In the twelve year period between 2004-2015 natural-origin Chinook salmon returns to the Sawtooth Fish Hatchery weir averaged 369 adults (Range 130-658). Given the depressed and

variable natural returns, increasing the size of the program as part of the stepping stone progression towards full integration will be implemented adaptively based on the projected return of natural adults to the weir every year. Timing of natural origin returns to the Sawtooth Fish Hatchery weir is relatively consistent and average timing data coupled with early returns to the weir can be used to project the eventual size of the total return in any given year. In years when the projected return to the weir exceeds 700 natural origin adults (jacks excluded) we will increase the size of the integrated program and concurrently reduce the size of the segregated program in an increment consistent with trying to maintain at least 1,000 spawners above the weir (Table 2a).

Table 2a. Sliding scale of natural origin abundance at the Sawtooth weir used to determine the size of the integrated smolt program.

Projected NOR Return to Weir (Jacks Excluded)	Size of Integrated Smolt Program
<700	150,000
700-999	250,000
1,000-1,299	500,000
1300-1599	1,000,000
>1,600	1,700,000

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

Table 3. Proposed releases of Upper Salmon River Hatchery Chinook salmon.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		NA
Unfed Fry		NA
Fry		NA
Fingerling		NA
Yearling	• Upper Salmon River –Segregated	• 1,550,000 100% adipose fin-clipped

	• Harvest • Upper Salmon River – Integrated Supplementation • Yankee Fork Salmon River- Shoshone Bannock program	• 150,000 100% CWT only • 300,000

Comment [LH4]: Update with recognition of moving the 300k YFSR back to USR after crystal springs online.

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

The most recent performance data for hatchery origin spring Chinook salmon released at or above the Sawtooth Fish Hatchery in the mainstem Salmon River are presented in Tables 4 and 5. The geometric mean SAR from release to Lower Granite Dam for segregated smolts released from brood years 1996-2007 is 0.37% (Table 4). For brood years 1991-2002 the geometric mean SAR for the integrated supplementation releases that were part of the ISS research project is 0.08% (Table 5).

1.13 DATE PROGRAM STARTED

The Sawtooth Fish Hatchery began operation in 1985. Supplementation research as part of the ISS study was conducted for brood years 1991-2002. The integrated broodstock as recommended by the HSRG began in 2010.

1.14 EXPECTED DURATION OF PROGRAM

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

Table 4. Sawtooth Fish Hatchery Chinook salmon smolt-to-adult survival (SAS) rates and smolt-to-adult return rates (SAR) to Lower Granite Dam for segregated production fish released into the Salmon River immediately upstream from the Sawtooth Hatchery weir for Brood Years 1991-2007.

Brood Year	Release Year	Number Released	Return Years	Age at Return			Total Adult Production	SAS (%)	Total Adult Returns to Lower Granite Dam	SAR to Lower Graite Dam
				1-ocean	2-ocean	3-ocean				
1991	1993	109,753	94,95,96	1	1	0	2	0.002%	2	0.002%
1992[a]	1994	141,530	95,96,97	6	19	8	33	0.023%	33	0.023%
1993	1995	103,695	96,97,98	18	76	12	106	0.102%	106	0.102%
1995[a]	1997	4,650	98,99,00	0	12	31	43	0.925%	43	0.925%
1997	1999	117,442	00,01,02	200	871	204	1275	1.086%	1171	0.997%
2000	2002	265,642	03,04,05	422	883	56	1361	0.512%	1285	0.484%
2001[a]	2003	960,193	04,05,06	502	1001	86	1589	0.165%	1589	0.165%
2002	2004	624,739	05,06,07	116	487	146	749	0.120%	724	0.116%
2003[a]	2005	134,769	06,07,08	23	136	54	213	0.158%	213	0.158%
2004	2006	1,552,444	07,08,09	1408	4814	349	6571	0.423%	6114	0.394%
2005	2007	995,262	08,09,10	2387	4376	108	6871	0.690%	6360	0.639%
2006	2008	174,132	09,10,11	434	660	87	1181	0.678%	1089	0.625%
2007	2009	274,644	10,11,12	156	373	111	640	0.233%	549	0.200%
			Geometric Mean (97-07)					0.387%		0.365%
			Geometric Mean (91-02)					0.120%		0.118%

Source: Lower Snake River Compensation Plan Chinook Salmon Fish Hatchery Evaluation- Idaho; IDFG Report Number 15-106.

Table 5. Sawtooth Fish Hatchery Chinook salmon smolt-to-adult survival (SAS) rates for integrated supplementation smolts released into the Salmon River upstream from the hatchery weir for brood years 1991-2002.

Brood Year	Release Year	Number Released	Return Years	Age at Return			Total Adult Production	SAS (%)	Total Adult Returns To Lower Grantie Dam	SAR (%) to Lower Graite Dam
				1-ocean	2-ocean	3-ocean				
1991[a]	1993	51,819	94,95,96	0	0	1	1	0.002%	1	0.002%
1992[a]	1994	72,300	95,96,97	2	3	1	6	0.008%	6	0.008%
1993[a]	1995	205,593	96,97,98	0	9	8	17	0.008%	17	0.008%
1994	1996	25,082	97,98,99	1	1	3	5	0.020%	5	0.020%
1996[a]	1998	43,161	99,00,01	61	142	32	235	0.544%	235	0.544%
1997	1999	105,951	00,01,02	88	464	65	617	0.582%	598	0.564%
1998	2000	123,425	01,02,03	183	779	161	1123	0.910%	1071	0.868%
1999	2001	57,134	02,03,04	63	120	0	183	0.320%	183	0.320%
2000	2002	120,119	03,04,05	50	204	18	272	0.226%	238	0.198%
2001	2003	136,546	04,05,06	59	122	6	187	0.137%	186	0.136%
2002	2004	187,461	05,06,07	54	48	22	124	0.066%	124	0.066%
Geometric Mean (91-02)								**0.076%**		**0.075%**

[a] Release groups were not tagged with CWT therefore any fish harvested in mixed stock fishieres would not be accounted for.

Source: IDFG unpublished data.

1.15 WATERSHEDS TARGETED BY PROGRAM

- Salmon River –above Redfish Lake Creek: HUC 17060201

1.16 INDICATE ALTERNATIVE ACTIONS CONSIDERED FOR ATTAINING PROGRAM GOALS

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

The upper Salmon River hatchery program has a federally authorized goal to return 19,445 adult spring run Chinook salmon to stream reaches upstream of Lower Granite Dam after a harvest of 77,780 adults in ocean and Columbia River commercial, tribal and recreational fisheries (see Section 1.7). It is the goal of this hatchery program to ensure hatchery-produced Chinook salmon are available to provide fisheries that are consistent with meeting spawning escapement targets and preserving the genetic integrity of natural populations. The 19,445 adult mitigation goal to the project area has not been reached since the inception of the program. The 1997-2007 geometric mean SAR to Lower Granite dam is 0.37% (Table 4).

The alternatives to meeting the program objectives are described in detail below. Alternatives #3 and #4 address both mitigation and conservation aspects, but based on average natural-origin returns to the Sawtooth Fish Hatchery it is unlikely that there would be sufficient natural-origin adults to fully integrate this hatchery program. Alternative #5 is not logistically feasible at this

point in time due to the extraordinarily large increase in production that would be necessary and the insufficient number of NORs needed to integrate a hatchery program this large. Alternative #3 is the preferred choice by managers. This HGMP does not reflect the facility and personnel needs that are required to fully implement alternative #3. Facility and personnel needs to fully implement alternative #3 will be discussed and negotiated outside of this HGMP. Instead, this HGMP addresses needs to operate the program under the status quo as described in the Executive Summary. This includes maintaining hatchery capacity at 2.0 million and dedicating approximately 7.5% of the hatchery capacity for the integrated conservation component of the program.

Managers have considered five alternative actions to the current mitigation program to achieve mitigation and conservation goals.

1. Sawtooth Fish Hatchery was designed to rear 2.3M yearling smolts. Current capacity is only 2.0M smolts. Increasing to full capacity would get closer to mitigation goal.
2. Current hatchery capacity and post-release survival conditions have never met the mitigation goal of 19,445 adults back to the project area. Current conditions have not resulted in meeting the planning SAR. Assuming previous conditions continue we can use the geometric mean SAR of 0.37% and estimate that production capacity needs to be increased to 5.25 million yearling smolts (19,445/0.0037= 5.25M) to result in 19,445 adults at Lower Granite Dam.
3. The integrated component is 150,000 yearling smolts. This represents 7.5% of the current hatchery capacity. In order offset this lost harvest opportunity for recreational fisheries, the hatchery capacity needs to be increased by 150,000 yearling smolts [total capacity; 5.25M (from #1 above) + 150,000 = 5.4M].
4. If a long term goal to fully integrate the hatchery broodstock were prioritized, the ability to fully integrate the program would be dependent on having sufficient natural-origin adults returning to the upper Salmon River (see sliding scale in Section 1.11.1). Attempting full integration with a high degree of natural influence at natural escapement levels observed above Sawtooth Hatchery weir over the last decade would require using all natural origin returns for integrated broodstock.
5. LSRCP mitigation goals were developed assuming a 4:1 catch to escapement ratio to the project area upstream of Lower Granite Dam. The original LSRCP mitigation goal included returning 19, 445 fish to the project area and an additional 77,780 downstream of the project for tribal non-tribal fisheries. To meet the full mitigation goal of 97,225 adults the hatchery capacity needs to be increased to approximately 26.3M yearling smolts (97,225/0.0037).

1.17 Staffing, support logistics, and facility changes needed to implement this integrated program and the associated monitoring and evaluation.

The following section identifies needs for the program as described in this HGMP but does not include needs necessary to fully implement alternative #3 in Section 1.16 above.

a. Facilities
    a. Increase production capacity at Sawtooth Fish Hatchery to meet the original production objective of 2.3 million smolts.
    b. Modify adult trap entrance facilitate transition of fish into the hatchery.
b. M&E
    a. Parental Based Tagging (PBT) has been identified as a priority to evaluate the integrated broodstock program (See Section 11.1). Currently, insufficient funds are available to fully fund this program.
    b. Most of natural production monitoring conducted by IDFG that previously occurred in the upper Salmon River was funded through an ongoing BPA funded supplementation research project (Bowles and Leitzinger 1991; BPA project 1991-073-00). This project sunsets in 2015 and continued monitoring of the hatchery and natural populations in the upper Salmon River will require additional funds to meet the management requirements for implementing the integrated and segregated hatchery program..

USFWS Hatchery Review Team (HRT) Recommendations

The HRT provided several potential programmatic alternatives to the current hatchery program along with their recommendation for the preferred alternative. For the Sawtooth Fish Hatchery upper Salmon River spring Chinook salmon program, the HRT preferred alternative is for the managers to develop a stepping stone program with an integrated component for conservation above the hatchery weir and a harvest mitigation component utilizing the stepping stone broodstock. Managers initiated development of an integrated broodstock beginning in 2010 (see Section 1.11.1 for details)

In addition to the programmatic recommendations, the review team also provided specific recommendations across eight categories: Program Goals and Objectives; Broodstock Choice and Collection; Hatchery and Natural Spawning; Incubation and Rearing; Release and Outmigration; Facilities and Operations; Research, Monitoring and Accountability; and Education and Outreach. Responses from the managers for each of the recommendations are provided in Appendix B - Table B1. Many of these recommendations will require additional funds in order to implement them.

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 7 consultation with the USFWS (April 2, 1999) resulted in NMFS Biological Opinion for the Lower Snake River Compensation Program (now expired). In 2003,

consultation was initiated to develop a new Snake River Hatchery Biological Opinion. Consultation has not been completed.

- Section 10 Permit Number 920 for Sawtooth Fish Hatchery, authorized direct and indirect take of listed Snake River salmon associated with hatchery operations and broodstock collection at Lower Snake River Compensation Program hatcheries operated by Idaho Department of Fish and Game. Expired 12/31/98; reapplication (to consolidate all programs under permit 1179) in process.

- ESA take non-tribal fisheries is authorized under an (Fisheries Monitoring and Evaluation Plan (FMEP) submitted to NOAA Fisheries in January 2011 under Section 4(d) Rule Limit 4.

- Annually renewed 4(d) research permits authorizing take of ESA listed salmonids associated with research/monitoring activities under ESA 4(d) rule's research limit 50CFR2233.203(b)(7).

- Section 10 Permit Number 1124 authorizing annual take of ESA listed Sockeye Salmon associated with research/management activities: Permit expires December 31, 2017.

- Snake River Sockeye Salmon Captive Broodstock, Research and Production HGMP. (Update May 2012).

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

Status of populations affected by this program is described in a report prepared by the Interior Columbia River Technical Recovery Team (ICTRT 2005). Information provided in this section is summarized from that publication but also includes more recent status assessment data that has been submitted to NOAA fisheries by IDFG.

The Salmon River Chinook salmon population is part of the Snake River spring/summer Chinook salmon ESU which has five major population groupings (MSGs). These are the 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 salmon. The Upper Salmon River population is a spring run and is one of eight extant populations in the Upper Salmon River MPG.

The ICTRT classified the Upper Salmon River as a "large" population based on historical habitat potential (ICTRT 2005). A Chinook salmon 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. Historically, it is estimated that from 2 to 3 million spring/summer Chinook salmon returned to the entire Snake River each year (NPCC 2004). The portion returning to the Salmon River above Redfish Lake Creek is unknown, but was probably in the thousands.

Adult Upper Salmon Chinook salmon returning to the subbasin consist of both hatchery- and natural-origin fish, as there is a segregated hatchery program present at the Sawtooth Fish Hatchery. With the exception of Rapid River stock, natural- and hatchery-origin Chinook salmon in the Salmon River drainage are listed as threatened under the ESA. Spawning takes place from mid-July through late September.

The ICTRT has identified three major spawning areas (MaSAs) and no minor spawning areas (MiSAs) within the Upper Salmon River Chinook salmon population (Figure 2). There are no modeled temperature limitations within this MaSA. Spawning is distributed broadly throughout the population boundaries including the mainstem and numerous tributaries. Tributaries most used by Chinook salmon for spawning include Beaver Creek, Frenchman Creek, Pole Creek and Alturas Lake Creek, although historically and currently most spawning occurs in the mainstem Salmon River.

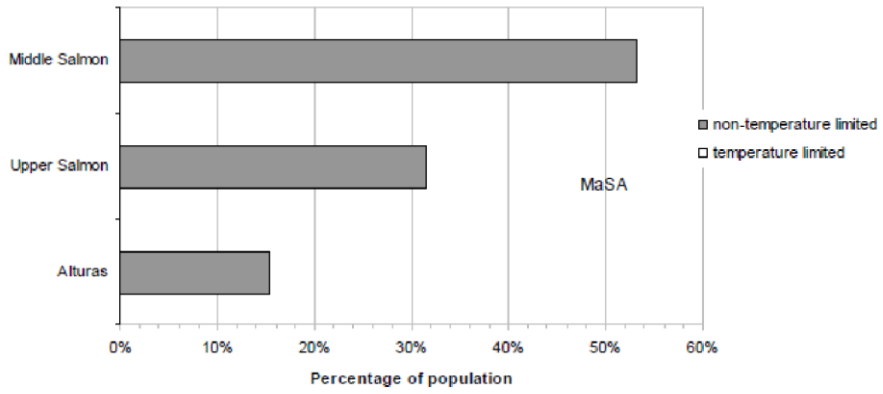
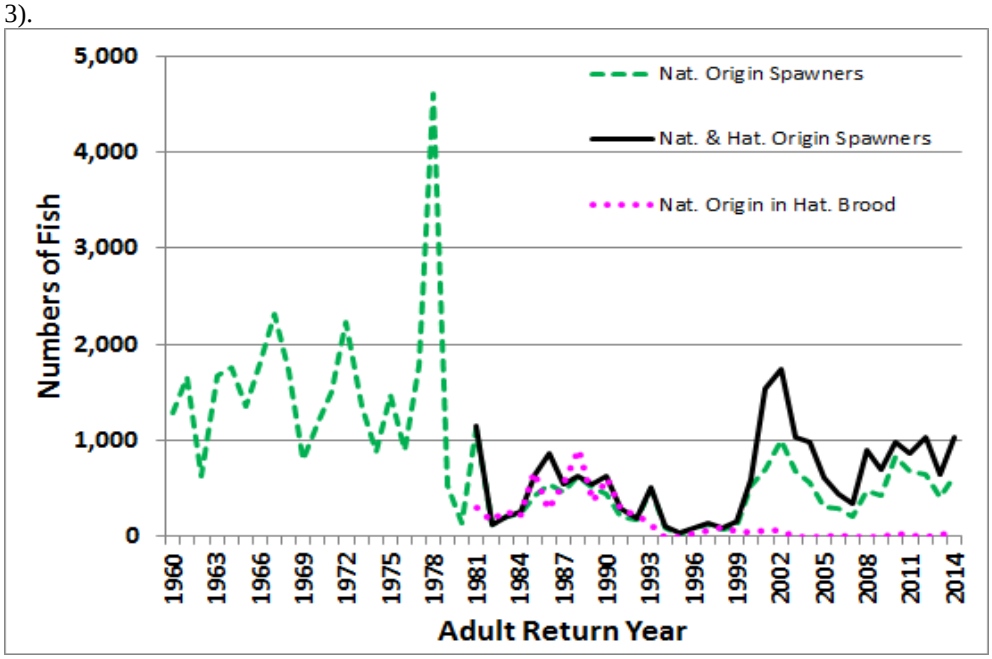


Figure 2. Upper Salmon River Spring Chinook population contains three MaSAs and no MiSAs.

