IDAHO DEPARTMENT OF FISH AND GAME
600 S Walnut / P.O. Box 25
Boise, Idaho 83707

C.L. "Butch" Otter / Governor
Virgil Moore / Director

September 13, 2011

Mr. Robert P. Jones
Salmon Management Division
National Marine Fisheries Service
1201 NE Lloyd Blvd., Suite 1100
Portland, OR 97232

Dear Mr. Jones,

The Idaho Department of Fish and Game submits these six (6) Hatchery and Genetic Management Plans (HGMP) for Snake River spring/summer Chinook salmon and summer steelhead programs. These HGMPs are being submitted for ESA consultation for Section 10(a)(1)(A) permits for artificial production programs IDFG manages associated with Idaho Power Company mitigation described in the Hells Canyon Settlement Agreement of 1980. (The Little Salmon River Summer Steelhead program includes the production and release of hatchery fish, in addition to that occurring as part of the Idaho Power Company mitigation, which occurs under the federally funded Lower Snake River Compensation Plan.) Consistent with the mitigation commitments described in the Hells Canyon Settlement Agreement, IDFG completed these HGMPs in consultation and coordination with other state, tribal and federal parties in the Snake River basin and they are consistent with provisions of the 2008-2017 U.S. v Oregon Management Agreement.

The six programs for which HGMPs are submitted are: 1) Hells Canyon Snake River Summer Steelhead, 2) Hells Canyon Snake River Spring Chinook Salmon, 3) Little Salmon River Summer Steelhead, 4) Little Salmon River Spring Chinook Salmon, 5) Pahsimeroi River Summer Steelhead and, 6) Pahsimeroi River Summer Chinook Salmon. Each of the programs is designed to enhance the survival of ESA-listed Snake River salmon and steelhead and provide continued mitigation for anadromous fish losses that resulted from federal and private hydropower development in the Snake River basin.

Please contact Peter Hassemer at (208) 334-3791 if you have any questions regarding this request. We appreciate you assistance and prompt attention to this request.

Sincerely,

Edward B. Schriever
Chief of Fisheries

cc: Craig Busack, Brett Farman
Jeff Yanke, Colleen Fagan – Oregon Department of Fish and Wildlife
Dave Johnson, Becky Johnson – Nez Perce Tribe
Chad Colter, Lytle Denny – Shoshone Bannock Tribes
Heather Bartlett, John Whalen – Washington Department of Fish and Wildlife
Jim Chandler, Paul Abbott, Stuart Rosenberger – Idaho Power Company
Scott Marshall, Joe Krakker – USFWS
Peter Hassemer, Sam Sharr, Brian Leth - IDFG

HATCHERY AND GENETIC MANAGEMENT PLAN

Hatchery Program:	**Little Salmon River Summer Steelhead** Niagara Springs Fish Hatchery Magic Valley Fish Hatchery Dworshak National Fish Hatchery
Species or Hatchery Stock:	Summer Steelhead - *Oncorhynchus mykiss* Pahsimeroi, Oxbow and Dworshak stocks
Agency/Operator:	Idaho Department of Fish and Game
Watershed and Region:	Little Salmon River/Salmon River Basin, Idaho
Date Submitted:	September 13, 2011
Date Last Updated:	September 2011

EXECUTIVE SUMMARY

The purpose of steelhead hatchery program in the Little Salmon River is to mitigate for fish losses caused by the construction and continued operation of the Hells Canyon and Lower Snake River hydroelectric dams. Mitigation is defined in two agreements; the Hells Canyon Settlement Agreement and Lower Snake River Compensation Plan. The Little Salmon River is the only tributary of the Salmon River that is open for recreational steelhead fishing. Managers have identified the Little Salmon River as an area they are willing to accept more potential impacts associated with operating a hatchery program. The Little Salmon River enables good angler access and an area with high concentrations of hatchery steelhead that are vulnerable to harvest. Mangers have focused the release of hatchery steelhead to this tributary of the Salmon River as a way of providing angler opportunity and reducing risks to adjacent tributaries and populations in the Salmon River.

The Hells Canyon Settlement Agreement calls for the production of 400,000 pounds (1.8 million smolts at 4.5 fish/lb) of steelhead smolts. Managers have prioritized approximately 25% of that production (445,000 smolts at 4.5 fish/lb) to be released in the Little Salmon River. Managers have also prioritized a component (approximately 515,000 smolts) of the mitigation production for the Lower Snake River Compensation Plan to be released in the Little Salmon River. Currently, 960,000 smolts are released into the Little Salmon River and are expected to return approximately 7,700 adults over Lower Granite Dam after harvest of approximately 15,400 adults in commercial, sport, and tribal fisheries in the ocean, Columbia River and lower Snake River. Smolt releases into the Little Salmon River from both the Hells Canyon and Lower Snake River mitigation programs are consistent with the 2008-2017 US vs. Oregon Management Agreement.

Broodstock for the program are collected at the Hells Canyon Dam trap and at the Pahsimeroi and Dworshak fish hatchery traps. Fish culture is performed at the Oxbow, Niagara Springs, Pahsimeroi, Clearwater, and Magic Valley fish hatcheries. Final egg incubation and juvenile rearing occurs at Niagara Springs and Magic Valley fish hatcheries. All hatchery operations and a portion of monitoring activities are funded by the Idaho Power Company (IPC) and the Lower Snake River Compensation Plan program. Where appropriate, other sources of funding for monitoring activities are identified.

The program is operated as a segregated harvest program. In their 2008 review of the program, the Hatchery Scientific Review Group made no specific recommendations to alter this program.

Key performance standards for the program will be tracked in a targeted monitoring and evaluation program. These standards include: (1) number of smolts released; (2) in-hatchery growth and survival rates; (3) post-release survival rates; (4) estimated harvest rates by release group; and (5) estimated smolt to adult survival rates.