In recent years, natural spawners include returns originating from naturally spawning parents and hatchery fish originating from the Sawtooth Fish Hatchery located on the Salmon River approximately one mile upstream of Redfish Lake Creek. A weir at the hatchery is used to trap salmon and regulate the number of hatchery fish passed upstream. Since the early 1990s, only natural-origin fish and supplementation program adults were passed upstream to spawn naturally. Fish returning as part of the harvest augmentation program are not released above the weir. Fish spawning downstream of the weir include natural-origin, hatchery-origin, and potentially some of the supplementation program adults. There are no efforts to regulate the composition of spawners downstream of the weir. Spawners originating from naturally spawning parents have

comprised an average of 89% since 1962, while the 96-05 average is 75%.

Abundance in recent years has been highly variable; the recent 10-year geometric number of natural-origin spawners was 268 fish. From 1981 through 2005, returns per spawner for Chinook Salmon in the Upper Salmon River ranged from 0.14 in 1990 to 16.55 in 1983 (Figure 3).



Source: Idaho Fish and Game

Figure 3. Upper Salmon River natural and total spring chinook salmon spawner abundance trends 1962-2015 for the Upper Salmon River Mainstem population above Redfish Lake Creek. Estimated from redd counts and weir counts.

Adult Run Timing – Run timing of natural-origin Chinook salmon at the Sawtooth Fish Hatchery weir generally occurs between mid-June and the first week of September and resembles a bimodal distribution. The first mode occurs between mid-June and the first week of August. The second, smaller, mode generally occurs between mid-August and the first week of September. Arrival dates for the 10th, 50th and 90th percentile of natural-origin returning adults from 1997-2012 are displayed in Table 6.

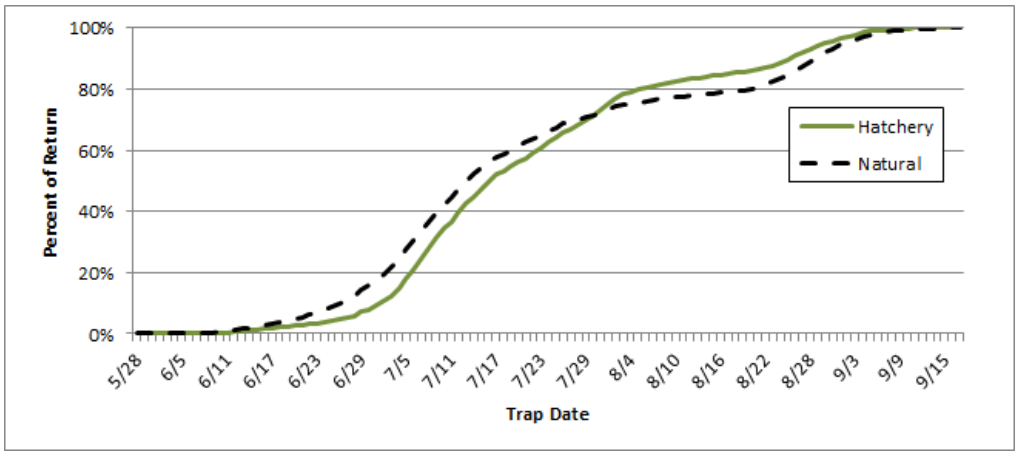
Arrival timing of hatchery-origin fish at the Sawtooth Fish Hatchery weir substantially overlaps with the arrival timing of natural-origin Chinook salmon. Figure 4 below displays the average cumulative proportion of hatchery- and natural-origin Chinook arriving at the Sawtooth Fish Hatchery weir 1997 through 2012.

Table 6. Arrival timing of natural-origin Chinook salmon at the Sawtooth Fish

Hatchery weir, 1997-2012.

Return Year	Number of Natural Origin Returns	Percent of Return		
		10%	50%	90%
1997	155	7/16	7/25	9/2
1998	128	6/25	7/16	9/9
1999	122	7/13	7/24	9/2
2000	535	6/22	7/8	9/7
2001	671	6/13	6/29	9/11
2002	863	6/28	7/8	9/1
2003	538	6/27	7/8	9/3
2004	483	6/28	7/10	9/1
2005	281	6/26	7/8	9/2
2006	296	7/2	7/11	8/27
2007	186	6/23	7/9	8/28
2008	392	7/11	7/25	9/3
2009	447	7/5	7/14	8/31
2010	720	7/5	7/18	8/31
2011	599	7/24	8/2	8/27
2012	504	7/5	7/13	8/28
Source: IDFG unpublished data				

Figure 4. Average cumulative proportion of hatchery- and natural-origin Chinook arriving at the Sawtooth Fish Hatchery weir 1997- 2012.



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. The age composition for return years 1998-2012 are summarized in Table 7. They found that, while age structure was variable from year to year, the majority of returning adults were composed of two-ocean adults.

Table 7. Estimated percent by age class of wild 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%**

Note: Small numbers of mini-jacks are observed at Lower Granite dam but are excluded from this age compositon

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

Ages for natural-origin Chinook returning to the Upper Salmon 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 Upper Salmon 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 1996 through 2012, the average age structure for natural-origin Chinook salmon returning to the Sawtooth Fish Hatchery was 11.42% one-ocean, 62.4% two-ocean, and 26.2% three-ocean (Table 8).

Table 8. Age class structure of natural-origin Chinook salmon captured at the Sawtooth Fish Hatchery weir 1998-2012. Ocean-age is displayed as a percent of the return.

Return Year	Number of Natural Adults	Percent of Natural Origin Return		
		1-Ocean	2-Ocean	3-Ocean
1996	105	7.6	78.1	14.3
1997	155	5.2	60.6	34.2
1998	127	3.1	24.4	72.5
1999	122	15.6	63.9	20.5
2000	535	17.9	75.9	6.2
2001	676	7.7	78.1	14.2
2002	863	2.4	60.7	36.9
2003	550	8.7	22.5	68.8
2004	483	12.8	78.9	8.3
2005	281	5.7	61.9	32.4
2006	296	6.6	85.3	8.1
2007	186	29.4	33.3	37.3
2008	392	12.2	78.6	9.2
2009	447	13.9	67.3	18.8
2010	720	9.9	81.5	8.6
2011	599	34.2	39.9	25.9
2012	504	1.7	69.8	28.4
Average	**414**	**11.4**	**62.4**	**26.2**

Source: IDFG unpublished data

Size Range of Returning Adults- Natural-origin adults returning to the upper Salmon River generally range in size from 50-105 cm fork length. Typically, one-ocean adults are less than 65cm fork length, two-ocean fish are 65-86 cm and three-ocean fish are greater than 86 cm. Table 9 shows the estimated average length at age for natural-origin Chinook salmon captured at the Sawtooth Fish Hatchery weir from 1996-2012.

Table 9. Estimated average length at age for natural origin male and female spring Chinook Salmon captured at Sawtooth Fish Hatchery weir for return years 1996-2012.

	Females		Males		
Return Year	Age 4	Age 5	Age 3	Age 4	Age 5
1996	77.9	90.6	60.5	76.4	92
1997	77	93	53	76.8	102.3
1998	77.1	91.2	54.3	75.8	96.2
1999	77.9	92.8	51.7	76.6	96
2000	77.4	92.7	53.6	76.7	93.5
2001	79	94.6	54.7	76.1	93.2
2002	77.9	92.9	54.6	76	99.3
2003	78.5	93.8	53.6	77.5	100.3
2004	77.2	93.7	53.5	74.5	92
2005	74.5	89.4	48.3	69.3	92.4
2006	76	86.2	50.9	69	88.4
2007	84	89.9	53.5	75	96.1
2008	75.8	88.6	54.2	75.5	96.4
2009	80	92.1	54	76.3	101.3
2010	79.3	92.5	54	74.3	96.2
2011	72.5	92.3	54.4	75.4	96.9
2012	76.4	92.1	50.8	73.2	98.7
Average	**77.6**	**91.7**	**53.5**	**75.0**	**96.0**

Source: Data IDFG unpublished data

Adult Sex Ratio – Sex ratio of natural-origin adults in the Upper Salmon River is variable year to year but generally is skewed towards males (Table 10). From 1995-2012 natural-origin males averaged 68% of the return including one-ocean jacks and 63% of the return excluding jacks (Table 10).

Table 10. Percent of natural-origin Chinook salmon returns to Sawtooth Fish Hatchery that were composed of males 1995-2012.

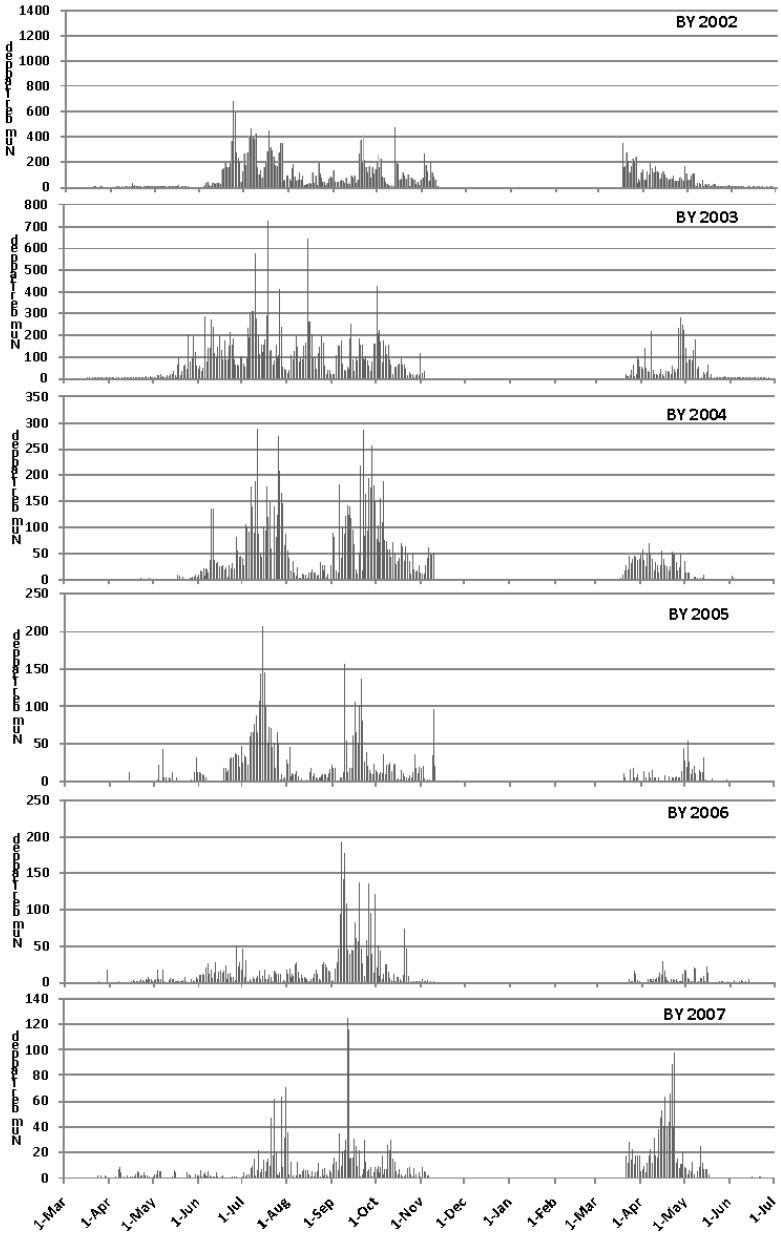
Return Year	Percent of Natural-origin returns composed of males	
	Jacks Included	Jacks Excluded
1995	89	78
1996	80	78
1997	67	65
1998	51	50
1999	79	75
2000	76	70
2001	58	55
2002	60	59
2003	47	42
2004	68	63
2005	56	53
2006	70	68
2007	72	60
2008	78	75
2009	64	58
2010	75	73
2011	68	52
2012	68	63
Average	**68**	**63**

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

Spawn Timing and Distribution – Natural-origin adults in the upper Salmon River (upstream of Redfish Lake Creek) exhibit spawn timing that is typical of spring-run Chinook salmon. The majority of spawning activity generally occurs from mid-August through the first week of September. Adults typically spawn from one kilometer downstream of the hatchery weir to 30 km upstream of the weir at the Breckenridge Diversion and in the lower five kilometers of Alturas Lake Creek (IDFG, unpublished data). Since 1989, few redds have been observed upstream of the Breckenridge Diversion.

Juvenile Life History and Migration Timing – Naturally produced juvenile Chinook salmon in the Upper Salmon River emerge from their redds during the late winter and early spring months. Some juveniles begin downstream movements shortly after emergence while others over-winter near the spawning area. Juvenile trapping data collected from the upper Salmon River indicates that juvenile Chinook emigrate from the spawning area in the upper Salmon River in three general pulses (parr, presmolt and smolt). Figure 5 below displays the emigration timing of natural-origin Chinook salmon from the Upper Salmon River that originated from spawners in

2002-2007 and is typical of other broods. The first pulse (subyearling parr) generally occurs



Source: IDFG unpublished data

Figure 5. Emigration timing of natural-origin juvenile Chinook salmon at the Sawtooth screw trap, 2002-2007.

from June-July, the second pulse (subyearling presmolt) occurs from August-October and the final pulse (yearling smolt) occurs from mid-March through May of the following year. The trap is typically operated from mid-March through mid-November, so any fish emigrating between November and mid-March are not accounted for.

Regardless of when juveniles emigrate from the spawning areas in the upper Salmon River, they rear in freshwater for one full year after emergence and subsequently migrate to the ocean as yearling smolts. Table 11 shows the seaward migration timing of natural-origin Chinook salmon from the upper Salmon River based on PIT-tag interrogation data from Lower Snake River Dams for brood years 1999-2007. Fish were PIT-tagged as subyearling parr and presmolts and as yearling smolts. Juveniles PIT-tagged as subyearlings typically arrive at Lower Granite dam two to four weeks prior to juveniles tagged as yearling smolts.

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	138	4/4/2009	4/23/2009	5/3/2009	5/19/2009	5/22/2009
	Y	263	4/18/2009	4/30/2009	5/19/2009	5/29/2009	7/4/2009
2006	S	286	4/22/2008	5/1/2008	5/8/2008	5/18/2008	6/1/2008
	Y	56	5/3/2008	5/12/2008	5/20/2008	6/4/2008	7/5/2008
2005	S	202	3/29/2007	4/17/2007	5/2/2007	5/13/2007	5/23/2007
	Y	117	4/30/2007	5/6/2007	5/15/2007	5/23/2007	5/28/2007
2004	S	210	4/2/2006	4/20/2006	4/30/2006	5/15/2006	6/7/2006
	Y	320	4/15/2006	4/29/2006	5/13/2006	6/4/2006	6/20/2006
2003	S	221	4/12/2005	4/23/2005	5/3/2005	5/13/2005	5/31/2005
	Y	1033	4/23/2005	5/9/2005	5/21/2005	6/5/2005	6/24/2005
2002	S	309	4/4/2004	4/22/2004	5/5/2004	5/15/2004	5/23/2004
	Y	988	4/14/2004	5/3/2004	5/15/2004	6/7/2004	7/25/2004
2001	S	212	4/2/2003	4/18/2003	5/1/2003	5/25/2003	7/9/2003
	Y	543	4/17/2003	5/6/2003	5/25/2003	6/5/2003	11/17/2003
2000	S	109	4/15/2002	4/20/2002	5/8/2002	5/23/2002	6/3/2002
	Y	107	4/20/2002	5/6/2002	5/22/2002	6/1/2002	7/17/2002
1999	S	189	4/24/2001	4/30/2001	5/12/2001	5/22/2001	7/3/2001
	Y	202	5/3/2001	5/14/2001	5/23/2001	5/29/2001	7/4/2001

Note: Y= fish tagged as yearlings, S= fish tagged as subyearlings
Source: IDFG unpublished data

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

The population directly affected by the Sawtooth Fish Hatchery program is Salmon River Upper

Mainstem (SRUMA) population.

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

All juvenile Chinook salmon releases from the Sawtooth Fish Hatchery occur within the SRUMA Chinook salmon population area. However, populations that could be affected by Sawtooth Fish Hatchery adult strays include the remaining seven extant 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 Sawtooth 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).