SECTION 1. GENERAL PROGRAM DESCRIPTION

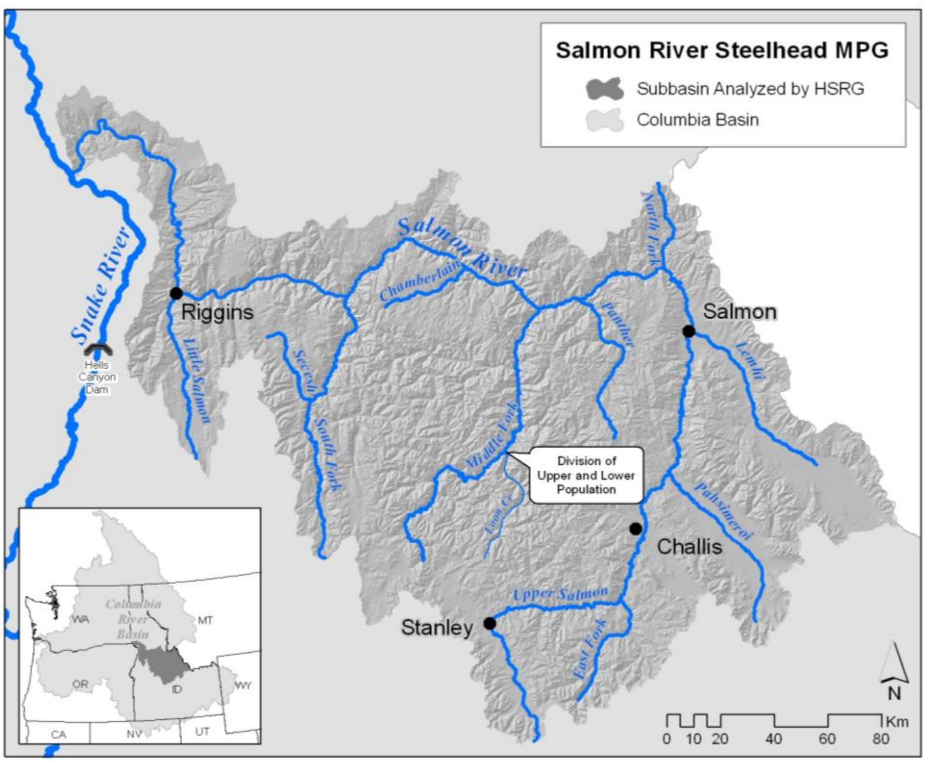
1.1 NAME OF HATCHERY OR PROGRAM

Hatchery: Niagara Springs Fish Hatchery
Magic Valley Fish Hatchery
Dworshak National Fish Hatchery

Program: Little Salmon River Summer steelhead

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

Little Salmon River summer steelhead (*Oncorhynchus mykiss*) are included in the Salmon River steelhead Major Population Group (MPG) in the Snake River Distinct Population Segment (DPS) and were listed as threatened under the Endangered Species Act in 1997. This MPG includes the South Fork Salmon River, Secesh River, Upper and Lower Mainstem Middle Fork Salmon, Chamberlain Creek, Panther Creek, North Fork Salmon River, Lemhi River, Pahsimeroi River, East Fork Salmon River, and upper Salmon River mainstem populations (Figure 1). The hatchery–origin steelhead in this program are not listed under the ESA.



Source: HSRG 2009

Figure 1. Salmon River Steelhead MPG.

1.3 Responsible organization and individuals

Lead Contact

Name (and title):	Pete Hassemer, Anadromous Fish Manager
Agency or Tribe:	Idaho Department of Fish and Game
Address:	600 S. Walnut, P.O. Box 25, Boise, ID 83707
Telephone:	(208) 334-3791
Fax:	(208) 334-2114
Email:	pete.hassemer@idfg.idaho.gov

On-site Operations Lead (Oxbow Fish Hatchery)

Name (and title):	Jeff Seggerman, Fish Hatchery Assistant Manager
Agency or Tribe:	Idaho Department of Fish and Game
Address:	P.O. Box 200, Oxbow, Oregon 97840
Telephone:	(541) 785-3459
Fax:	(541) 785-3396
Email:	oxbowfh@pinetel.com

On-site Operations Lead (Pahsimeroi Fish Hatchery)

Name (and title):	Todd Garlie, Fish Hatchery Manager II
Agency or Tribe:	Idaho Department of Fish and Game
Address:	71 Fish Hatchery Lane, May, Idaho 83253
Telephone:	(208) 876-4330
Fax:	(208) 876-4332
Email:	tgarlie@custertel.net

On-site Operations Lead (Niagara Springs Fish Hatchery)

Name (and title):	Jerry Chapman, Fish Hatchery Manager II
Agency or Tribe:	Idaho Department of Fish and Game
Address:	2131 Niagara Springs Road, Wendell, ID 83355
Telephone:	(208) 536-2283
Fax:	(208)536-5137
Email:	niagara@magiclink.com

On-site Operations Lead (Magic Valley Fish Hatchery)

Name (and title):	Rick Lowell, Fish Hatchery Manager II
Agency or Tribe:	Idaho Department of Fish and Game.
Address:	2036 River Road, Filer, ID 83328.
Telephone:	(208) 326-3230.
Fax:	(208) 326-3354.
Email:	richard.lowell@idfg.gov

Name (and title):	Jerry McGehee, Fish Hatchery Manager II, Clearwater Fish Hatchery.
Agency or Tribe:	Idaho Department of Fish and Game.
Address:	4156 Ahsahka Rd., Ahsahka, ID 83520.
Telephone:	(208) 476-3331.
Fax:	(208) 479-3548.
Email:	jmcgehee@idfg.state.id.us

Name (and title): Larry Peltz, Complex Manager,
Dworshak National Fish Hatchery.
Agency or Tribe: U.S. Fish and Wildlife Service.
Address: P.O. box 18, 4147 Ahsahka Rd., Ahsahka, ID 83520
Telephone: (208) 476-4591.
Fax: (208) 476-3252.
Email: larry_peltz@fws.gov