Abundance - Total spawner abundance, natural spawner abundance and natural fish used as broodstock is described in Figure 3. As part of developing an integrated broodstock, a component of the natural-origin return is incorporated into the hatchery broodstock annually. Approximately 7.5% of the total hatchery production is used to maintain an integrated component of the broodstock that is used to supplement the natural population above the weir, thus increasing the abundance of fish spawning naturally upstream of the weir. This will be particularly advantageous in years of very low natural-origin abundance. A sliding scale (Table 2) 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, six natural-origin adult Chinook salmon mortalities were documented as a direct result of trapping and handling operations.

Productivity - The hatchery weir is located near the lower boundary of the SRUMA population but suitable spawning habitat occurs below the weir. This situation makes it impossible to control the composition of hatchery- and natural-origin spawners below the weir. Managers have initiated an integrated broodstock program to reduce the impacts associated with hatchery-origin fish spawning with natural-origin fish. Additionally, the integrated program will provide a conservation benefit for years when natural-origin numbers are very low. The sliding scale for broodstock management is designed to maintain the existing harvest mitigation program while reducing risks to the natural population.

Spatial Structure - The ICTRT rated all metrics for spatial structure for the upper Salmon River mainstem population as very low. It is not expected that the hatchery program poses risk to the spatial structure of the upper Salmon River mainstem population. For years of very low natural-origin abundance, the integrated hatchery program will provide an opportunity to increase the extent of available habitat that is used.

Diversity - The original brood source for the Sawtooth Fish Hatchery program came from adults captured at a temporary weir operated from 1981-1984 at the site of the current hatchery location. It was estimated that at least 50% of the adults trapped in 1981 resulted from a hatchery smolt release (914,000) in 1979 that was Rapid River stock raised at the Mullen Fish Hatchery (Moore 1981). Beginning in 1983, all returning hatchery adults at the trap were Sawtooth Fish Hatchery stock. There is currently little genetic differentiation between the hatchery- and natural-origin fish in the SRUMA mainstem population and the natural-origin fish in the SRUMA clusters with other Upper Salmon River MPG populations.

The ICTRT rated most of the metrics for diversity in the SRUMA population as low or very low. Genetic variation, due to lack of inter-annual variation, was rated as a moderate risk. The metric for "spawner composition" was rated as a moderate risk due to the high proportion of within-population hatchery-origin spawners spawning naturally. 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.

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.

For purposes of this HGMP the "viable" threshold as defined here is equivalent to the ICTRT defined Minimum Abundance Threshold (MAT). The ICTRT classified the SRUMA population as a "large" population based on historical habitat potential (ICTRT 2005). A Chinook population classified as large has a MAT of 1,000 naturally produced spawners with sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe. The SRUMA population is at high risk based on the integrated abundance and productivity risk. The current program management is attempting to address these deficiencies in two ways: (1) maintain an integrated stepping stone program to reduce the effects of domestication and risks associated with hatchery fish spawning with natural-origin fish in the wild (modeled increase in productivity); and (2) use a segment of the returning integrated adults to supplement natural spawners above the hatchery weir to increase the abundance of natural spawners.

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.

Estimated recruits per spawner for brood years 1982-2008 for the SRUMA population are provided in Table 12. The most recent twelve year (1997-2008) geometric mean recruits per spawner is 1.0 (range: 0.15-15.5).

Table 12. Adult recruits per spawner for the Salmon River Upper Mainstem spring Chinook Salmon population 1981-2008.

Spawn Year	Total spawners	Recruits per Spawner
1981	1,156	0.72
1982	125	7.28
1983	198	6.40
1984	246	4.25
1985	643	1.43
1986	868	0.72
1987	544	0.74
1988	633	1.04
1989	534	0.33
1990	633	0.07
1991	287	0.25
1992	185	0.79
1993	501	0.30
1994	94	0.67
1995	30	5.89
1996	86	6.84
1997	134	8.40
1998	80	15.55
1999	156	1.71
2000	597	1.08
2001	1,535	0.15
2002	1,740	0.21
2003	1,040	0.15
2004	987	0.49
2005	614	0.82
2006	441	2.06
2007	343	1.59
2008	888	0.65
Geometric Mean (1997-2008)		**1.00**

Source: IDFG unpublished data.

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

For the period 1980-2014, the geometric mean number of natural-origin Chinook salmon spawners in the Salmon River Upper Mainstem population is 315 (Table 13). During this period the minimum abundance threshold of 1,000 spawners was achieved in only one year. The most recent 12-year (2003-2014) geometric mean number of natural-origin spawners is 475.

Table 13. Estimated spawning abundance of hatchery- and natural-origin Chinook salmon spawners in the Salmon River Upper Mainstem population 1981-2014

Spawn Year	Natural Spawners Including Jacks	Hatchery Spawners Including Jacks	Total Adult Spawners (H+N) Including Jacks
1981	1,111	45	1,156
1982	124	1	125
1983	197	1	198
1984	238	8	246
1985	432	211	643
1986	545	323	868
1987	459	85	544
1988	623	10	633
1989	503	31	534
1990	433	200	633
1991	197	90	287
1992	179	6	185
1993	497	4	501
1994	80	14	94
1995	23	7	30
1996	79	7	86
1997	116	18	134
1998	65	15	80
1999	97	59	156
2000	527	70	597
2001	698	837	1,535
2002	991	749	1,740
2003	677	363	1,040
2004	559	428	987
2005	311	303	614
2006	289	152	441
2007	199	144	343
2008	475	413	888
2009	432	263	695
2010	822	158	980
2011	681	182	863
2012	648	388	1,036
2013	415	231	646
2014	630	397	1,027
Geometric Mean (2005-2014)	**475**	**264**	**755**

Source: IDFG unpublished data

Provide the most recent 12 year (e.g., 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Table 14. Estimated proportion of Chinook Salmon spawning naturally that are hatchery origin (pHOS) within the Salmon River Upper Mainstem population. Estimates are provided for areas both upstream and downstream of the Sawtooth Fish Hatchery weir. Total is the estimated pHOS for the population weighted by spawner abundance.

Return Year	Downstream of the Weir	Upstream of the Weir	Total for SRUMA
1981	6.6%	0.0%	3.9%
1982	3.3%	0.0%	0.8%
1983	0.6%	0.0%	0.5%
1984	4.9%	2.7%	3.3%
1985	10.0%	36.1%	32.8%
1986	13.6%	39.6%	37.2%
1987	7.0%	17.1%	15.6%
1988	0.1%	2.0%	1.6%
1989	0.4%	7.1%	5.8%
1990	6.0%	35.3%	31.6%
1991	6.5%	40.0%	31.4%
1992	7.4%	1.5%	3.2%
1993	6.4%	0.0%	0.8%
1994	55.5%	2.7%	14.9%
1995	51.3%	9.5%	23.3%
1996	33.1%	5.2%	8.1%
1997	37.9%	5.9%	13.4%
1998	16.0%	20.0%	18.8%
1999	37.8%	37.4%	37.8%
2000	45.2%	8.1%	11.7%
2001	68.0%	52.7%	54.5%
2002	51.7%	40.8%	43.0%
2003	56.6%	26.8%	34.9%
2004	76.1%	31.9%	43.4%
2005	81.9%	37.9%	49.3%
2006	58.6%	28.7%	34.5%
2007	88.5%	12.8%	42.0%
2008	93.0%	23.1%	46.5%
2009	89.7%	8.7%	37.8%
2010	51.1%	6.6%	16.1%
2011	86.4%	0.8%	21.1%
2012	84.7%	20.9%	37.5%
2013	88.0%	6.1%	35.8%
2014	40.2%	37.9%	38.7%

Source: IDFG unpublished data

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 Operational Activities - ESA-listed spring Chinook salmon are trapped during broodstock collection periods at the Sawtooth Fish Hatchery.

The Sawtooth Fish Hatchery develops broodstocks to meet LSRCP mitigation and supplementation objectives. The number of NORs retained for use as broodstock will vary depending on the abundance of NORs (see sliding scale in Section 1.11.1)

Hatchery Programmatic Maintenance Activities

Hatchery diversion dam and water source intake*:* The various wooden, steel and concrete structures which constitute the diversion dam and water source intake at the Sawtooth Hatchery site 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 dam board 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 need to enter the stream channel under a special use permit. 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. Should isolation of the work area with coffer dams also involve dewatering, hatchery personnel would electro-fish the site to capture and relocate any listed species present within the coffered work zone.

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 the Sawtooth Hatchery intake site. 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 need to 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.

The diversion dams and water source intakes are located within the migration and spawning habitat of ESA listed spring Chinook salmon and steelhead. A small number of listed bull trout have also been observed migrating through this section of the Salmon River. Direct effects to individual adult or juvenile spring 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 within a work window of July 1 (post-steelhead fry emergence) to August 15 (pre-Chinook salmon spawning. All excavated material will be removed from the river and loaded into a truck for offsite disposal.

Water source intake canal and fish bypass screen*:* Just as gravel, sediment and small woody debris is deposited in the vicinity of river water intake structures, similar material is deposited within the canal that delivers surface water to the irrigation ditch. This accumulation of sediment and debris has the potential to restrict the flow of water diverted to the hatchery ditch. Materials must be removed annually to ensure an uninterrupted supply of water for irrigation. 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 canal and deposit it on site or in transport vehicles for offsite disposal.

The fish bypass screen and associated pipes located at control box require occasional maintenance. This involves daily brushing the screens for removal of small woody debris.

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.

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 likely insignificant.

***Adult fish weir, Sawtooth Hatchery**:* Following periods of high flow, sand and gravel accumulates in front of the adult fish weir and entrance to the fish ladder and trap used for capturing adult spring Chinook salmon and steelhead returning to the hatchery. This gravel accumulation 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 most cases, excavation equipment will need to 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 spring 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. 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.

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. To minimize potential impacts to embryonic life stages of Chinook salmon or steelhead, all work will be completed 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 Sawtooth 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.

***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 16 (Sec 7.4.2) provides the number of natural-origin adult spring Chinook salmon captured at the hatchery weir and the number retained for broodstock.

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)

All adult spring Chinook salmon (hatchery- and natural-origin) are trapped and handled at the Sawtooth Fish Hatchery weir. The number of returning natural-origin adults varies annually (see Tables 13 above). The number of natural-origin adults held for broodstock is based on a sliding scale (see Section 1.11.1)

Estimated take by activity for hatchery operations and programmatic maintenance is provided in Appendix A; Tables A1-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 spring Chinook salmon will exceed projected take levels presented in Tables A1-A2 (Appendix A). 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 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.

This program conforms with the plans and policies of the Lower Snake River Compensation Program administered by the U.S. Fish and Wildlife Service to mitigate for the loss of Chinook salmon production caused by the construction and operation of the four dams on the lower Snake River.

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

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

- Cooperative Agreement between the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game, USFWS Agreement No.: F14AC00008 (Mod 2) (2015 Cooperative agreement number for Lower Snake River Compensation Plan- Monitoring and Evaluation Studies).

- Cooperative Agreement between the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game, USFWS Agreement No.: F14AC00007 (Mod 2) (2015 Cooperative Agreement number for Lower Snake River Compensation Plan hatchery-Operation and Maintenance).

- 2008-2017 Management Agreement pursuant to US vs. Oregon, U.S. District Court, District of Oregon

3.3 RELATIONSHIP TO HARVEST OBJECTIVES

The Lower Snake River Compensation Plan defined replacement of adults "in place" and "in kind" for appropriate state management purposes. Juvenile production and adult escapement targets were established at the outset of the LSRCP. State, tribal and federal co-managers work cooperatively 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.

Adult hatchery origin Chinook Salmon available for harvest in the upper Salmon sport and Tribal fisheries originate from Sawtooth Hatchery program and the Chinook Salmon program at the Pahsimeroi Hatchery. If smolt to adult return rates are low for smolts released from Sawtooth Hatchery from a particular year it is possible that adult returns in four years may be insufficient to support fisheries and may even be insufficient to supply enough broodstock to meet the egg take and smolt production goals for the hatchery for that brood year. Managers attempt to fill rearing space vacated by such a shortfall by taking additional broodstock at Pahsimeroi hatchery and rearing gametes from that additional broodstock at Sawtooth. Juvenile fish from eggs collected at Pahsimeroi Hatchery are reared separately through to the smolt stage, uniquely marked with coded wire tags and transferred back to Pahsimeroi for release as smolts.
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 benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years, if available.

Since the inception of the LSRCP program, Chinook salmon sport fishing seasons targeting Sawtooth Fish Hatchery fish have only occurred in the upper Salmon River since 2008. Hatchery-origin adults produced at the Sawtooth Fish Hatchery are subjected to potential harvest during their upstream migration through river sections where sport fishing seasons have occurred. Estimated harvest of Sawtooth Fish Hatchery reared Chinook salmon in terminal and mixed stock fisheries is presented in Table 15 below.

Table 15. Estimated harvest of hatchery-origin Sawtooth Fish Hatchery spring Chinook salmon 1997-2012.

Return Year	Return to Hatchery	Upper Salmon R. Harvest (Sport)	Upper Salmon R. Harvest (Tribal)	Lower Salmon R. Harvest	Columbia and Snake River Harvest	Total Havest	Total Return	Exploitation Rate
1997	93	No Fishery	1	0	0	1	94	1.1%
1998	21	No Fishery	0	0	0	0	21	0.0%
1999	76	No Fishery	0	0	0	0	76	0.0%
2000	461	No Fishery	0	0	0	0	461	0.0%
2001	1,440	No Fishery	3	0	103	106	1,546	6.9%
2002	1,056	No Fishery	0	0	54	54	1,110	4.9%
2003	701	No Fishery	0	1	44	45	746	6.0%
2004	1,544	No Fishery	22	6	76	104	1,648	6.3%
2005	1,292	No Fishery	75	0	0	75	1,367	5.5%
2006	578	No Fishery	46	0	25	71	649	10.9%
2007	1,554	No Fishery	0	0	158	158	1,712	9.2%
2008	5,685	670	400	210	583	1,863	7,548	24.7%
2009	3,746	1,862	382	0	252	2,496	6,242	40.0%
2010	795	9	21	6	93	129	924	14.0%
2011	3,614	289	3	480	385	1,157	4,771	24.3%
2012	3,094	881	383	222	390	1,876	4,970	37.7%

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 Salmon River spring Chinook salmon program is operated consistent with existing Biological Opinions.

3.5 ECOLOGICAL INTERACTIONS

Potential adverse effects to listed salmon could occur from the release of hatchery-produced

spring Chinook smolts through the following interactions: predation, competition, behavior modification, and disease transmission. 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.

Competition/Predation/Behavioral Modification

The IDFG does not believe that the release of spring Chinook salmon juveniles in the upper Salmon 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. Juvenile sockeye have a later outmigration timing (May-June) than spring Chinook salmon (March-April). There is no information available to indicate that competition occurs between these two species.

Although it is possible that both hatchery-produced spring Chinook salmon and natural fall Chinook salmon could occur in the Snake River at the same time, the IDFG believes that hatchery-produced smolts released in 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, spring Chinook salmon smolts migrating through the Salmon and Snake rivers will probably be using different habitat than emerging fall Chinook salmon fry (Everest 1969). Fall Chinook salmon adults would be temporally and spatially separated from the spring Chinook salmon adults returning to the upper Salmon River.

Based on general migration information, it appears that the potential for adverse effects from hatchery-produced spring Chinook salmon would be greatest with juvenile, listed spring and summer Chinook salmon. As mentioned earlier, hatchery-produced juveniles are spatially separated from listed spring Chinook salmon during early rearing. Peery and Bjornn (1992) documented that natural, Chinook salmon fry movement in the upper Salmon river began in early March, peaked in late April to 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). Additionally, the IDFG is unaware of any literature that suggests juvenile Chinook salmon are piscivorous.

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 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. If 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 juveniles (hatchery-produced) select deeper water and faster velocities than smaller juveniles (natural 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 fish 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 mitigation and supplementation 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 spring 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.

Fish Health

Spring Chinook salmon reared at the Sawtooth Fish Hatchery have a history of chronic bacterial kidney disease (BKD) incidence. Current control measures at the Sawtooth Fish Hatchery include: 1) adult antibiotic injections, 2) egg disinfection, 3) egg culling based on BKD ELISA

value, 4) egg segregation incubation, 5) juvenile segregation rearing, and 6) juvenile antibiotic feedings.

Bacterial kidney disease and other diseases can be horizontally transmitted from hatchery fish to natural, listed species. However, 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. However, little additional research has occurred in this area. Hauck and Munson (IDFG, unpublished) stated that hatcheries with open water supplies (river water) may derive pathogen problems from natural populations. The hatchery often promotes environmental conditions favorable for the spread of specific pathogens. When liberated, infected hatchery-produced fish have the potential to perpetuate and carry pathogens into the wild population.