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

Idaho Power Company – Facility owner and sole funding source for operation and maintenance of Oxbow, Pahsimeroi and Niagara Springs fish hatcheries

Name (and title): Paul E. Abbott, Hatchery Biologist
Agency or Tribe: Idaho Power Company
Address: 1221 W. Idaho Street, Boise, ID 83702
Telephone: (208) 388-2353
Fax: (208) 388-5880
Email: pabbott@idahopower.com

Hells Canyon Settlement Agreement Parties –Signatories to the FERC-approved agreement defining mitigation requirements for Idaho Power Company associated with construction and continuing operation of the Hells Canyon Complex. Parties include the Idaho Power Company (IPC), the National Marine Fisheries Service (NOAA Fisheries), the Idaho Department of Fish and Game (IDFG), the Oregon Department of Fish and Wildlife (ODFW), the Washington Department of Fisheries (WDF), and the Washington Department of Game (WDG) (now collectively the Washington Department of Fish and Wildlife (WDFW)).

U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan Office: Administers the Lower Snake River Compensation Plan as authorized by the Water Resources Development Act of 1976.

Name (and title): Scott Marshall
Agency or Tribe: U.S. Fish and Wildlife Service
Address: 1387 S. Vinnell Way, Suite 343 Boise, Idaho 83709
Telephone: (208) 378-5321
Fax: (208) 378-5304
Email: scott_marshall@fws.gov

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

- Oxbow Fish Hatchery (broodstock collection, spawning and incubation)
  Funded by Idaho Power Company
  Staffing level: 1 FTE plus 30 months of seasonal labor

Annual budget: $180,000 as of FY10

- Pahsimeroi Fish Hatchery (broodstock collection, spawning and incubation)
  Funded by Idaho Power Company
  Staffing level: 3 FTE plus 35 months of seasonal labor
  Annual budget: $476,000 as of FY10

- Niagara Springs Fish Hatchery (incubation, rearing and smolt release)
  Funded by Idaho Power Company
  Staffing Level: 4 FTE plus 46 months of seasonal labor
  Annual budget: $520,300 as of FY10

- Magic Valley Fish Hatchery (incubation, rearing and smolt release)
  Funded by Lower Snake River Compensation Plan (USFWS)
  Staffing Level: 4 FTE and 27 months of temporary staff
  Annual Budget:$750,000 FY10

- Clearwater Fish Hatchery (incubation)
  Funded by Lower Snake River Compensation Plan (USFWS)
  Staffing Level: 8 FTE and 152 months of temporary staff
  Annual Budget:$1,887,000 FY10

- Dworshak National Fish Hatchery (broodstock collection and spawning)
  Funded by: U.S. Army Corps of Engineers has a direct funding agreement with BPA to provide 100% funding for the facility
  Staffing Level: 19 staff

1.5 LOCATIONS OF HATCHERY AND ASSOCIATED FACILITIES

Oxbow Fish Hatchery - The Oxbow Fish Hatchery (OFH) is located in eastern Oregon immediately upstream of the confluence of Pine Creek and the Snake River at the IPC village known as Oxbow, Oregon. The hydrologic unit code for the OFH is 17050201. The Hells Canyon Trap (HC Trap), the adult trapping facility for OFH steelhead, is located on the Oregon side of the Snake River approximately 35 kilometers downstream from the OFH. The HC Trap is located immediately below IPC's Hells Canyon Dam. The hydrologic unit code for Hells Canyon Dam is 17060101. River kilometer codes for OFH and Hells Canyon Dam are not available.

Pahsimeroi Fish Hatchery – Pahsimeroi Fish Hatchery (PFH) is comprised of two separate facilities – the lower Pahsimeroi Fish Hatchery (lower PFH) and the upper Pahsimeroi Fish Hatchery (Upper PFH). The lower PFH is located on the Pahsimeroi River approximately 1.6 kilometers above its confluence with the mainstem Salmon River near Ellis, Idaho. The Upper PFH is located approximately 11.3 kilometers further upstream from the lower facility on the Pahsimeroi River. The river kilometer codes for the upper and lower facilities are 522.303.489.011 and 522.303.489.002 respectively. The hydrologic unit code for both facilities is 17060202.

Niagara Springs Fish Hatchery - Niagara Springs Fish Hatchery (NSFH) is located in southern Idaho along the middle Snake River approximately 16 kilometers south of Wendell, Idaho. The hydrologic unit code for NSFH is 17040212, which is part of the Upper Snake Rock Watershed. A river kilometer code for NSFH is not available.

Dworshak National Fish Hatchery – The Dworshak National Fish Hatchery (DNFH) is located at the confluence of the North Fork and mainstem Clearwater rivers at river kilometer 65 in the Snake River Basin, Idaho. The HUC4 EPA River Reach is 1706030602600.

Clearwater Fish Hatchery - The Clearwater Fish Hatchery (CFH) is located at confluence of the North Fork and mainstem Clearwater rivers at river kilometer 65 on the Clearwater River. The HUC4 EPA River Reach is 1706030602600.

Magic Valley Fish Hatchery – The Magic Valley Fish Hatchery (MVFH) is located adjacent to the Snake River approximately 11.2 kilometers northwest of Filer, Idaho. There is no river kilometer code for the facility. The hydrologic unit code for the facility is 17040212.

1.6 TYPE OF PROGRAM

This is a segregated harvest program

1.7 PURPOSE(GOAL) OF PROGRAM

The purpose of the steelhead hatchery program in the Little Salmon River is to mitigate for fish losses caused by the construction and continued operation of the Hells Canyon and Lower Snake River hydroelectric dams. The Hells Canyon Settlement Agreement (HCSA) and Lower Snake River Compensation Plan define these mitigation provisions. The Little Salmon River is the only tributary of the Salmon River that is open for recreational steelhead fishing.