The IDFG monitors the health status of hatchery-produced spring Chinook salmon from the time they are ponded at the Sawtooth Fish Hatchery until their release as pre-smolts or smolts. Sampling protocols follow those established by the PNFHPC and AFS Fish Health Section.

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 preclude the risk of transmission (Pilcher and Fryer 1980; LaPatra et al. 1990; Lee and Evelyn 1989). Even with consistent monitoring, it is difficult to attribute a particular occurrence of disease to actions of the LSRCP hatchery spring Chinook program in the upper Salmon River.

Reduction in Fitness

There are potential adverse effects to listed adult spring Chinook salmon and their progeny from hatchery-produced adult spring Chinook released upstream of the Sawtooth Fish Hatchery weir to spawn naturally. None of these potential impacts will result in direct mortality of natural adults. Potential effects include changes in fitness, growth, survival, and disease resistance of natural populations. In addition, natural populations may be impacted through decreased productivity and decreased long-term adaptability (Kapuscinski and Jacobson 1987; Bowles and Leitzinger 1991). Negative impacts to natural populations are more likely when hatchery populations are not derived from locally adapted, endemic broodstocks. However, some increase in natural production can be expected when hatchery-origin fish are sufficiently similar to wild fish and natural rearing habitats are not at capacity (Reisenbichler 1983). The IDFG believes this to be the case in the upper Salmon River; recognizing that releasing adult spring Chinook salmon from the Sawtooth Fish Hatchery to spawn naturally can increase natural production, but not necessarily productivity.

It is important to note that the IDFG has developed criteria to manage the release of hatchery-origin adults upstream of the Sawtooth Fish Hatchery weir for natural spawning. These criteria conform with NMFS and USFWS Section 10 and 7 permit language in addition to meeting the management objectives of the IDFG salmon supplementation study.

The potential exists for returning hatchery adults to stray and pose additional risk to natural populations. However, existing IDFG data indicate that this is not currently a problem for Sawtooth-origin adults.

SECTION 4. WATER SOURCE

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

Sawtooth Fish Hatchery – The Sawtooth Fish Hatchery receives water from the Salmon River and from five wells. River water enters an intake structure located approximately 0.8 km upstream of the hatchery facility. River water intake screens comply with NMFS criteria. River water flows from the collection site to a control box located in the hatchery building where it is screened to remove fine debris. River water can be distributed to indoor vats, outside raceways, or adult holding raceways. The hatchery water right for river water use is approximately 60 cfs. Incubation and early rearing water needs are met by three primary wells. A fourth well provides tempering water to control the build-up of ice on the river water intake during winter months. The fifth well provides domestic water for the facility. The hatchery water right for well water is approximately 9 cfs. River water temperatures range from 0.0ºC in the winter to 20.0ºC in the summer. Well water temperatures range from 3.9ºC in the winter to 11.1ºC in the summer.

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.

Intake screens at all facilities are in compliance with NMFS screen criteria and were designed by the Corp of Engineers.

Redds have been observed in the section of the river that reduced flow because of water withdrawal associated with hatchery operations. Spawning takes place from mid-August until late September. Spawning in this area would be initiated during the time of the lowest flow so dewatering of redds is unlikely.

SECTION 5 FACILITIES

5.1 BROODSTOCK COLLECTION FACILITIES (OR METHODS)

Sawtooth Fish Hatchery – Adult collection at the Sawtooth Fish Hatchery is facilitated by a permanent weir that spans the Salmon River. Weir panels are installed to prevent the upstream migration of adult Chinook salmon. Fish volitionally migrate into the adult trap where they are manually sorted into adult holding raceways. The hatchery has three 167 ft long x 16 ft wide x 5 ft deep holding raceways and an enclosed spawning building. Each raceway has the capacity to hold approximately 1,300 adults.

5.2 FISH TRANSPORTATION EQUIPMENT (DESCRIPTION OF PEN, TANK TRUCK, OR CONTAINER USED)

A variety of transportation vehicles and equipment are available at the various facilities. Generally, adult transportation at both facilities is unnecessary as hatchery-produced adults are trapped and spawned on site.

5.3 BROODSTOCK HOLDING AND SPAWNING FACILITIES

Section 5. the describes broodstock holding and spawning facilities.

5.4 INCUBATION FACILITIES

Sawtooth Fish Hatchery – Incubation facilities at the Sawtooth Fish Hatchery consist of a well water-supplied system of 100 stacks of incubator frames containing 800 incubation trays. The maximum incubation capacity at the Sawtooth Fish Hatchery is 5 million Chinook eggs.

5.5 Rearing facilities

Sawtooth Fish Hatchery – Inside rearing consists of 3 semi-square tanks with an individual volume of 17 cubic feet and a capacity of 15,000 swim up fry each; 4 inside rearing tanks with an individual volume of 90 cubic feet and a capacity for 50,000 fry each; and 13 inside rearing vats with an individual volume of 391 cubic feet and a capacity for 100,000 fry each. Outside rearing consists of 12 fry raceways each with 750 cubic ft of rearing space and 28 production raceways each with 2,700 cubic ft of rearing space. Each production raceway has a capacity to raise 100,000 Chinook to smolt stage for a total design capacity of 2.8 million fish.

5.6 ACCLIMATION/RELEASE FACILITIES

For the Salmon River spring Chinook program, acclimation occurs at the Sawtooth Fish Hatchery in outside production raceways supplied with river water.

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

Brood year 1992 spring Chinook salmon experienced an epizootic of apparent mycotic nature. As a result of this infection, survival to release as smolts averaged 50.4%. Brood year 1992 juveniles were released earlier than usual as a result of this infection. Typically, eyed-egg to smolt survival averages 95.0% or better.

Return year 2006 adult spring Chinook salmon experienced infection of *Ichthyopthirius multifilis* due to low water flows and high water temperatures. Overall pre-spawning mortality was 51.2%.

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

The Sawtooth Fish Hatchery is staffed around the clock and equipped with an alarm system. The hatchery well water supply system is backed up by generator power. The inside vat room can be switched to gravity flow with river water in the event of a generator failure. Protocols are in place to guide emergency situations during periods of time when the hatchery well water supply is interrupted. Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

SECTION 6 BROODSTOCK ORIGIN AND IDENTITY

6.1 SOURCE

The Salmon River spring Chinook broodstock was developed primarily from endemic sources. Prior to the completion of construction of the Sawtooth Fish Hatchery in 1985, Chinook salmon smolts were periodically released in the vicinity of the present hatchery (first records date from 1966). While locally returning adults were used as much as possible, juveniles were released from adults sourced at Rapid River Fish Hatchery, Hayden Creek Fish Hatchery (Lemhi River tributary), and Marion Forks Fish Hatchery (Oregon) in 1967 (Bowles and Leitzinger 1991). During the 1970s, several releases into the rearing pond from Rapid River stock were made. Bowles and Leitzinger (1991) note that adult returns from these releases were negligible. The original brood source for the Sawtooth Hatchery program came from adults captured at a temporary weir operated from 1981-1984 at the site of the current hatchery location. Brood year 1985 was the first year that all adult trapping, incubation and rearing occurred at the Sawtooth Fish Hatchery.

6.2 SUPPORTING INFORMATION

6.2.1 History

See Section 6.1 above.

6.2.2 Annual size

Information on the number of adults used to develop broodstocks prior to the construction of the present-day Sawtooth Fish Hatchery is not available. See Section 6.2.3 below. Approximately 525 female and 525 male Chinook salmon are needed to be spawned annually to meet the current production objective of releasing 2.0 million yearling smolts. To account for prespwning mortaility, aproximatley 537 pairs of adults are held.

6.2.3 Past and proposed level of natural fish in broodstock

The number of natural fish included in the broodstock from 1995-2014 is summarized in Table 16. Currently, the specific number of natural-origin fish retained for broodstock is dependent on the number of natural origin adults that return each year (see Sliding Scale in Section 1.11.1).

6.2.4 Genetic or ecological differences

Narum et al. (2009) combined hatchery and wild samples collected at the Sawtooth weir as part of a study examining the genetic variation and structure of Chinook salmon throughout the Snake River basin. No deviations in Hardy–Weinberg or linkage equilibrium were observed indicating little to no genetic differentiation between these two groups. Chinook salmon populations are regionally structured within subbasins and wild and hatchery adults collected from the mainstem Salmon River-Sawtooth adult weir genetically cluster with other wild and hatchery populations in the upper Salmon River (Pahsimeroi Hatchery, E.F. Salmon River, and W.F. Yankee Fork, and (Narum et al. 2007). The hatchery and natural population in the SRUMA population do not show significant genetic differentiation. Additionally there is no data to indicate the loss of phenotypic variation through time that would have resulted from the hatchery operations (ICTRT 2005).

6.2.5 Reasons for choosing

The upper Salmon River endemic spring Chinook salmon stock was used to found this program. Reasons for choosing include availability, local adaptability, and less risk posed to upper Salmon 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

We have implemented an integrated broodstock program at Sawtooth Fish Hatchery. This will reduce risks associated with hatchery fish spawning in the natural environment. 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 risk to the natural population. We also collect tissue samples for Genetic Stock Identification (GSI) and Parentage-Based Tagging (PBT) from every fish spawned and every fish released upstream of the weir. These efforts combined with the Genetic Baselines developed for Snake River Spring/Summer Chinook salmon will allow continued evaluation of potential genetic effects of the program.

SECTION 7 BROODSTOCK COLLECTION

7.1 LIFE-HISTORY STAGE TO BE COLLECTED

Adult Chinook salmon collected at the Sawtooth 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

Sawtooth Fish Hatchery

A weir that spans the Salmon River at the location of the Sawtooth Fish Hatchery is used to collect broodstock. The weir is put into operation between late-May and mid-June depending on spring flows and remains in operation until the middle of September. Broodstock are selected randomly from ripe fish and represent adults collected throughout the entire adult migration.

7.3 IDENTITY

Since 1991, all hatchery produced fish released from Sawtooth 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, integrated hatchery-origin fish released as part of the supplementation component will be marked or tagged differentially from the segregated hatcheryfish.

7.4 PROPOSED NUMBER TO BE COLLECTED

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

Approximately 525 female and 525 male Chinook salmon are needed annually to meet the current production objectives of 2.0 million yearling smolts released from the Sawtooth Fish Hatchery. The number of NORs retained for the integrated broodstock is based on a sliding scale of abundance for natural origin returns (see Section 1.11.1)

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

The number of hatchery and natural origin adults trapped and retained for broodstock at Sawtooth Fish Hatchery during the period 1995-2014 is presented in Table 16.

Table 16. Number of hatchery- and natural-origin spring Chinook Salmon trapped and spawned at Sawtooth Fish Hatchery 1995-2014.

	Hatchery			Natural					
Return Year	Jack	Male	Female	Jack	Male	Female	Total Return	Males Spawned (Hat/Nat)	Females Spawned (Hat/Nat)
1995	8	9	2	8	8	2	37	8 (8/0)	2 (2/0)
1996	21	13	17	6	78	21	156	40 (16/24)	10 (4/6)
1997	0	49	50	9	95	51	254	64 (35/29)	54 (44/10)
1998	0	11	15	4	61	62	153	27 (11/16)	27 (10/17)
1999	60	6	9	19	76	26	196	31 (14/17)	12 (3/9)
2000	279	50	122	97	308	130	986	165 (127/38)	89 (75/14)
2001	176	657	594	51	343	282	2,103	382 (352/30)	382 (355/27)
2002	65	303	555	33	483	347	1,786	161 (125/36)	197 (172/25)
2003	476	92	130	46	207	285	1,236	54 (54/0)	33 (33/0)
2004	587	408	540	67	262	154	2,018	312 (312/0)	434 (434/0)
2005	165	529	586	39	117	125	1,561	156 (156/0)	297 (297/0)
2006	40	192	233	56	152	88	761	85 (85/0)	60 (60/0)
2007	1,233	82	87	49	85	52	1,588	83 (83/0)	69 (69/0)
2008	1,740	1,780	1,708	52	254	86	5,620	596 (596/0)	594(954/0)
2009	380	1,348	1,828	77	208	162	4,003	523 (523/0)	518 (518/0)
2010	109	285	361	88	455	177	1,475	355 (306/49)	354 (354/0)
2011	3,460	113	217	187	221	191	4,389	120(99/21)	207(207/0)
2012	293	1,238	1,257	27	281	196	3,292	478(451/27)	505(505/0)
2013	1,520	751	673	98	212	90	3,344	484(465/19)	484(464/20)
2014	717	889	793	68	251	158	2,876	472(451/21)	461 (442/19)

Source: Sawtooth Fish Hatchery Run reports

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

Trapping of Chinook Salmon at Sawtooth hatchery to collect broodstock that is representative of the entire run profile may routinely result in daily collection of some fish in excess of brood needs. Protocols establish collaboratively by State and Tribal managers define disposition options for hatchery origin fish trapped in excess of broodstock needs. These options, ordered by priority, include: 1) recycling of fish through the non-tribal and tribal fisheries immediately downstream of Sawtooth weir at the request of either party, 2) distribution to tribes for ceremonial and subsistence use, 3) distribution to food banks or public for human consumption; 4) outplanting live fish to natural spawning in areas designated as appropriate for supplementation by state, tribal, and federal management entities, and 5) storing carcasses in freezer trailers until transfer to rendering facilities or taken to a landfill.

7.6 FISH TRANSPORTATION AND HOLDING METHODS

Adult Chinook salmon migrate into the adult holding facility at the Sawtooth Fish Hatchery. No fish transportation is needed. As adults enter the trap and are identified and measured. Adults are then distributed to concrete holding raceways where they may remain for up to two months before spawning occurs.

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 Salmon River AOP.

Comment [BL5]: Fish Health

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 Salmon River AOP.

7.8 DISPOSITION OF CARCASSES

Carcasses are stored in freezer trailers until transfer to rendering facilities or taken to a landfill.

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

The risk of disease amplification is minimized by following established fish health and disease management protocols. Fish health maintenance and hatchery facility sanitation guidelines are established and monitored by IDFG's Eagle Fish Health Laboratory.

Comment [BL6]: Fish Health

Broodstock selection criteria have been established to collect broodstock that are representative of the entire run.

SECTION 8 MATING

8.1 SELECTION METHOD

Spawning protocols at the Sawtooth Fish Hatchery follow plans developed based on a sliding scale for pHOS and pNOB that are driven by escapement of natural-origin adults. Female spring Chinook salmon are sorted two times per week and selected randomly as they ripen. Generally, two spawn days occur each week. Each female is spawned with one male and males are generally not reused.

8.2 MALES

Males are randomly selected for spawning on each spawning day. Each male is spawned with one female and not reused unless there is a shortage of males in which case males may be used more than once. If reusing males is necessary each male receives an opercle punch after being used once and is placed back into the holding pond. Every effort is made to use all returning fish for spawning during the spawning year. Jacks do not make up more than ten percent of the total males used.

8.3 FERTILIZATION

Spawning ratios of 1 male to 1 female will be used and males are generally not used more than once. Following fertilization, one cup of well water is added to each bucket and set aside for 30 seconds to one minute. See sections 8.1 and 8.2 for more detail.

8.4 CRYOPRESERVED GAMETES

Milt is not cryopreserved as part of this program and no cryopreserved gametes are used in this program.

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

Adults are chosen randomly and represent the entire return. The integrated broodstock is made predominantly of natural adults except when returns of natural origin adults to the weir are less than 125 fish. Integrated hatchery origin adults may be incorporated into the segregated broodstock to maintain genetic continuity between the segregated broodstock and the natural population.

SECTION 9 INCUBATION AND REARING

9.1 INCUBATION

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

The original Lower Snake River Compensation Program production target of 19,445 adults back to the project area upstream of Lower Granite Dam was based on a smolt-to-adult survival rate of 0.87%. To date, program SARs have not met these planning guidelines. This is not due to lower than expected "in-hatchery" performance. Typically, survival from green-egg to eyed-egg is in excess of 85% and survival from eyed-egg to release is in excess of 90% (Table 17 and 18).

9.1.2 Cause for, and disposition of surplus egg takes

Surplus eggs may be generated (~ 10% above need) to provide a buffer against culling associated with the presence of bacterial kidney disease. Surplus eggs may be provided to the streamside egg box program monitored by the Shoshone-Bannock Fisheries Program or disposed of in a landfill.

9.1.3 Loading densities applied during incubation

At the Sawtooth Fish Hatchery, incubation flows are set at 5 to 6 gpm per eight tray incubation stack. Typically, eggs from one female are incubated per tray (approximately 5,000 eggs).

9.1.4 Incubation conditions

Pathogen-free well water is used for all incubation at the Sawtooth Fish Hatchery. Incubation stacks utilize catch basins to prevent silt and fine sand from circulating through incubation trays. Following 48 hours of incubation, eggs are treated three times per week with formalin (1,667 ppm) to control the spread of fungus. Formalin treatments are discontinued at eye-up. Once eggs reach the eyed stage of development (approximately 560 FTU), they are shocked to identify dead and unfertilized eggs. Dead and undeveloped eggs are then removed with the assistance of an automatic egg picking machine. During this process, the number of eyed and dead eggs is generated. Eggs generally reach the eyed stage of development when they have accumulated approximately 560 FTUs.