1.8 JUSTIFICATION OF PROGRAM

HCSA Mitigation

The IPC summer steelhead mitigation program began in 1966 to provide mitigation for lost steelhead production caused by the construction and operation of the Hells Canyon Complex. IPC is required by the HCSA to collect a sufficient number of adult steelhead from the Snake and Pahsimeroi rivers to provide for the annual production of 400,000 lbs of steelhead smolts (200,000 pounds each of Oxbow-A and Pahsimeroi-A stocks; approximately 1,800,000 fish). Section IV.A.3.f of the HCSA allows the fisheries agencies to deviate from this schedule with regards to release location and relative balance between the two stocks (Oxbow-A and Pahsimeroi-A). At the discretion of fisheries managers, approximately 25% (445,000 smolts) of the total mitigation production is released in the Little Salmon River.

LSRCP Mitigation

A component of the hatchery steelhead releases in the Little Salmon River are 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 pg 14)*

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

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

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

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

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

- The survival rate required to deliver a 2:1 catch to escapement ratio has been less than expected and this has resulted in fewer adults being produced in most years.
- The listing of Snake River fall Chinook and Snake River Steelhead under the Endangered Species Act has resulted in significant curtailment of commercial, recreational and tribal fisheries throughout the mainstem Columbia River. This has resulted in a much higher percentage of the annual run returning to the project area than was expected.
- The U.S. v. Oregon court stipulated Fishery Management Plan has established specific hatchery production agreements between the states, tribes and federal government and this has diversified the hatchery program by adding new off station releases to meet short term conservation objectives.

The LSRCP mitigation program within the Salmon River watershed was designed to escape 25,260 adults back to the project area after a harvest of 50,520 (Magic Valley and Hagerman Nation fish hatcheries combined). The Little Salmon River accounts for approximately 17% of the LSRCP mitigation releases in the Salmon River drainage. 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 270 adult broodstock to perpetuate the LSRCP hatchery program in the Little Salmon River (see sections 1.11.1and 6-8 for more detail).
3. To provide recreational and tribal fisheries annually (see Section 3.3 for more detail).
4. To maximize the beneficial uses of fish that return to the project area that are not used for broodstock, harvest or natural spawning. Managers have developed agreements to share and distribute these fish equally between tribal and non-tribal entities. Specific objectives are established annually as part of a preseason co-manager meeting between the states, tribes and federal agencies to prioritize the distribution of fish, Specific dispositions may include:

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

1.9 LIST OF PROGRAM PERFORMANCE STANDARDS

"Performance Standards" are designed to achieve the program goal/purpose, and are

generally measurable, realistic, and time specific. The NPPC "Artificial Production Review" document attached with the instructions for completing the HGMP presents a list of draft "Performance Standards" as examples of standards that could be applied for a hatchery program. If an ESU-wide hatchery plan including your hatchery program is available, use the performance standard list already compiled.

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

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

In a report prepared for Northwest Power and Conservation Council, the Independent Scientific Review Panel (ISRP) and the Independent Scientific Advisory Board (ISAB) reviewed the nature of the demographic, genetic and ecological risks that could be associated with supplementation, and concluded that the current information available was insufficient to provide an adequate assessment of the magnitude of these effects under alternative management scenarios. 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 (Glabreath et al. 2008) that describes framework for integrated hatchery research, monitoring, and evaluation to be evaluated at a basin-wide ESU scale.

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

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

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

Category	Standards	Indicators
1. LEGAL MANDATES	1.1. Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in applicable agreements such as under U.S. v. OR and U.S. v. Washington.	1.1.1. Total number of fish harvested in Tribal fisheries targeting this program. 1.1.2. Total fisher days or proportion of harvestable returns taken in Tribal resident fisheries, by fishery. 1.1.3. Tribal acknowledgement regarding fulfillment of tribal treaty rights.
	1.2. Program contributes to mitigation requirements.	1.2.1. Number of fish released by program, returning, or caught , as applicable to given mitigation requirements.
	1.3. Program addresses ESA responsibilities.	1.3.1. Section 7, Section 10, 4d rule and annual consultation
2. IMPLEMENTATION AND COMPLIANCE	2.1. Program contributes to mitigation requirements.	2.1.1. Hatchery is operated as a segregated program. 2.1.2. Hatchery is operated as an integrated program 2.1.3. Hatchery is operated as a conservation program
	2.2. Program addresses ESA responsibilities.	2.2.1. Hatchery fish can be distinguished from natural fish in the hatchery broodstock and among spawners in supplemented or hatchery influenced population(s)
	2.3. Restore and maintain treaty-reserved tribal and non-treaty fisheries.	2.3.1. Hatchery and natural-origin adult returns can be adequately forecasted to guide harvest opportunities. 2.3.2. Hatchery adult returns are produced at a level of abundance adequate to support fisheries in most years with an acceptably limited impact to natural-spawner escapement.
	2.4. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.	2.4.1. Number of fish release by location estimated and in compliance with AOPs and US vs. OR Management Agreement. 2.4.2. Number if adult returns by release group harvested 2.4.3. Number of non-target species encountered in fisheries for targeted release group.