Table 17. Sawtooth Fish Hatchery spring Chinook salmon egg take and survival information for brood years 1986-2012.

Spawn Year	Green Eggs Taken	Number of Eyed-eggs	*Number of Eggs Culled	Survival to Eyed Stage (%)
1986	2,035,535	1,870,657	0	91.9%
1987	2,721,399	2,533,640	0	93.1%
1988	3,120,669	2,846,235	0	91.2%
1989	733,365	668,373	0	91.1%
1990	1,431,360	1,346,350	0	94.1%
1991	922,000	794,800	0	86.2%
1992	468,300	423,600	0	90.5%
1993	369,340	341,641	0	92.5%
1994	29,933	26,232	0	87.6%
1995	7,377	4,977	0	67.5%
1996	51,743	45,128	0	87.2%
1997	260,480	231,827	0	89.0%
1998	139,469	129,593	0	92.9%
1999	63,642	59,373	0	93.3%
2000	454,355	420,733	0	92.6%
2001	1,890,845	1,732,927	361,794	91.6%
2002	1,037,558	920,651	16,044	88.7%
2003	174,575	145,744	5,290	83.5%
2004	1,999,254	1,752,395	93,417	87.7%
2005	1,182,537	1,051,935	15,100	88.9%
2006	223,758	188,742	10,011	84.4%
2007	376,639	310,258	3,168	82.4%
2008	2,894,444	2,701,418	51,855	93.3%
2009	2,429,273	2,282,484	79,328	94.0%
2010	1,736,980	1,548,780	35,095	89.2%
2011	1,004,691	858,885	36,958	85.5%
2012	2,336,645	2,004,162	37,469	85.8%

*To reduce the risk of vertical transmission of the causative agent of Bacterial Kidney Disease, egg lots from females with ELISA optical density values in excess of stated annual objectives were culled.

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

9.1.5 Ponding

Eggs are typically held in incubation trays at the Sawtooth Fish Hatchery until they reach the swim-up stage of development, at approximately 1,650 FTUs. Ponding and rearing plans are generally developed to accommodate segregation groups (based on female ELISA optical density values) and whether juveniles are destined for supplementation or production

(mitigation) releases.

Fry are ponded directly into inside rearing vats. Vats are baffled to provide compartmentalized rearing space and to assist with cleaning. In addition, vats are covered to provide some degree of privacy from human activity and building lights. Density and flow indices are maintained to not exceed 0.3 and 1.5, respectively (Piper et al. 1982). Fish are targeted to be reared to approximately 7.6 cm in vats before being transferred to outside rearing raceways.

9.1.6 Fish health maintenance and monitoring

Following fertilization, eggs are typically water-hardened in an Iodophor solution per label instructions. During incubation, eggs routinely receive scheduled formalin treatments to control the growth of fungus. Treatments are typically administered three times per week at a concentration of 1,667 ppm active ingredient. Dead eggs are removed following shocking. Additional egg picks are performed as needed to remove additional eggs not identified immediately after shocking. See Salon River AOP for additional details regarding fish health protocols

Comment [BL7]: Fish health

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

No adverse genetic or ecological effects to listed fish are anticipated. Eggs destined for supplementation and production releases are maintained in separate incubation trays. To offset potential risk from overcrowding and disease transmission, eggs from two females are placed in individual incubation trays until eyed stage. Then egg density is mechanically reduced to 7,200 to 7,500 eyed eggs per tray.

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.

Sawtooth Fish Hatchery spring Chinook survival information is presented by life stage in Table 18.

9.2.2 Density and loading criteria (goals and actual levels)

Density (DI) and flow (FI) indices at the Sawtooth Fish Hatchery are maintained to not exceed 0.30 and 1.5, respectively (Piper et al. 1982).

9.2.3 Fish rearing conditions

At the Sawtooth Fish Hatchery, swim-up fry are transferred from incubation trays to vats at approximately 1,650 FTUs. Vats contain temporary PVC baffles positioned every 4 feet. Starting flows are typically set at approximately 20 gpm per vat. As fish grow, flows are increased up to a maximum of approximately 110 gpm per vat. Vat water is generally supplied from the hatchery's pathogen-free wells. Water temperature during early rearing ranges from 4.4°C to 7.8°C.

Spring Chinook salmon are generally transferred to outside rearing raceways when they reach approximately 7.6 cm in length. Initially, fish are placed in the upper sections of two large raceways where flows are set at approximately 660 gpm per raceway. As fish grow, they are divided among additional raceways and raceway sections and flows are increased. River water supplies the outside rearing raceways at the Sawtooth Fish Hatchery. Water temperatures during outside rearing range from 1.1°C to 16.0°C.

Table 18. Sawtooth Fish Hatchery spring Chinook survival information by hatchery life stage.

Brood Year	Number of Eyed-Eggs in Incubation	Fry		Fingerlings		Smolts	
		Number Transferred to Vats	Percent Survival from Eyed-Eggs	Number Transfered to Raceways	Percent Survival from Eyed-Eggs	Number Released	Percent Survival From Eyed-Egg
1988	2,846,235	2,818,312	99.0%			2,541,500	89.3%
1989	668,373			660,560	98.8%	652,600	97.6%
1990	1,346,350	1,308,098	97.2%			1,273,400	94.6%
1991	794,800	793,908	99.9%			774,583	97.5%
1992	423,600	422,093	99.6%			213,830	50.5%
1993	341,641	338,500	99.1%	336,424	98.5%	334,313	97.9%
1994	26,232	25,888	98.7%	25,659	97.8%	25,006	95.3%
1995	4,997	4,890	97.9%	4,812	96.3%	4,756	95.2%
1996	45,128	44,875	99.4%	43,650	96.7%	43,161	95.6%
1997	234,000	232,213	99.2%	225,468	96.4%	223,240	95.4%
1998	129,593	127,064	98.0%	124,730	96.2%	123,425	95.2%
1999	59,373	59,111	99.6%	58,114	97.9%	57,134	96.2%
2000	420,733	402,777	95.7%	398,833	94.8%	385,761	91.7%
2001	1,371,133	1,213,215	88.5%	1,196,468	87.3%	1,105,169	80.6%
2002	904,607	879,040	97.2%			821,415	90.8%
2003	145,744	136,830	93.9%			134,769	92.5%
2004	1,752,395	1,693,210	96.6%			1,552,544	88.6%
2005	1,051,935	1,014,736	96.5%			995,262	94.6%
2006	188,742	179,573	95.1%	177,333	94.0%	174,132	92.3%
2007	310,258	300,712	96.9%	292,639	94.3%	274,644	88.5%
2008	1,948,907					1,854,377	95.1%
2009	1,802,767	1,766,831	98.0%			1,735,179	96.3%
2010	1,548,780					1,456,221	94.0%
2011	858,885	814,163	94.8%	789,016	91.9%	786,864	91.6%
2012	2,044,162	1,988,838	97.3%	1,972,234	96.5%	1,932,483	94.5%

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

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 Chinook salmon are reared for approximately 18 months before being released as full-term smolts. During this rearing period, Chinook salmon are sample-counted monthly. Fish length, weight, and condition factor vary from year-to-year but typically average the following:

- At ponding (English units): 1.4 inches, 1,200 fish/pound, condition factor (C) = 3.04.
- At transfer from indoor vats to outside rearing raceways: 3.0 inches, 130 fish/pound, condition factor (C) = 2.85
- At release: 5.5 inches, 15 fish/pound, condition factor (C) = 4.01

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

See Section 9.2.4 above.

9.2.6 Indicate food type used, daily application schedule, feeding rate range, and estimates of total food conversion efficiency during rearing (average program performance)

Juvenile Chinook salmon are fed a semi-moist diet provided from different manufacturers (state contract dependent). Conversion rate from first ponding to release averages 1.3 pounds of food fed for each pound of weight gained. Table 19 identifies the percent of food by weight fed to each size class of fish.

Table 19. Average percent body weight fed per day

Fish/pound	% body weight fed/day	Term in culture
Swim-up to 800 fpp	2.5	Dec.-Jan.
800 – 500	2.5	January
500 – 400	2.25	February
400 – 300	2	March
300 - 200	2	April
200 – 150	1.5	May
150 – 110	1	June
110 – 90	1	July
90 – 50	1	August
50 -20	1	September
20	maintenance	Oct. - Feb.
20-17	0.75	March to Release

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

Comment [BL8]: Fish Health

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 receive antibiotic-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.

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

Currently no natural rearing methods are employed at SFH.

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

At spawning, ELISA optical density values for broodstock spawners are used to establish BKD management criteria for egg culling and isolation incubation needs. Fish are maintained at conservative density and flow indices (< 0.3 and < 1.5, respectively). Fish are fed by hand and observed several times daily. Proper disinfection protocols are in place. Rearing vats and raceways are swept on a regular basis.

Comment [BL9]: Fish Health

SECTION 10 RELEASE

Fish release levels and release practices applied through the Sawtooth Fish Hatchery program are described in this section.

10.1 PROPOSED FISH RELEASE LEVELS

Sawtooth Fish Hatchery proposed releases include 2,000,000 yearling smolts (Table 20). Of these, 1,700,000 are released in the upper Salmon River immediately downstream of the Sawtooth Fish Hatchery adult trapping facility and up to 300,000 are released into the Yankee Fork Salmon River (See Yankee Fork Salmon River HGMP).

Table 20. Number and life stage of Chinook released from Sawtooth Fish Hatchery.

Age Class	Maximum Number	Size (fpp)	Release Date	Location	Rearing Hatchery
Eggs					
Unfed Fry					
Fry					
Fingerling					
Yearling	1,550,000	18	Mid April	Upper Salmon River at Sawtooth Fish Hatchery (segregated production)	Sawtooth Fish Hatchery
	150,000	18	Mid April	Upper Salmon River at Sawtooth Fish Hatchery (integrated)	
	300,000	18	Mid April	Yankee Fork Salmon River	

10.2 Specific location(s) of proposed release(s)

- Release point: Upper Salmon River at Sawtooth Fish Hatchery 17060201 HUC
- 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

Release information presented in the Tables 21-23 reflect releases that occurred in the upper Salmon River immediately downstream of the Sawtooth Fish Hatchery for the segregated harvest mitigation program (Table 21), the ISS Supplementation research project (Table 22) and the current integrated supplementation program (Table 23).

10.4 ACTUAL DATES OF RELEASE AND DESCRIPTION OF RELEASE PROTOCOLS

Yearling spring Chinook have been released from the Sawtooth Hatchery annually during March and April. Specific release numbers from 1996 through 2014 are listed in Table 24 below. Typically releases occur in April and are planned to coincide with rising water flows in the Salmon River. Fish are generally released in the evening. Raceway screens and dam boards are removed allowing fish to volitionally emigrate into the tailrace and through a 36-inch pipe to the Salmon River. Fish that do not volitionally emigrate are forced out.

Table 21. Juvenile spring Chinook salmon releases from Sawtooth Fish Hatchery into the upper Salmon R. for brood years 1983-2012.

Brood year	Release Year	Life Stage Released	Number Released	Average Size at Release (FPP)
1983	1985	Smolt	420,060	20.2
1984	1986	Smolt	451,142	17.3
1985	1987	Smolt	1,081,400	15.0
1986	1987	Parr	100,600	20.5
1986	1988	Smolt	1,604,889	23.0
1987	1988	Parr	990,400	20.4
1987	1989	Smolt	1,101,600	20.5
1988	1989	Parr	446,400	96.0
1988	1990	Smolt	1,500,200	19.7
1989	1990	Parr	2,000	25.0
1989	1991	Smolt	650,600	25.9
1990	1991	Parr	1,496	44.0
1990	1992	Smolt	1,265,163	30.2
1991	1992	Parr	414,972	25.5
1991	1993	Smolt	109,753	25.0
1992	1994	Smolt	141,530	4.6
1993	1995	Smolt	27,778	22.5
1997	1999	Smolt	117,442	21.8
2000	2002	Smolt	265,642	15.4
2001	2003	Smolt	960,193	20.1
2002	2004	Smolt	624,739	21.0
2003	2005	Smolt	134,769	19.0
2004	2006	Smolt	1,552,444	21.7
2005	2007	Smolt	995,262	17.2
2006	2008	Smolt	174,132	19.1
2007	2009	Smolt	274,644	14.0
2008	2010	Smolt	1,455,634	22.0
2009	2011	Smolt	1,337,302	23.0
2010	2012	Smolt	1,080,164	28.3
2011	2013	Smolt	652,732	19.7
2012	2014	Smolt	1,559,698	

Table 22. Juvenile spring Chinook salmon releases from Sawtooth Fish Hatchery into the upper Salmon R. for brood years 1991-2002. These releases were part of the Idaho Supplmentation Studies (ISS) research project.

Brood year	Release Year	Life Stage Released	Number Released	Average Size at Release (FPP)
1991	1992	Parr	198,039	25.0
1991	1993	Smolt	51,819	25.0
1992	1994	Smolt	72,300	25.0
1993	1995	Smolt	281,510	23.1
1994	1996	Smolt	25,082	20.0
1995	1997	Smolt	4,650	12.0
1996	1998	Smolt	43,161	13.9
1997	1999	Smolt	105,951	23.0
1998	2000	Smolt	123,425	16.4
1999	2001	Smolt	57,134	11.5
2000	2002	Smolt	120,119	16.4
2001	2003	Smolt	136,546	20.1
2002	2004	Smolt	187,461	18.0

Table 23. Juvenile spring Chinook salmon releases from Sawtooth Fish Hatchery into the upper Salmon R. for brood years 2010-2012. These releases are part of the integrated supplemention program at Sawtooth Fish Hatchery

Brood year	Release Year	Life Stage Released	Number Released	Average Size at Release (FPP)
2010	2012	Smolt	179,021	27.0
2011	2013	Smolt	134,132	24.9
2012	2014	Smolt	180,208	

Table 24. Date of release for yearling spring Chinook Salmon released from the Sawtooth Fish Hatchery into the upper Salmon River mainstem 1996-2014

Release Year	Rearing Hatchery	Life Stage	Date Released
1996	Sawtooth	Yearling	3/26/1994
1997	Sawtooth	Yearling	4/17/1997
1998	Sawtooth	Yearling	4/21/1998
1999	Sawtooth	Yearling	4/16/1999
2000	Sawtooth	Yearling	4/12, 4/19/00
2001	Sawtooth	Yearling	4/18/2001
2002	Sawtooth	Yearling	4/9, 4/19, 4/23/02
2003	Sawtooth	Yearling	4/18/2003
2004	Sawtooth	Yearling	4/13/2004
2005	Sawtooth	Yearling	3/31/2005
2006	Sawtooth	Yearling	3/30, 4/12,
2007	Sawtooth	Yearling	4/11/2007
2008	Sawtooth	Yearling	4/23/2008
2009	Sawtooth	Yearling	4/14/2009
2010	Sawtooth	Yearling	4/9/2010
2011	Sawtooth	Yearling	4/1/2011
2012	Sawtooth	Yearling	4/6/2012
2013	Sawtooth	Yearling	4/5/2013
2014	Sawtooth	Yearling	4/4/2014

10.5 FISH TRANSPORTATION PROCEDURES, IF APPLICABLE

No fish transportation is necessary for general production at the Sawtooth Fish Hatchery as all fish are released to the upper Salmon River directly from rearing raceways. Transportation for upper Yankee Fork Salmon River supplementation production follows IHOT transportation guidelines.

10.6 ACCLIMATION PROCEDURES (METHODS APPLIED AND LENGTH OF TIME)

All spring Chinook salmon juveniles released from the Sawtooth Fish Hatchery are reared on river water.

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. Fish intended for potential harvest

interception are generally 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.

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. If the number of eggs that are collected exceed the capacity of the facility, they are culled as green or eyed eggs.

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 lot 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.

Comment [BL10]: Fish Health

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

Emergency procedures are in place to guide activities in the event of potential catastrophic event. Plans include a troubleshooting and repair process followed by the implementation of an emergency action plan if the problem cannot be resolved. Emergency actions include switching between well water and river water during incubation and early rearing phases, fish consolidations, and early releases to the Salmon 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. 1. Continuing fish health practices to minimize the impact of infectious disease. Follow IHOT, AFS, and PNFHPC guidelines and recommendations. See Salmon River AOP for details.

Comment [BL11]: Fish Health

2. Marking hatchery-produced spring Chinook salmon for broodstock management. Smolts released for supplementation research will be marked differentially from other fish.

4

5. Attempting to program time of release to mimic natural fish for Salmon River smolt releases.

7. Continuing to use broodstock for general production and supplementation research that exhibit life history characteristics similar to locally evolved stocks.