Category	Standards	Indicators
	2.5. Hatchery incubation, rearing, and release practices are consistent with current best management practices for the program type.	2.5.1. Juvenile rearing densities and growth rates are monitored and reported. 2.5.2. Numbers of fish per release group are known and reported. 2.5.3. Average size, weight and condition of fish per release group are known and reported. 2.5.4. Date, acclimation period, and release location of each release group are known and reported.
	2.6. Hatchery production, harvest management, and monitoring and evaluation of hatchery production are coordinated among affected co-managers.	2.6.1. Production adheres to plans documents developed by regional co-managers (e.g. US vs. OR Management agreement, AOPs etc.). 2.6.2. Harvest management harvest, harvest sharing agreements, broodstock collection schedules, and disposition of fish trapped at hatcheries in excess of broodstock needs are coordinated among co-management agencies. 2.6.3. Co-managers react adaptively by consensus to monitoring and evaluation results. 2.6.4. Monitoring and evaluation results are reported to co-managers and regionally in a timely fashion.
3. HATCHERY EFFECTIVENESS MONITORING REGIONAL FOR AUGMENTATION AND SUPPLEMENTATION PROGRAMS	3.1. Release groups are marked in a manner consistent with information needs and protocols for monitoring impacts to natural- and hatchery-origin fish at the targeted life stage(s)(e.g. in juvenile migration corridor, in fisheries, etc.).	3.1.1. All hatchery origin fish recognizable by mark or tag and representative known fraction of each release group marked or tagged uniquely. 3.1.2. Number of unique marks recovered per monitoring stratum sufficient to estimate number of unmarked fish from each release group with desired accuracy and precision.
	3.2. The current status and trends of natural origin populations likely to be impacted by hatchery production are monitored.	3.2.1. Abundance of fish by life stage is monitored annually. 3.2.2. Adult to adult or juvenile to adult survivals are estimated. 3.2.3. Temporal and spatial distribution of adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored. 3.2.4. Timing of juvenile outmigration from rearing areas and adult returns to spawning areas are monitored. 3.2.5. Ne and patterns of genetic variability are frequently enough to detect changes across generations.
	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.

Category	Standards	Indicators
	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. OPERATION OF ARTIFICIAL PRODUCTION FACILITIES	4.1. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.	4.1.1. Annual reports indicating level of compliance with applicable standards and criteria. 4.1.2. Periodic audits indicating level of compliance with applicable standards and criteria.
	4.2. Effluent from artificial production facility will not detrimentally affect natural populations.	4.2.1. Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc.
	4.3. Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	4.3.1. Water withdrawals compared to applicable passage criteria. 4.3.2. Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria. 4.3.3. Number of adult fish aggregating and/or spawning immediately below water intake point. 4.3.4. Number of adult fish passing water intake point. 4.3.5. Proportion of diversion of total stream flow between intake and outfall.
	4.4. Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.	4.4.1. Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence. 4.4.2. Juvenile densities during artificial rearing. 4.4.3. Samples of natural populations for disease occurrence before and after artificial production releases.

Category	Standards	Indicators
	4.5. Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.	4.5.1. Number and location(s) of carcasses or other products distributed for nutrient enrichment. 4.5.2. Statement of compliance with applicable regulations and guidelines.
	4.6. Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population.	4.6.1. Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution.
	4.7. Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.	4.7.1. Mortality rates in trap. 4.7.2. Prespawning mortality rates of trapped fish in hatchery or after release.
	4.8. Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.	4.8.1. Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present. 4.8.2. Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition.
5. SOCIO-ECONOMIC EFFECTIVENESS	5.1. Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	5.1.1. Total cost of program operation. 5.1.2. Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits.
	5.2. Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	5.2.1. Total cost of program operation. 5.2.2. Average total cost of activities with similar objectives.
	5.3. Non-monetary societal benefits for which the program is designed are achieved.	5.3.1. Number of adult fish available for tribal ceremonial use. 5.3.2. Recreational fishery angler days, length of seasons, and number of licenses purchased.

1.11 EXPECTED SIZE OF PROGRAM

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

IPC's overall mitigation goal for summer steelhead is to produce 400,000 pounds of smolts annually. IPC is required by the Hells Canyon Settlement Agreement to collect a sufficient number of adult steelhead from the Snake and Pahsimeroi rivers to provide for the annual production of 400,000 lbs of steelhead smolts (200,000 pounds each of Oxbow-A and Pahsimeroi-A stocks; approximately 1,800,000 fish). However, Section IV.A.3.f of the Hells Canyon Settlement Agreement allows the fisheries agencies to deviate from this schedule with regards to release location and relative balance between the two stocks (Oxbow-A and Pahsimeroi-A).

As part of IPCs mitigation, current management objectives are to release 275,000 (61,111 lbs) Oxbow A-run and 170,000 (37,778 lbs) Pahsimeroi A-run steelhead smolts into the Little Salmon River annually. To meet these release targets, approximately 92 and 52 females are needed, respectively. With a 1:1 spawn ratio, an equivalent number of adult males are needed. The number of adults needed is based on a ten-year average of pre-spawn mortality, fecundity, in-hatchery survival, and cull rates (see below).

Oxbow-A Fecundity and Survival

- 92 females trapped x 17.0% pre-spawn mortality = 16 pre-spawn mortalities (76 females remaining)
- 76 females x 5,526 fecundity = 419,976 green eggs
- 419,976 green eggs x 0% cull rate for pathogen control = 0 culled eggs (419,976 remaining)
- 419,976 green eggs x 65.6% green egg to smolt survival = 275,505 smolts at release

Pahsimeroi-A Fecundity and Survival

- 52 females trapped x 0.1% pre-spawn mortality = 1 pre-spawn mortality (51 females remaining)
- 51 females x 4,770 fecundity = 243,270 green eggs
- 243,270 green eggs x 0% cull rate for pathogen control = 0 culled eggs (243,270 remaining)
- 243,270 green eggs x 70.9% green egg to smolt survival = 172,479 smolts at release

In addition to the steelhead released into the Little Salmon River as part of the Hells Canyon Settlement Agreement, managers have also prioritized releasing a component of the Lower Snake River Compensation Plan steelhead mitigation (515,000 smolts) into the Little Salmon River. These steelhead are a combination of Pahsimeroi-A run steelhead (200,000) collected at Pahsimeroi Fish Hatchery and Dworshak B-run steelhead (315,000) collected at Dworshak National Fish Hatchery. Steelhead from both stocks are reared at Magic Valley Fish Hatchery. To meet the release targets, approximately 60 Pahsimeroi-A and 75 Dworshak females are needed (based on average pre-spawn mortality, fecundity, in-hatchery survival, and cull rates). With a 1:1 spawn ratio, an equivalent number of adult males are also needed.

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

Steelhead released in the Little Salmon River are composed of four groups. Two of the groups are reared at Niagara Springs Fish Hatchery and are part of the IPC mitigation. The other two groups are reared at Magic Valley Fish Hatchery and are part of the Lower Snake River Compensation Plan. Annually, 960,000 steelhead yearling smolts are released into the Little Salmon River (Table 2). All yearling smolts are adipose fin-clipped and a fraction is coded wire tagged. A summary of actual numbers of smolts released into the Little Salmon River since 1995 is presented in Section 10.3.

Table 2. Annual summer steelhead release targets for the Little Salmon River.

Life Stage	Rearing Hatchery	Stock	Release Level
Yearling	Niagara Springs	Oxbow-A	275,000
Yearling	Niagara Springs	Pahsimeroi-A	170,000

Yearling	Magic Valley	Pahsimeroi-A	200,000
Yearling	Magic Valley	Dworshak-B	315,000
Total			960,000

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

Smolt-to-adult survival rates for this program are not available; however, estimates of the number of program fish that have contributed to fisheries are presented in Section 3.3.1. Beginning with BY07, managers have increased the number of PIT-tags implanted in all hatchery steelhead produced to allow estimation of the SAR (from juvenile release to adult return at Lower Granite Dam) of program fish.

1.13 DATE PROGRAM STARTED (YEARS IN OPERATION), OR IS EXPECTED TO START

The Little Salmon River hatchery steelhead program began 1983. The facilities listed below support operations of the program.

Oxbow Fish Hatchery - Oxbow Fish Hatchery was constructed in 1961 as an experimental facility for evaluating the feasibility of supplementing Snake River fall Chinook populations through artificial propagation. New concrete holding ponds were built to accommodate adult steelhead and collection of broodstock for artificial propagation began in September 1965. The first eggs were collected in March 1966 and transferred to NSFH for rearing. OFH continues to spawn broodstock and supply eggs and fry to NSFH today.

Pahsimeroi Fish Hatchery – The Upper PFH was constructed in 1966 as an acclimation facility for summer steelhead smolts that were transported from NSFH and eventually released into the Pahsimeroi River. This occurred from 1967 through 1971 until IDFG determined that directly released steelhead smolts survived as well or better than acclimated smolts. Since then, all steelhead smolts have been directly released into the Pahsimeroi River immediately below the adult barrier weir at the lower PFH. IPC constructed the lower PFH in 1968 along the lower Pahsimeroi River approximately 1.6 kilometers above its confluence with the main Salmon River. Steelhead trapping and spawning at the lower PFH began in 1969, with the first returns of NSFH smolts released in 1967.

Niagara Springs Fish Hatchery - Niagara Springs Fish Hatchery was constructed in 1966 with the expressed goal of producing 200,000 pounds of steelhead smolts annually. The first year class of fish spawned at OFH and reared at NSFH was released into the Pahsimeroi River in the spring of 1967. Following the signing of the HCSA in 1980, steelhead production goals at NSFH increased from 200,000 to 400,000 pounds of fish annually.

Magic Valley Fish Hatchery - The hatchery has been in operation since 1983. A new facility was constructed in 1988.

Clearwater Fish Hatchery- The hatchery was completed and became operational in 1990.

Completion dates of the steelhead satellite facilities are: Red River - 1986, and Crooked River - 1990. The Red River facility was originally constructed under the Columbia Basin Development Program, and was later modified under the Lower Snake River Compensation Program.

1.14 EXPECTED DURATION OF PROGRAM

This summer steelhead program is expected to continue indefinitely to mitigate for losses of anadromous fish associated with the construction and operation of the Hells Canyon and the Lower Snake River dams.

1.15 WATERSHEDS TARGETED BY PROGRAM

Listed by hydrologic unit code –
Little Salmon River: 17060210

1.16 INDICATE ALTERNATIVE ACTIONS CONSIDERED FOR ATTAINING PROGRAM GOALS, AND REASONS WHY THOSE ACTIONS ARE NOT BEING PROPOSED

IDFG has not considered alternative actions to achieve program goals. Stated production goals are mandated by the Federal Energy Regulatory Commission (FERC) through the HCSA with IPC and through the Lower Snake River Compensation Plan that was authorized through the Water Resources Development Act of 1976.

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

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

- Section 10 Permit Number 1481: annual incidental take of listed anadromous fish associated with recreational fishing programs. Expires 5/31/10.

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

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

Populations affected by this program are described in a report prepared by the ICTRT (2005). This section is summarized from that publication.

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

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

The ICTRT has identified one major spawning area (MaSA) and four minor spawning areas (MiSA) within reaches used by Little Salmon River summer steelhead (ICTRT 2005).

Identify the NMFS ESA-listed population(s) that will be directly affected by the program. (Includes listed fish used in supplementation programs or other programs that involve integration of a listed natural population. Identify the natural population targeted for integration).

The Little Salmon hatchery steelhead program is a segregated harvest program. No listed natural-origin fish are used in the broodstock.

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

- Snake River spring/summer Chinook salmon
- Snake River Fall Chinook
- Snake River steelhead

All hatchery-origin juveniles released as part of this hatchery program are released in the Little Salmon River. The Little Salmon River accounts for approximately 55% of the spawning area within the Little Salmon River population. Tributaries of the Salmon River (Rock, Slate, Whitebird, and Skookumchuck creeks) downstream of the Little Salmon River account for the balance of the spawning area.