8.

9. Monitoring hatchery effluent to ensure compliance with the National Pollutant Discharge Elimination System permit.

10. Continuing Hatchery Evaluation Studies to provide comprehensive monitoring and evaluation for LSRCP Chinook.

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

In section 11.1.1 below, a series of tables, each followed by narrative, is provided for the purpose of adding detail with regards to plans and methods used to collect data necessary to assess indicators listed in Section 1.10. The narrative provided reflects the overall IDFG monitoring and evaluation program and is not specific to this HGMP. This narrative is intended to provide an overview of the statewide monitoring plan and to show the linkage between programs from multiple HGMPs. The two columns on the right hand side of the table are provided to indicate whether each indicator is:

1. Applicable to the hatchery program/s described in this HGMP (yes "Y" or no "N")
2. Currently being monitored.
    a. For cells with a "Y", the indicator is being monitored with funding provided by the hatchery mitigation program.
    b. For cells with a "C", the indicator is being monitored, but is tied to a separately funded program (e.g. Idaho Supplementation Studies (ISS), Idaho Natural Production Monitoring Program (INPM), General Parr Monitoring (GPM) program etc.). Without continued funding for these programs, many of the M&E components will not occur. For example, the ISS program is scheduled to end in

2014 with some components ending in 2012. Funding to offset this loss needs to be identified to avoid significant M&E data gaps.

c. For cells with a "Y/C", the indicator is being monitored and is partially funded through the hatchery mitigation program. Other programs, such as those listed in 2b above, provide the remaining funding.
d. For cells with an "N", the indicator is not currently being monitored. For all indicators applicable to this HGMP that are not being addressed (N), a brief narrative is provided in Section 11.1.2 describing why the particular indicator is not being monitored.

Table 24, at the end of Section 11.1.1, provides a more detailed description of methodologies used in the basin that are more specific to VSP parameters.

11.1.1 Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

Category	Standards	Indicators	Applicable	Monitored
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.	Y	C
		1.1.2. Total fisher days or proportion of harvestable returns taken in Tribal resident fisheries, by fishery.	Y	C
		1.1.3. Tribal acknowledgement regarding fulfillment of tribal treaty rights.	Y	C
	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.	Y	Y
	1.3. Program addresses ESA responsibilities.	1.3.1. Section 7, Section 10, 4d rule and annual consultation	Y	Y

1.1.1 – 1.1.2 The Nez Perce Tribe (NPT) and the Shoshone/Bannock Tribe (SBT) each authorize and manage fisheries. Both are non-selective fisheries that harvest both hatchery and natural returns. Each tribe conducts statistically based inseason fishery

interview programs to estimate fishing effort, numbers of hatchery and natural origin Chinook salmon harvested and other species harvested, IDFG conducts similar statistically based harvest monitoring programs for non-Treaty recreational fisheries. For Chinook salmon fisheries IDFG and Tribal co-managers confer through scheduled inseason conferences to assess current ESA take and harvest shares. Steelhead fisheries are more protracted than Chinook salmon fisheries and require less inseason consultation. IDFG and Tribal co-managers share pre-season fisheries management plans and post-season estimates of harvest and ESA take.

1.1.3 – 1.2.1 Numbers of spring/summer Chinook salmon marked, tagged and total numbers released are in accordance with the production schedule in the 2008-2017 US vs. OR Management Agreement. Fisheries harvests in Idaho are not governed by terms of the US vs. OR agreement but Idaho and the respective Treaty Tribes manage in accordance with the principal of 50% Tribal and 50% non-tribal sharing of fish available for harvest in Idaho fisheries.

The mitigation objectives for the hatchery programs in Idaho are stipulated in the LSRCP and in the 1980 Hells Canyon Settlement Agreement. Each hatchery reports numbers of fish released by life stage in annual run or brood year reports. Representative sub-samples of fish released are code-wire tagged and PIT tagged to assess harvest contribution by release group and survival to the project area upstream of Lower Granite Dam. The majority of fish PIT tagged are representative of the run at large through the FCRPS. PIT tags detected among subsequent adult returns in the fish ladder at Lower Granite Dam are used to estimate inseason total facility specific returns to Lower Granite Dam. An independent estimate of the adult return over Lower Granite Dam is also complete post-season based on summed tribal and non-tribal harvest estimates and hatchery trapping data.

1.3.1

- ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.
- Section 7 consultation with USFWS (April 2, 199) resulted in NMFS Biological Opinion for the Lower Snake River Compensation Program (now expired). In 2003, consultation was initiated to develop a new Snake River Hatchery Biological Opinion. Consultation has not been completed.
- Section 10 Permit Numbers 919 – East Fork Salmon River Satellite Facility, 920 – Sawtooth Fish Hatchery, and 921 – McCall Fish Hatchery, authorized direct and indirect take of listed Snake River salmon associated with hatchery operations and broodstock collection at Lower Snake River Compensation Program hatcheries operated by Idaho Department of Fish and Game. Expired 12/31/98; reapplication (to consolidate all programs under permit 1179) in process.
- 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 Idaho Department of Fish and Game. Expired 12/31/98; reapplication in process.

- Section 10 Permit Number 903 authorized indirect take of listed Snake River salmon associated with hatchery operations and broodstock collection at Idaho Power Company mitigation hatcheries operated by Idaho Department of Fish and Game, including Rapid River hatchery, Oxbow Fish Hatchery/Hell's Canyon Trap and Pahsimeroi Hatchery. Expired 12/31/98; reapplication in process.
- Section 10 Permit Number 1120 authorized annual take of listed sockeye salmon associated continuation of a sockeye salmon captive broodstock program. Expired 12/31/2002; reapplication (under Permit 1454) in process.

Anadromous hatchery programs managed by IDFG have operated based on annual acknowledgement from NOAA Fisheries that the programs are in compliance with the provisions of Section 10 (# 1179) that expired in 1999. Newly developed program specific HGMPs are currently under review.

Category	Standards	Indicators	Applicable	Monitored
	2.1. Confirmation of hatchery type	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	 Y Y	 Y Y
	2.2. Hatchery - natural composition of hatchery broodstock and natural spawners are known and consistent with hatchery type.	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)	Y	Y
	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.	Y	Y/ C

		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.	Y	Y
	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 of adult returns by release group harvested 2.4.3. Number of non-target species encountered in fisheries for targeted release group.	Y Y Y	Y Y Y
	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.	Y Y Y Y	Y Y Y Y
	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 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.	Y Y Y Y	Y Y Y Y

2.1.1 – 2.1.3 Each hatchery program has a defined purpose relative to mitigation and conservation.

2.2.1- 2.6.4 The adipose fin-clip is the primary mark that we use distinguish hatchery origin from natural origin fish in harvests and escapement . All hatchery releases for harvest mitigation are adipose fin-clipped and representative portions of those releases are coded-wire tagged. Relatively small numbers of releases of Chinook salmon intended to supplement natural populations are released with intact adipose fins but are coded-wire tagged. Steelhead intended to supplement natural populations are also released un-clipped. Few of these releases are coded-wire tagged. The marking rate by mark type for each release group of Chinook salmon and steelhead are inventories and reported annually.

Representative sub-samples of fish released from anadromous fish hatcheries in Idaho are code-wire tagged and PIT tagged to assess harvest contribution by release group. Coded-wire tag recovery data indicate that harvest of Snake River spring/summer Chinook salmon and steelhead are negligible in ocean fisheries. ODFW, WDFW, and CRITFC conduct statistically based fishery, interview biological sampling, and tag recovery

programs in Tribal and non-Tribal fisheries in the mainstem and tributaries of the Columbia River in zones 1 through 6 and in the lower Snake River below Lower Granite Dam. Data from these sampling programs are used to estimate fishing effort, numbers of hatchery and natural origin fish harvested and released and in many cases contributions of specific mitigation hatchery releases to harvest. Results from these program are available inseason to assist harvest and hatchery managers and are reported in summary jointly by ODFW and WDFW.

IDFG, Nez Perce Tribe (NPT) and the Shoshone/Bannock Tribe (SBT) each authorize and manage fisheries in the boundary waters of the Snake River mainstem and tributaries of the Snake, Clearwater and Salmon Rivers. ODFW and WDFW also conduct recreational fisheries in the boundary waters of the Snake River shared by Idaho. Non-Tribal recreational fisheries are selective for adipose fin-clipped hatchery origin fish. Tribal fisheries are largely non-selective fisheries that harvest both hatchery and natural returns. IDFG, ODFW, WDFW and Tribes conducts statistically based inseason and post season fishery interview programs to estimate fishing effort, numbers of hatchery and natural origin fish harvested and released and other species encountered. Coded-wire tag recovery data from these programs are used to estimate hatchery specific contributions to age specific harvests by fishery.

IDFG and the Tribes estimate annual escapements of natural populations that are affected by fisheries targeting program fish through weirs operated in conjunction with hatchery programs. Statewide index counts of Chinook salmon redds are conducted to estimate numbers of spawners by population. IDFG and the Tribes have developed genetic stock identification standard and a sampling program at Lower Granite Dam to estimate escapement above the dam at the level of major spawning population groups for both Chinook salmon and steelhead.

Hatchery release numbers, mark rates among releases and sampling rates in Snake River and Columbia River mainstem and tributary fisheries downstream of Lower Granite Dam are reported by ODFW, WDFW, and CRITFC co-managers in the RMIS database maintained by the Pacific States Marine Fisheries Commission. IDFG, Nez Perce Tribe (NPT) and the Shoshone/Bannock Tribe (SBT) each authorize and manage fisheries in the boundary waters of the Snake River mainstem and tributaries of the Snake, Clearwater and Salmon Rivers. ODFW and WDFW also conduct recreational fisheries in the boundary waters of the Snake River shared by Idaho. Non-Tribal recreational fisheries are selective for adipose fin-clipped hatchery origin fish. Tribal fisheries are largely non-selective fisheries that harvest both hatchery and natural returns. IDFG, ODFW, WDFW and Tribes conducts statistically based inseason and post season fishery interview programs to estimate fishing effort, numbers of hatchery and natural origin fish harvested and released and other species encountered. Sampling rate by mark type, number of marks by program observed in fishery samples, and estimated total contribution of each population to by fishery are estimated and reported annually.

For hatchery Chinook salmon populations, IDFG completed annual run reconstructions

based on population and age specific harvest estimates in Columbia River, Snake River and Snake River tributary fisheries and age specific rack returns. Run reconstruction data for each hatchery are used to develop hatchery specific pre-season run forecasts. Natural returns to Idaho are forecasted using similar run reconstructions of aggregate Snake River natural returns to Lower Granite Dam. IDFG and Tribal co-managers in the Snake Basin plan fisheries based on these forecasts. IDFG and Tribal co-managers confer through scheduled inseason conferences to assess accuracy of the preseason forecast based on inseason estimates of the actual hatchery returns from real-time PIT tag detections in the Columbia River hydro-system. Co-managers also assess inseason estimates of ESA take, harvest shares, and the disposition of hatchery returns to racks in excess of broodstock needs.

Steelhead fisheries are more protracted than Chinook salmon fisheries and require less inseason consultation. IDFG and Tribal co-managers share pre-season fisheries management plans and post-season estimates of harvest and ESA take.

Category	Standards	Indicators	Applicable	Monitored
3. HATCHERY EFFECTIVENESS MONITORING FOR AUGMENTATION AND SUPPLEME	3.1. Release groups are marked in a manner consistent with information needs and protocols for monitoring impacts to natural- and hatchery-origin fish at the targeted life stage(s)(e.g. in juvenile migration corridor, in fisheries, etc.).	3.1.1. All hatchery origin fish recognizable by mark or tag and representative known fraction of each release group marked or tagged uniquely.	Y	Y
		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.	Y	Y
	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.	Y	C
		3.2.2. Adult to adult or juvenile to adult survivals are estimated.	Y	C
		3.2.3. Temporal and spatial distribution of adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored.	Y	C
		3.2.4. Timing of juvenile outmigration from rearing areas and adult returns to spawning areas are monitored.	Y	C
		3.2.5. Ne and patterns of genetic variability are frequently enough to detect changes across generations.	Y	C
	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.	Y	Y
		3.3.2. Number of adult returns by release group harvested	Y	Y
		3.3.3. Number of non-target species encountered in fisheries for targeted release group.	Y	Y
	3.4. Effects of strays from hatchery programs on non-target (unsupplemented and same species) populations remain within acceptable limits.	3.4.1. Fraction of strays among the naturally spawning fish in non-target populations.	Y	C
		3.4.2. Fraction of strays in non-target populations that originate from in-subbasin releases.	Y	C
		3.4.3. Fraction of hatchery strays in out-of-basin natural population.	Y	C
	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.	Y	C
		3.5.2. Spatial and temporal trends among adult spawners and rearing juvenile fish in the available habitat.	Y	C
	3.6. Supplementation of natural population with hatchery origin production does not negatively	3.6.1. Pre- and post-supplementation trends in abundance of fish by life stage is monitored annually.	Y	C

NTATION PROGRAMS	impact the viability of the target population.	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.	Y Y Y	C C C
	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.	Y Y Y Y Y	Y/C N C C Y/C
	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.	Y Y Y	C C C
	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.	Y Y Y	Y/C Y/C Y/C
	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.	3.10.1 Detectable changes in rate of occurrence and spatial distribution of disease, parasite or pathogen among the affected hatchery and natural populations.	Y	N

3.1.1 – 3.9.3 The adipose fin-clip is the primary mark that we use distinguish hatchery origin from natural origin fish in harvests and escapement. All hatchery releases for harvest mitigation are adipose fin-clipped and representative portions of those releases are coded-wire tagged. Relatively small numbers of releases of Chinook salmon intended to supplement natural populations are released un-clipped but are coded-wire tagged. Steelhead intended to supplement natural populations are also released un-clipped. Few of these releases are coded-wire tagged. The marking rate by mark type for each release group of Chinook salmon and steelhead are inventories and reported annually.

Hatchery release numbers, mark rates among releases and sampling rates in Snake River and Columbia River mainstem and tributary fisheries downstream of Lower granite Dam are reported by ODFW, WDFW, and CRITFC co-managers in the RMIS database maintained by the Pacific Sates Marine Fisheries Commission. IDFG, Nez Perce Tribe (NPT) and the Shoshone/Bannock Tribe (SBT) each authorize and manage fisheries in the boundary waters of the Snake River mainstem and tributaries of the Snake, Clearwater and Salmon Rivers. ODFW and WDFW also conduct recreational fisheries in the boundary waters of the Snake River shared by Idaho. Non-Tribal recreational fisheries are selective for adipose fin-clipped hatchery origin fish. Tribal fisheries are largely non-selective fisheries that harvest both hatchery and natural returns. IDFG, ODFW, WDFW and Tribes conducts statistically based inseason and post season fishery interview programs to estimate fishing effort, numbers of hatchery and natural origin fish harvested and released and other species encountered. Sampling rate by mark type, number of marks by program observed in fishery samples, and estimated total contribution of each population to by fishery are estimated and reported annually

Numbers of spawners by age are estimated annually by weir counts, spawning ground surveys or a combination of both methods for all Chinook salmon conservation programs. All fish passed upstream of weirs are identified by marks or tags as hatchery or natural origin and are sampled for age, sex, and size. Index redd counts are conducted on all natural spawning areas affected by supplementation programs and representative portions of carcasses on spawning grounds are sampled for marks, or tags and for age, sex, and size information. Annual estimates of spawners by age are used to monitor inter-annual spawner-recruit trends.

Because steelhead migration into spawning areas in Idaho coincides with high flows it is not possible to accurately estimate total spawning escapement in supplemented streams using weir counts or spawning ground surveys. Partial escapement estimated from weirs on the upper reaches of spawning areas are available for each supplemented system but escapements to lower reaches cannot be measured. Additional funding will be required to build permanent weirs below spawning areas on supplemented systems. Additional funding is also required to implement parental based tagging programs to distinguish progeny from hatchery origin from natural origin spawners in these systems.

Releases of fish from supplementation programs are marked or tagged to differentiate them from fish released for harvest mitigation and from natural origin fish. Mark rate by

mark type for all releases are inventoried and reported. Screw traps are used to estimate numbers natural origin out-migrants from the supplemented population. All fish passed upstream of weirs are identified by marks or tags as hatchery or natural origin and are sampled for age, sex, and size. Index redd counts are conducted on all natural spawning areas affected by supplementation programs and representative portions of carcasses on spawning grounds are sampled for marks, or tags and for age, sex, and size information. Annual estimates of spawners by age are used to monitor inter-annual spawner-recruit trends.

While the above methods allow us to estimate numbers of natural origin and hatchery origin spawners on the spawning grounds, they do not allow us to estimate the relative contribution of hatchery and natural spawners to natural production. IDFG, Tribal and federal co-managers in the Snake basin are currently collecting genetic samples from all fish spawned in anadromous hatcheries and all natural and hatchery fish passed above weirs associated with hatchery programs. IDFG has worked in conjunction with CRITFC to build a library of genetic markers that can be used to identify individual parents of juveniles produced by adults sampled in hatchery broodstocks or from adults passed above weirs to spawn. Parental based analysis of juvenile production can be used to assess the relative contributions of individual spawning crosses (i.e. hat x hat, hat x nat, or nat x nat). While we currently have the samples in hand to do this analysis and will continue to collect those samples, we have no funding to process the samples for parental analysis.

Hatcheries or hatchery satellite facilities where broodstocks are collected are typically located on the tributary where the parent natural population for the hatchery broodstock reside. Hatchery and natural returns at those locations are trapped and enumerated at weirs run throughout the adult migration. Long time series of historic daily migration data are available at all facilities for both hatchery and natural returns. Managers use historic data to construct timing curves of average daily proportion of the run by date. These timing curves are used to project the numbers of natural fish returning to the weir and the numbers of the proportion of the annual broodstock need that should be collected by day. All hatchery and natural fish captured at the weirs are sampled for age, sex, and size data. Age is typically determined by length frequency analysis using age length relationships from known age coded-wire tagged fish.

All natural fish intercepted at hatchery facilities where broodstocks are maintained as a segregated population, all natural fish trapped during broodstock collection are released to spawn naturally in the available habitat upstream of the weir. In hatchery programs that have integrated broodstock being maintained or developed, the natural and hatchery composition of the broodstock and the affected natural populations are carefully monitored and controlled based sliding scales specific to each program. The proportions of natural fish into the hatchery broodstock and hatchery fish into the natural spawning population are based on a sliding scale of natural abundance. Success of the program is predicated on an average measure of percent natural influence in the hatchery and natural populations across generations.

The overwhelming majority of hatchery produced spring/summer Chinook salmon and all steelhead in Idaho are released as smolts. Representative portions of all smolt releases are PIT tagged and migratory timing of these fish is known. Hatchery smolts quickly exit terminal tributary rearing areas. While mainstem migration among hatchery smolts corresponds with typical timing observed among natural origin fish no significant competitive interactions during their brief seaward migratory period have been documented.

Where parr and presmolt release programs and egg box programs are implemented in some areas where natural production is severely depressed. The size of these programs are small and metered by best available estimates of the abundance of natural fish and habitat capacity.

At all broodstock collection sites for spring/summer Chinook salmon hatcheries and steelhead hatcheries operated by Idaho Department of Fish and Game, daily records of adult fish trapped and their disposition (i.e. held for brood, passed above weir to spawn, etc.) are maintained. Representative fractions of all natural origin and hatchery fish trapped are sampled for age, sex and size. Daily spawning records are maintained for each hatchery as are incubator loading densities, survival at various stages of development, and fry emergence timing are documented. Juvenile growth and survival are monitored by life stage, all production fish are adipose fin-clipped and or coded-wire tagged. A representative sample of all smolt release groups are PIT tagged. All data relative to hatchery adult collection, spawning, incubation, and rearing data are stored in a standardized relational data base that is maintained collaboratively with Tribal, Federal and state co-managers in the Snake River Basin. All coded wire tagging, PIT tagging and release data are entered into RMIS and PITAGIS databases maintained by the Pacific States Marine Fisheries Commission. PIT tag detections at key points in the seaward migration of juvenile releases from hatcheries are used to estimate migration timing and survival.

The Idaho Supplementation Studies is a large scale effectiveness monitoring program that is designed to track production and productivity in supplemented (treated) versus unsupplemented (control) streams. It is a long term program that is designed to last approximately 20 years and assess production and productivity prior to, during and after treatment in approximately 15 streams. The study is conducted collaboratively by IDFG, the Nez Perce Tribe, the Shoshone/ Bannock Tribes, and the USFWS. The study collects comparative production and productivity measures in approximately 15 control streams that have been paired with treatment sites and monitored across the duration of the study. Tributaries where Sawtooth, Pahsimeroi, McCall, Clearwater, and Kooskia hatcheries release spring/summer Chinook salmon are among the study sites. At each site, juvenile screw traps assess hatchery and natural juvenile outmigration timing, abundance, age structure, condition and survival. Representative portions of the natural out-migration are PIT tagged to assess timing and survival to Lower Granite Dam. ISS also monitors adult return in treatment streams at weirs and in treatment and control streams by systematic

redd counts in natural spawning areas through spawning. Weir and redd count data provide data on adult spawn timing, age structure, genetic composition, and spatial distribution.

The Idaho Natural Production Monitoring Program and the Idaho Steelhead Monitoring and Evaluation Study monitor adult and juvenile segments of natural Chinook salmon and steelhead populations in addition to those specifically monitored for effectiveness monitoring in the ISS project. Snorkel surveys have historically been conducted in representative standardized index sections of streams where natural populations of Chinook and steelhead spawn and rear. Snorkel surveys provide estimates of relative annual abundance, temporal, and spatial distribution of juvenile salmon and steelhead. Systematic sampling of juveniles encounters for age and tissues for genetic analyses provide estimates of age composition and genetic structure and diversity in each population.

The Idaho Natural Production Monitoring program also oversees the systematic redd count survey program for natural populations of Chinook salmon throughout Idaho. Data from this program are available from the 1950's through the present and proved historic estimates of spawner abundance and distribution in all extant natural populations of Chinook salmon in Idaho. During systematic spawning ground surveys, carcasses of adult spawners are also sampled for scales, sex and size information and for tissues analyzed to characterize the genetic structure of the populations.

Category	Standards	Indicators	Applicable	Monitored
4. OPERATION OF ARTIFICIAL PR	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.	i. Annual reports indicating level of compliance with applicable standards and criteria. ii. Periodic audits indicating level of compliance with applicable standards and criteria.	Y Y	Y Y
	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.	Y	Y
	4.3. Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to	4.3.1. Water withdrawals compared to applicable passage criteria. 4.3.2. Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening	Y Y	Y Y

O D UC TI O N FA CI LIT IE S	natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	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.	 Y Y Y	 Y Y Y
	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.	Y Y Y	Y Y N
	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.	Y Y	Y Y
	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.	Y	C
	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.	Y Y	Y Y
	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.	Y N	C

4.1.1 – 4.1.2
https://research.idfg.idaho.gov/Fisheries%20Research%20Reports/Forms/Show%20All%20Reports.aspx for annual reporting. Reports are available upon request.

4.2.1
https://research.idfg.idaho.gov/Fisheries%20Research%20Reports/Forms/Show%20All%20Reports.aspx for annual reporting. Permits and compliance reports are available upon request.

4.3.1 – 4.3.5 Water withdrawal permits have been obtained to establish water rights for each hatchery facility. Intake system designed to deliver permitted flows. Operators monitor and report as required. Hatcheries participating in the programs will maintain all screens associated with water intakes in surface water areas to prevent impingement, injury, or mortality to listed salmonids.

4.4.1 – 4.4.3 Certification of fish health conducted prior to release (major bacterial, viral,

parasitic pathogens); IDFG fish health professionals sample and certify all release and/or transfer groups.

4.5.1 – 4.5.2 Nutrient enhancement projects, where/when applicable, are outlined in IDFG research, management, and/or hatchery permits and annual reports; see https://research.idfg.idaho.gov/Fisheries%20Research%20Reports/Forms/Show%20All%20Reports.aspx for annual reporting.

4.6.1 Hatchery and research elements monitor the following characteristics annually: juvenile migration timing, adult return timing, adult return age and sex composition, spawn timing and distribution.

4.7.1 – 4.7.2 Facility will maintain all weirs/traps associated with program to either reduce or eliminate stress, injury, or mortality to listed salmonids. Mortality rates are documented

4.8.1 – 4.8.2 Facility will maintain all weirs/traps associated with program to either reduce or eliminate stress, injury, or mortality to listed salmonids. Mortality rates are documented

Category	Standards	Indicators	Applicable	Monitored
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.	Y Y	Y Y
	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.	Y Y	Y Y

5.1.1 – 5.2.2 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 24. 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).
	Smolts	Smolt estimates, which result from juvenile emigrant trapping and PIT tagging, are derived by estimating the proportion of the total juvenile abundance estimate at the tributary comprised of each juvenile life stage (parr, presmolt, smolt) that survive to first mainstem dam. It is calculated by multiplying the life stage specific abundance estimate (with standard error) by the life stage specific survival estimate to first mainstem dam (with standard error). The standard error around the smolt equivalent estimate is calculated using the following formula; where X = life stage specific juvenile abundance estimate and Y = life stage specific juvenile survival estimate:

		$Var(X \cdot Y) = E(X)^2 \cdot Var(Y) + E(Y)^2 \cdot Var(X) + Var(X) \cdot Var(Y)$
	Run Prediction	This will not be in the raw or summarized performance database.
Survival – Productivity	Smolt-to-Adult Return Rate	The number of adult returns from a given brood year returning to a point (stream mouth, weir) divided by the number of smolts that left this point 1-5 years prior. Calculated for wild and hatchery origin conventional and captive brood fish separately. Adult data applied in two ways: 1) SAR estimate to stream using population estimate to stream, 2) adult PIT tag SAR estimate to escapement monitoring site (weirs, LGR), and 3) SAR estimate with harvest. Accounts for all harvest below stream. *Smolt-to-adult return rates* are generated for four performance periods; tributary to tributary, tributary to tributary, tributary to first mainstem dam, first mainstem dam to first mainstem dam, and first mainstem dam to tributary. *First mainstem dam to first mainstem dam S*AR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the estimated number of PIT tagged juveniles at first mainstem dam. Variances around the point estimates are calculated as described above. *Tributary to tributary SAR* estimates for natural and hatchery origin fish are calculated using PIT tag technology as well as direct counts of fish returning to the drainage. PIT tag SAR estimates are calculated by dividing the number of PIT tag adults returning to the tributary (by life stage and origin type) by the number of PIT tagged juvenile fish migrating from the tributary (by life stage and origin type). Overall PIT tag SAR estimates for natural fish are then calculated by averaging the individual life stage specific SAR's. Direct counts are calculated by dividing the estimated number of natural and hatchery-origin adults returning to the tributary (by length break-out for natural fish) by the estimated number of natural-origin fish and the known number of hatchery-origin fish leaving the tributary. *Tributary to* first mainstem dam SAR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the number of PIT tagged juveniles tagged in the tributary. There is no associated variance around this estimate. The adult detection probabilities at first mainstem dam are near 100 percent. First mainstem dam *to tributary* SAR estimates are calculated by dividing the number of PIT tagged adults returning to the tributary by the estimated number of PIT tagged juveniles at first mainstem dam. The estimated number of PIT tagged juveniles at first mainstem dam is calculated by multiplying lifestage specific survival estimates (with standard errors) by the number of juveniles PIT tagged in the tributary. The variance for the estimated number of PIT tagged juveniles at first mainstem dam is calculated as follows, where X = the number of PIT tagged fish in the tributary and Y = the variance of the lifestage specific survival estimate: $Var(X \cdot Y) = X^2 \cdot Var(Y)$ The variance around the SAR estimate is calculated as follows, where X = the number of adult PIT tagged fish returning to the tributary and Y = the estimated number of juvenile PIT tagged fish at first mainstem dam : $Var\left(\frac{X}{Y}\right) = \left(\frac{EX}{EY}\right)^2 \cdot \left(\frac{Var(Y)}{(EY)^2}\right)$
	Progeny-per- Parent Ratio	Adult to adult calculated for naturally spawning fish and hatchery fish separately as the brood year ratio of return adult to parent spawner abundance using data above weir. Two variants calculated: 1) escapement, and 2) spawners.
	Recruit/spawner (R/S)(Smolt Equivalents per Redd or female)	Juvenile production to some life stage divided by adult spawner abundance. Derive adult escapement above juvenile trap multiplied by the prespawning mortality estimate. Adjusted for redds above juv. Trap. *Recruit per spawner* estimates, or *juvenile abundance (can be various life stages or locations) per redd/female*, is used to index population productivity, since it represents the quantity of juvenile fish resulting from an average redd (total smolts divided by total redds)

		or female. Several forms of juvenile life stages are applicable. We utilize two measures: 1) juvenile abundance (parr, presmolt, smolt, total abundance) at the tributary mouth, and 2) smolt abundance at first mainstem dam.
	Pre-spawn Mortality	Percent of female adults that die after reaching the spawning grounds but before spawning. Calculated as the proportion of "25% spawned" females among the total number of female carcasses sampled. ("25% spawned" = a female that contains 75% of her egg compliment].
	Juvenile Survival to first mainstem dam	Life stage survival (parr, presmolt, smolt, subyearling) calculated by CJS Estimate (SURPH) produced by PITPRO 4.8+ (recapture file included), CI estimated as 1.96*SE. Apply survival by life stage to first mainstem dam to estimate of abundance by life stage at the tributary and the sum of those is total smolt abundance surviving to first mainstem dam . Juvenile survival to first mainstem dam = total estimated smolts surviving to first mainstem dam divided by the total estimated juveniles leaving tributary.
	Juvenile Survival to all Mainstem Dams	*Juvenile survival to first mainstem dam and subsequent Mainstem Dam(s)*, which is estimated using PIT tag technology. Survival by life stage to and through the hydrosystem is possible if enough PIT tags are available from the stream. Using tags from all life stages combined we will calculate (SURPH) the survival to all mainstem dams.
	Post-release Survival	Post-release survival of natural and hatchery-origin fish are calculated as described above in the performance measure "Survival to first mainstem dam and Mainstem Dams". No additional points of detection (i.e screwtraps) are used to calculate survival estimates.
Distribution	Adult Spawner Spatial Distribution	Extensive area tributary spawner distribution. Target GPS red locations or reach specific summaries, with information from carcass recoveries to identify hatchery-origin vs. natural-origin spawners across spawning areas within populations.
	Stray Rate (percentage)	Estimate of the number and percent of hatchery origin fish on the spawning grounds, as the percent within MPG, and percent out of ESU. Calculated from 1) total known origin carcasses, and 2) uses fish released above weir. Data adjusted for unmarked carcasses above and below weir.
	Juvenile Rearing Distribution	Chinook rearing distribution observations are recorded using multiple divers who follow protocol described in Thurow (1994).
	Disease Frequency	Natural fish mortalities are provided to certified fish health lab for routine disease testing protocols. Hatcheries routinely samples fish for disease and will defer to then for sampling numbers and periodicity
Genetic	Genetic Diversity	Indices of genetic diversity – measured within a tributary) heterozygosity – allozymes, microsatellites), or among tributaries across population aggregates (e.g., FST).
	Reproductive Success (Nb/N)	Derived measure: determining hatchery:wild proportions, effective population size is modeled.
	Relative Reproductive Success (Parentage)	Derived measure: the relative production of offspring by a particular genotype. Parentage analyses using multilocus genotypes are used to assess reproductive success, mating patterns, kinship, and fitness in natural pop8ulations and are gaining widespread use of with the development of highly polymorphic molecular markers.
	Effective Population Size (Ne)	Derived measure: the number of breeding individuals in an idealized population that would show the same amount of dispersion of allele frequencies under random genetic drift or the same amount of inbreeding as the population under consideration.
Life History	Age Structure	Proportion of escapement composed of adult individuals of different brood years. Calculated for wild and hatchery origin conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries. Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated.
	Age–at–Return	Age distribution of spawners on spawning ground. Calculated for wild and hatchery conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries.
	Age–at-Emigration	Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap

y		are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated.
	Size-at-Return	Size distribution of spawners using fork length and mid-eye hypural length. Raw database measure only.
	Size-at-Emigration	Fork length (mm) and weight (g) are representatively collected weekly from natural juveniles captured in emigration traps. Mean fork length and variance for all samples within a lifestage-specific emigration period are generated (mean length by week then averaged by lifestage). For entire juvenile abundance leaving a weighted mean (by lifestage) is calculated. Size-at-emigration for hatchery production is generated from pre release sampling of juveniles at the hatchery.
	Condition of Juveniles at Emigration	Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).
	Percent Females (adults)	The percentage of females in the spawning population. Calculated using 1) weir data, 2) total known origin carcass recoveries, and 3) weir data and unmarked carcasses above and below weir. Calculated for wild, hatchery, and total fish.
	Adult Run-timing	Arrival timing of adults at adult monitoring sites (weir, DIDSON, video) calculated as range, 10%, median, 90% percentiles. Calculated for wild and hatchery origin fish separately, and total.
	Spawn-timing	This will be a raw database measure only.
	Juvenile Emigration Timing	Juvenile emigration timing is characterized by individual life stages at the rotary screw trap and Lower Granite Dam. Emigration timing at the rotary screw trap is expressed as the percent of total abundance over time while the median, 0%, 10, 50%, 90% and 100% detection dates are calculated for fish at first mainstem dam.
	Mainstem Arrival Timing (Lower Granite)	Unique detections of juvenile PIT-tagged fish at first mainstem dam are used to estimate migration timing for natural and hatchery origin tag groups by lifestage. The actual Median, 0, 10%, 50%, 90% and 100% detection dates are reported for each tag group. Weighted detection dates are also calculated by multiplying unique PIT tag detection by a life stage specific correction factor (number fish PIT tagged by lifestage divided by tributary abundance estimate by lifestage). Daily products are added and rounded to the nearest integer to determine weighted median, 0%, 50%, 90% and 100% detection dates.
Habitat	Physical Habitat	TBD
	Stream Network	TBD
	Passage Barriers/Diversions	TBD
	Instream Flow	USGS gauges and also staff gauges
	Water Temperature	Various, mainly Hobo and other temp loggers at screw trap sights and spread out throughout the streams
	Chemical Water Quality	TBD
	Macroinvertebrate Assemblage	TBD
	Fish and Amphibian Assemblage	Observations through rotary screwtrap catch and while conducting snorkel surveys.
In-Hat	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.