Assess the level of risk that the hatchery program has on the natural population (criteria based on Appendix C of the NOAA Fisheries- Supplemental Comprehensive Analysis (SCA))

Abundance: Maintaining a segregated broodstock will prevent the need to remove natural-origin adults for use as broodstock. No broodstock for this program is collected within the Little Salmon River population. Broodstock is collected at the Hells Canyon trap, Pahsimeroi Fish Hatchery, and Dworshak Fish Hatchery. The only weir operated within the Little Salmon River population (Rapid River) is not part of this hatchery program and is not expected to block or delay natural-origin adults. Interbreeding of hatchery and natural fish in the Little Salmon River has the potential to reduce the abundance of the natural population though a reduction in productivity

Productivity: Hatchery-origin returns from steelhead released in the Little Salmon River are not trapped but a significant fraction is removed during the recreational harvest. A velocity barrier operated at Rapid River hatchery is used to prevent hatchery-origin steelhead from escaping above the barrier on Rapid River. All natural-origin steelhead trapped are released upstream to spawn naturally. It is likely that unharvested hatchery returns to the Little Salmon River are spawning naturally and have the potential to reduce the productivity of the natural population. The number and composition of natural spawners in the Little Salmon River population is unknown. It is less likely that hatchery fish are straying into tributaries downstream of the Little Salmon River since none of the hatchery releases occur in those vicinities.

Spatial Structure: Operation of this hatchery program is not expected to negatively affect spatial distribution of natural-origin spawners. Delay or blockage of migration associated with operation of the velocity barrier and trap on Rapid River does not appear to be a problem at this facility.

Diversity: Maintaining the segregated hatchery mitigation program in the Little Salmon River does include some risk to the natural population in the Little Salmon River proper. Managers are willing to accept higher risk in this localized area in exchange for providing excellent harvest opportunity in an area where steelhead are vulnerable to harvest. The velocity barrier associated with the Rapid River Hatchery prevents hatchery origin fish from escaping above the barrier in Rapid River. By concentrating the hatchery releases in the Little Salmon River managers are attempting to reduce risks to other tributaries and populations in the Salmon River MPG.

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 (see definitions in "Attachment 1").

Little Salmon River steelhead are part of the Snake River DPS. The DPS contains both A and B-run steelhead. This population is an "A" run and is classified as threatened under the Endangered Species Act. The ICTRT classified this population as "Intermediate" but able to meet "Basic" abundance and productivity criteria for viability. A "Basic" population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT (HSRG 2009).

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.

This data is not available.

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

This data is not available for Little Salmon River population as a whole, but information is available for the Rapid River (a major tributary of the Little Salmon River) natural steelhead population. Table 3 below lists the number of natural-origin steelhead trapped at Rapid River for the last 13 years.

Table 3. Natural-origin steelhead trapped at the Rapid River weir, 1997-2009.

Year	Female	Male	Unknown	Total Wild Steel-head Trapped
1997	39	16	1	56
1998	15	8		23
1999	6	4		10
2000	11	7		18
2001	15	8	8	31
2002	67	39		106
2003	47	33	7	87
2004	64	56		120
2005	60	21		81
2006	71	28		99
2007	21	11		32
2008	59	64		123
2009	62	44		106

Provide the most recent 12 year estimates of annual proportions of direct hatchery-origin and listed

natural-origin fish on natural spawning grounds, if known.

This data is not available for the Little Salmon River population as a whole. Only natural-origin steelhead are released above the Rapid River weir to spawn naturally. Because there is no adult trap on the mainstem Little Salmon River, it is expected that the proportion of hatchery-origin steelhead on the spawning grounds is relatively high. The number of hatchery-origin spawners in the lower elevations (Minor Spawning Areas) of the Little Salmon River Population (Whitebird Creek, Slate Creek, Skookumchuck, and Rock Creek) is expected to be low because no hatchery-origin steelhead are released in those areas. These four tributaries combined account for approximately 45% of the spawning area in the Little Salmon River Population.

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.

For this hatchery program, there are no traps, weirs or rearing facilities located in the Little Salmon River. These activities occur at multiple facilities and ESA take associated with these facilities is accounted for in separate HGMPS (see Pahsimeroi A-run Steelhead HGMP, Hells Canyon A-Run steelhead HGMP, and Dworshak B-run steelhead HGMP).

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

Primary take from hatchery activities is associated with trapping and handling natural steelhead during broodstock collection. Take from this activity is reported in the HGMPs associated with hatcheries where the broodstock is collected (Pahsimeroi A-run Steelhead HGMP, Hells Canyon A-Run steelhead HGMP, and Dworshak B-run steelhead HGMP).

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).

Primary take from hatchery activities is associated with trapping and handling natural steelhead during broodstock collection. Take from this activity is reported in the HGMPs associated with hatcheries where the broodstock is collected (Pahsimeroi A-run Steelhead HGMP, Hells Canyon A-Run steelhead HGMP, and Dworshak B-run steelhead HGMP).

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

It is unlikely that take levels for natural steelhead will exceed projected take levels. However, in the unlikely event that this occurs, 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 hatchery-origin steelhead trapping 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 to the provisions of the Hells Canyon Settlement Agreement (HCSA) and the Lower Snake River Compensation Plan to mitigate for adult steelhead lost due to the construction and ongoing operation of the Hells Canyon Complex and the four Lower Snake River dams.

3.2 LIST ALL EXISTING COOPERATIVE AGREEMENTS, MEMORANDA OF UNDERSTANDING, MEMORANDA OF AGREEMENT, OR OTHER MANAGEMENT PLANS OR COURT ORDERS UNDER WHICH PROGRAM OPERATES. INDICATE WHETHER THIS HGMP IS CONSISTENT WITH THESE PLANS AND COMMITMENTS, AND EXPLAIN ANY DISCREPANCIES.

- 2008-2017 Management Agreement for Upper Columbia River Fall Chinook, Steelhead and Coho pursuant to United States of America v. State of Oregon, U.S. District Court, District of Oregon.

- Production and release strategies in this HGMP are consistent with the 2008-2017 US v.OR Management Agreement.