Chery Measures		Estimated survival of various in-hatchery juvenile stages (green egg to eyed egg, eyed egg to ponded fry, fry to parr, parr to smolt and overall green egg to release) Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Life stage at release varies (smolt, presmolt, parr, etc.).
	Size-at-Release	Mean fork length measured in millimeters and mean weight measured in grams of a hatchery release group. Measured during prerelease sampling. Sample size determined by individual facility and M&E staff. Life stage at release varies (smolt, presmolt, parr, etc.).
	Juvenile Condition Factor	Condition Factor (K) relating length to weight expressed as a ratio. Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).
	Fecundity by Age	The reproductive potential of an individual female. Estimated as the number of eggs in the ovaries of the individual female. Measured as the number of eggs per female calculated by weight or enumerated by egg counter.
	Spawn Timing	Spawn date of broodstock spawners by age, sex and origin, Also reported as cumulative timing and median dates.
	Hatchery Broodstock Fraction	Percent of hatchery broodstock actually used to spawn the next generation of hatchery F1s. Does not include prespawn mortality.
	Hatchery Broodstock Prespawn Mortality	Percent of adults that die while retained in the hatchery, but before spawning.
	Female Spawner ELISA Values	Screening procedure for diagnosis and detection of BKD in adult female ovarian fluids. The enzyme linked immunosorbent assay (ELISA) detects antigen of *R. salmoninarum.*
	In-Hatchery Juvenile Disease Monitoring	Screening procedure for bacterial, viral and other diseases common to juvenile salmonids. Gill/skin/ kidney /spleen/skin/blood culture smears conducted monthly on 10 mortalities per stock
	Length of Broodstock Spawner	Mean fork length by age measured in millimeters of male and female broodstock spawners. Measured at spawning and/or at weir collection. Is used in conjunction with scale reading for aging.
	Prerelease Mark Retention	Percentage of a hatchery group that have retained a mark up until release from the hatchery. Estimated from a sample of fish visually calculated as either "present" or "absent"
	Prerelease Tag Retention	Percentage of a hatchery group that have retained a tag up until release from the hatchery - estimated from a sample of fish passed as either "present" or "absent". ("Marks" refer to adipose fin clips or VIE batch marks).
	Hatchery Release Timing	Date and time of volitional or forced departure from the hatchery. Normally determined through PIT tag detections at facility exit (not all programs monitor volitional releases).
	Chemical Water Quality	Hatchery operational measures included: dissolved oxygen (DO) - measured with DO meters, continuously at the hatchery, and manually 3 times daily at acclimation facilities; ammonia (NH^3) nitrite (NO^2), -measured weekly only at reuse facilities (Kooskia Fish Hatchery).
	Water Temperature	Hatchery operational measure (Celsius) - measured continuously at the hatchery with thermographs and 3 times daily at acclimation facilities with hand-held devices.

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

Section 11.1.1 describes the methods and plans to address the standards and indicators listed in Section 1.10. The table includes a field indicating whether or not the indicator is being monitored.

For cells with a "Y", the indicator is being monitored with funding provided by the hatchery mitigation program.

For cells with a "C", the indicator is being monitored, but is tied to a separately funded program (e.g. Idaho Supplementation Studies (ISS), Idaho Natural Production Monitoring Program (INPM), General Parr Monitoring (GPM) program etc.). Without continued funding for these

programs, many of the M&E components will not occur. For example, The ISS program is scheduled to end in 2014 with some components ending in 2012. Funding to offset this loss needs to be identified to avoid significant M&E data gaps.

For cells with a "Y/C", the indicator is being monitored and is partially funded through the hatchery mitigation program. Other programs, such as those listed in 2b above, provide the remaining funding.

For cells with an "N", the indicator is not currently being monitored. For all applicable indicators that are not being addressed (N), a brief narrative is provided below describing why that particular indicator is not being monitored.

Indicator

3.7.2 *Natural spawning success of hatchery-origin fish must be similar to that of natural-origin fish*- Tissue samples are, and will continue to be, collected from all natural- and hatchery-origin fish released above the hatchery weir that will enable the analysis of relative reproductive success of hatchery and natural parents. However, evaluation of the relative reproductive success of hatchery- and natural-origin Chinook salmon spawning naturally above the hatchery weir has not been initiated. Until such time that this evaluation is initiated, the combined productivity of hatchery- and natural-origin spawners will be monitored using data that is currently being collected and analyzed under existing M&E contracts. Funding for evaluating the relative reproductive success of hatchery and natural fish in this population would be a useful tool for validating assumptions in models that project outcomes from integrated hatchery programs. This type of effectiveness monitoring has population specific and regional applications.

3.10.1 Detectable changes in rate of occurrence and spatial distribution of disease, parasite or pathogen among the affected hatchery and natural populations - IDFG maintains a formalized fish health monitoring program for stocks propagated and reared at the hatchery facilities. IDFG has not prioritized the need to develop a formalized monitoring program for natural populations adjacent to the hatchery program. However, if mortalities occur or are observed during routine field operations and data collection events, samples are collected and delivered to the IDFG Fish Health Lab for analysis. Additionally, fish health samples collected by the USFWS as part of the National Wild Fish Heath Survey Database (www.esg.montana.edu/nfhdb/) are collected throughout Idaho.

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

4.4.3 *Samples of natural populations for disease occurrence before and after artificial*

production releases See 3.10.1 above

11.2 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC AND ECOLOGICAL EFFECTS TO LISTED FISH RESULTING FROM MONITORING AND EVALUATION ACTIVITIES.

Risk aversion measures for monitoring and evaluation activities associated with the evaluation of the Lower Snake River Compensation Program are specified in our ESA Section 7 Consultation and Section 10 Permit 1124. A brief summary of the kinds of actions taken is provided.

Adult handling activities are conducted to minimize impacts to ESA-listed, non-target species. Adult and juvenile weirs and screw traps are engineered properly and installed in locations that minimize adverse impacts to both target and non-target species. All trapping facilities are constantly monitored to minimize a variety of risks (e.g., high water periods, high emigration or escapement periods, security).

Adult spawner and redd surveys are conducted to minimize potential risks to all life stages of ESA-listed species. The IDFG conducts formal redd count training annually. During surveys, care is taken to not disturb ESA-listed species and to not walk in the vicinity of completed redds.

Snorkel surveys conducted primarily to assess juvenile abundance and density are conducted in index sections only to minimize disturbance to ESA-listed species. Displacement of fish is kept to a minimum.

Marking and tagging activities are designed to protect ESA-listed species and allow mitigation harvest objectives to be pursued/met. Hatchery produced fish are visibly marked to differentiate them from their wild/natural counterpart.

SECTION 12 RESEARCH

12.1 OBJECTIVE OR PURPOSE

12.2 COOPERATING AND FUNDING AGENCIES

12.3 PRINCIPAL INVESTIGATOR OR PROJECT SUPERVISOR AND STAFF12.4 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

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

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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

15.3 Analysis of effects

15.4 Actions taken to mitigate for potential effects

15.5 References

APPENDIX A

Table A1. Estimated take levels from adult trapping and broodstock collection.

Listed species affected: Spring Chinook Salmon **ESU/Population:** Snake River ESU, Upper Salmon R. population **Activity:** Adult enumeration and Broodstock collection				
Location of hatchery activity: Hatchery trap/weir **Dates of activity:** June through mid-September **Hatchery program operator:** Brent Snider				
	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 and may be as high as 8%. Trapping and handling mortality is less than ½ % of fish handled..	
Other Take (specify) h) Carcass sampling				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
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 Chinook salmon and summer Steelhead
ESU/Population: Snake River/Upper Salmon River
Activity: Hatchery Programmatic Maintenance (See Section 2.2.3 for detailed description of activities.)
Location of activity: Sawtooth Fish Hatchery

Maintenance Activity	Type of Take	Annual Take of Listed Fish By Life Stage (Number of Fish)			
		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)		50/10		
	Unintentional lethal take g)		1/1		
	Other Take (specify) h)				
Water source intake canal and fish bypass screen	Observe or harass a)				
	Capture, handle, and release c)		50/10		
	Unintentional lethal take g)		1/1		
	Other Take (specify) h)				
Adult fish weir at Sawtooth Fish Hatchery	Observe or harass a)				
	Capture, handle, and release c)		50/10		
	Unintentional lethal take g)		1/1		
	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)		150/30		
	Unintentional lethal take g)		3/3		
	Other Take (specify) h)				

APPENDIX B

Table B1. Responses to the issues and recommendations made by the USFWS Hatchery Review Team specific to the Sawtooth Fish Hatchery upper Salmon River spring Chinook Salmon program.

Category	HRT#	Issue Recommendation	Response from IDFG
Program Goals and Objectives	SA03	Quantify/establish smolt release, adult escapement, and harvest goals at Sawtooth and Yankee Fork.	Addressed in HGMP.
	SA04	Revisit East Fork Salmon River conservation/harvest needs. Consider reimplementing hatchery or supplementation releases	No current plans to reimplement hatchery or supplementation releases in the EFSR.
	SA05	Work with Regional processes to improve migration survival	IDFG currently participates in these types of regional processes.
	SA06	Establish conservation and broodstock escapement goals spring Chinook for upstream of Sawtooth weir.	Addressed in HGMP and will be addressed in recovery planning.
Broodstock Choice and Collection	SA07	Move toward developing a local broodstock for Yankee Fork spring Chinook salmon program.	See Shoshone Bannock - Yankee Fork Chinook salmon HGMP.
Hatchery and Natural Spawning	SA08	Prohibit hatchery spring Chinook salmon above Sawtooth weir.	Addressed in HGMP and will be addressed in recovery planning.
	SA09	Discontinue erythromycin injection of adults passed above the Sawtooth weir. Use anesthesia that does not require withdrawal periods.	IDFG is moving in this direction.
	SA10	Comply with Pacific Northwest fish Health Protection guidelines for processing salmon carcasses for nutrients. Do not outplant treated carcasses to basins negative for whirling disease.	IDFG developed and implemented these guidelines.
Incubation and	SA11	Incubate eggs one female per tray.	IDFG implements best management practices consistent with the size and

Rearing			intent of hatchery programs.
	SA12a	Reduce rearing densities in rearing room.	IDFG implements best management practices consistent with the size and intent of hatchery programs.
	SA12b	Discontinue sockeye rearing and move to another facility.	Plans are being developed to shift sockeye production to a newly acquired hatchery facility
	SA13	Develop disinfection system to treat river water for *M. cerebralis* for incubation system.	This recommendation is being considered and additional well water is being developed by the LSRCP office.
Incubation and Rearing	SA14	Evaluate the benefits of prophylactic feeding erythromycin treated food. Phase out use if warranted.	This recommendation has been or is being accomplished.
Release and Outmigration	SA15	Increase pre-release fish health sampling to 60 fish (from 20).	This protocol is currently in place.
Facilities and Operations	SA16	Design easier and less hazardous weir cleaning mechanism for Sawtooth weir.	IDFG will work with LSRCP to rectify this hazard issue. Additional funding is required to fully resolve the issue.
	SA17	Implement long term maintenance plan to maintain the integrity of the intake structure and stabilize the river channel.	This recommendation has been or is being accomplished.
	SA18	Implement program to stabilize undercutting of the Sawtooth weir apron; maintain the integrity of the weir.	This recommendation has been or is being accomplished.
	SA19	Construct shade covers over raceways; consider adding predator exclusion.	IDFG will work with LSRCP to implement this recommendation. Additional funding is required to fully implement the recommendations.
	SA20	Increase backup generator fuel storage capacity.	This recommendation has been determined to not be needed at this time.
	SA21	Provide backup (emergency) power to adult trap, spawning shed, and housing.	This recommendation is being considered through the LSRCP office.
	SA22	Increase the amount of disease free water available for early rearing.	This is critical for overall program success. IDFG will work with LSRCP to rectify this issue. Additional funding is required to fully resolve the issue.

	SA23	Develop means to cool adult holding water and reduce pathogen load in adult holding pond. Consider increasing well water supply, chilling, ozone or UV-treatment, or other to chill water.	This recommendation is being accomplished through the LSRCP office.
	SA24	Install sprinkler systems in temporary housing.	This recommendation is being considered through the LSRCP office.
Facilities and Operations	SA25	Evaluate impact of weir location on meeting East Fork Salmon River program goals. Determine options for meeting East Fork Salmon River program goals, including moving the weir, increased M & E, etc.	Relocating the weir downstream to address steelhead issues (see East Fork HGMP) will benefit monitoring and evaluation of the entire East Fork Salmon R. natural Chinook Salmon population. Moving the weir will require significant additional funding.
	SA26	Construct isolated chemical storage facility.	This recommendation has been accomplished.
	SA27	Ensure that water diverted for fish production is measured and reported correctly to Idaho Department of Water Resources and Water FWS division of Water Resources.	This recommendation is accomplished through NPDES permits. This information is available as needed.
Research Monitoring and Accountability	SA28	Monitor out-migrant survival. Investigate size/time of release, environmental factors, and fish health to explain low juvenile survival to Lower Granite.	This recommendation is being accomplished and being developed by the hatchery and M&E staff.
	SA29	Implement CWT across all rearing containers to ensure CWT is representative of all fish in the group.	Funding is required to investigate the utility of Parental Based Tagging; that technology may replace CWTs. The issue of CWT representation across rearing containers has been addressed.
	SA30a	Work with IDFG and co managers to develop PIT tagging protocols that allow estimating adult return to Snake and Salmon River basins. Determine numbers to mark that provide predetermined precision estimates of adult return in 'average' years.	Issue is currently being addressed through an annual statement of work negotiated between IDFG and LSRCP and coordinated through Annual Operating Plan process. Requires maintenance of funding for M&E tasks.
	SA30b	PIT tag adequate number of smolts to estimate downstream migration survival and smolt-to-adult return rates, and assist with in-season harvest management.	Issue is currently being addressed through an annual statement of work negotiated between IDFG and LSRCP and coordinated through Annual Operating Plan process. Requires maintenance of funding for M&E tasks.

	SA30c	Work with states and tribes to develop a PIT tagging program consistent with program goals and objectives that is linked to regional goals and objectives, and coordinated through a PIT tag steering committee.	Currently being accomplished through annual coordination processes.
	SA31	Develop a tribal monitoring program documenting tribal harvest of Sawtooth released salmon. Provide funding to implement monitoring.	The Shoshone Bannock Tribe has an established monitoring for all fisheries in the Upper Salmon River Basin.
Research Monitoring and Accountability	SA32	work with co managers to develop a data management plan that incorporates tagging goals and objectives, data management, and reporting requirements of CWT data at the program and regional level. Incorporate data management plan into cooperative agreement	Coded-wire tagging goals and objectives are described in the annual AOP document. For this facility. Reporting of tagged juvenile releases and tag recoveries among returning adults are submitted to RMIS within the specified reporting periods.
	SA33	Reduce back log of annual reports. Ensure are contract reporting requirements are met according to established guidelines.	Hatchery production reports are current, M&E reports have been reformatted and IDFG is working with the LSRCP office to bring all reporting requirements up to date.
	SA34	Implement hazard analysis and Critical Control Point (HACCP) plan addressing disinfection of sampling equipment (including rotary screw traps) prior to moving between drainages.	This recommendation is being accomplished and being developed by the hatchery and M&E staff.
	SA35	Develop a method to deal with annual operating contingencies that are not addressed in AOP's or other forums. Develop a more formal process to discuss, evaluate, and document issues as they arise.	Sufficient coordination occurs to address this issue.
	SA36	Update visitor center displays.	LSRCP is in process of developing the solution to this recommendation.
Education and Outreach	SA37	Develop means to document and disseminate harvest and conservation benefits of LSRCP program.	Issue is currently being addressed through an annual statement of work negotiated between IDFG and LSRCP and coordinated through Annual Operating Plan process. Requires maintenance of funding for M&E tasks. We are working with the LSRCP office to develop web accessible harvest reports. IDFG maintains summary

			harvest data on a department website