3.3 RELATIONSHIP TO HARVEST OBJECTIVES

The Lower Snake River Compensation Plan defined replacement of adults “in place” and “in kind” for appropriate state management purposes. Juvenile production and adult escapement targets were established at the outset of the LSRCP. The Hells Canyon Settlement Agreement defined mitigation goals in terms of pounds of smolts released. State and Tribal co-managers have established near and long term expectations for adult returns to Idaho Power facilities based on the smolt to adult return rates used to size the production capacity of the LSRCP hatcheries. State, tribal and federal co-managers work co-operatively to develop annual production and mark plans that are consistent with the 2008-2017 US vs. OR Management Agreement, and recommendations of the HSRG and HRT relative to ESA impact constraints, genetics, fish health and fish culture concerns.

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

State and Tribal co-managers confer pre-season relative to assessing forecasted levels of abundance of both hatchery and natural fish in the fisheries. Forecasts are used to project likely non-tribal and tribal harvest shares. Incidental take rates applicable to fisheries are projected based on forecasted natural populations addressed in the 2000 Biop. As part of the in-season harvest management and monitoring program, the IDFG and Tribal cooperators conduct annual angler surveys to assess the contribution program fish make toward meeting program harvest mitigation objectives. The surveys are also used for in-season assessments of recreational and Tribal harvest shares and to determine ESA take relative to allowable levels based on the sliding scales of natural spawner abundance. Co-managers also conduct meetings after fisheries conclude to assess the success of the management actions taken during the season.

3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years if available. Also provide estimated future harvest rates on fish propagated by the program, and on listed fish that may be taken while harvesting program fish.

The majority of the steelhead released into the Little Salmon River have been adipose fin-clipped and have been susceptible to sport and tribal fisheries in the Columbia and Snake rivers. Between 1995 and 2000, all releases were 100% adipose fin-clipped. Between 2001 and 2009, an average of 78% of all hatchery-origin fish released into the Little Salmon River were adipose fin-clipped. The unclipped fish were part of the US v. OR Interim Management Agreements. Beginning with the releases in 2010, all fish released into the Little Salmon River will be adipose fin-clipped to allow differentiation between hatchery- and natural-origin steelhead. Estimated harvest rates on these program fish are displayed in Table 4 below. It should be noted that the Estimated Harvest in Idaho (Section 20) is the section of the Little Salmon River from the mouth to the upper end of the fishing boundary. Harvest estimates are based on telephone surveys of Idaho licensed anglers and include the combined catch of fish from all groups of steelhead released into the Little Salmon River (those from Niagara Springs, Magic Valley, and Hagerman National fish hatcheries). There are insufficient CWT recoveries in Section 20 (for most years) to allow partitioning of catch by release group. The estimated harvest downstream of Idaho is based on the recovery of CWTs from groups of steelhead released into the Little Salmon River. In some years, not all release groups were marked with CWT, therefore harvest estimates are low.

Table 4. Estimated annual harvest of Little Salmon River summer steelhead, 1997-2009.

Run (Fall/Spring)	Estimated Harvest in Idaho (Section 20)	Estimated Harvest in the Columbia and Lower Snake Rivers	Total Estimated Harvest
1997/1998	2,119	238	2,357
1998/1999	1,172	252	1,424
1999/2000	779	450	1,229
2000/2001	2,485	235	2,720
2001/2002	8,161	826	8,987
2002/2003	5,945	923	6,868
2003/2004	2,918	153	3,071
2004/2005	2,699	135	2,834
2005/2006	2,293	652	2,945
2006/2007	451	285	736
2007/2008	994	197	1,191
2008/2009	1,855	169	2,024

3.4 RELATIONSHIP TO HABITAT PROTECTION AND RECOVERY STRATEGIES

Hatchery production for harvest mitigation is influenced but not specifically linked to habitat protection strategies in the Salmon subbasin or other areas. The NMFS has not developed a recovery plan specific to Snake River steelhead, but the Salmon River hatchery steelhead program is operated consistent with existing Biological Opinions.

3.5 ECOLOGICAL INTERACTIONS. [PLEASE REVIEW ADDENDUM A BEFORE COMPLETING THIS SECTION. IF IT IS NECESSARY TO COMPLETE ADDENDUM A, THEN LIMIT THIS SECTION TO NMFS JURISDICTIONAL SPECIES. OTHERWISE COMPLETE THIS SECTION AS IS.]

The operation of anadromous fish hatchery programs has the potential to negatively affect ESA listed salmon and steelhead. Flagg et al. (2000) provide a thorough literature review of studies assessing the ecological interactions of hatchery reared and wild spring/summer Chinook salmon and steelhead. In general, the studies they reviewed documented some negative interaction through competition, predation, behavioral modification and fish health but, there is a general lack of information that quantifies the extent of the interactions. They also note that these potential interactions can be reduced with specific hatchery operational guidelines such as rearing fish to full term smolts to reduce the overlap for food and habitat requirements. The summer steelhead hatchery program in the Little Salmon River population has the potential to affect wild Chinook, summer steelhead, sockeye salmon, and bull trout.

In order to minimize negative ecological interactions between hatchery and natural populations of salmon and steelhead, the time period that hatchery and natural fish have to potentially interact can be minimized. All of the steelhead released in the Little Salmon River population are reared to full smolt stage and exhibit rapid downstream migration after release thus reducing the time they have to interact with wild salmonids in the rearing area and migratory corridor.

The IDFG believes that negative competitive interactions with wild fish resulting from the release of full term hatchery-reared smolts should be minimal due to: 1) spatial segregation, 2) foraging efficiency of hatchery-produced fish, 3) rapid emigration in free flowing river sections, 4) differential habitat selection and 5) differences in migration timing. If competition occurs, it would most likely occur at sites of large hatchery-reared release groups (Petrosky 1984).

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

Because of their size and timing, Chinook salmon fry are probably the most vulnerable to predation. Hillman and Mullan (1989) observed substantial predation of newly emerged Chinook salmon by hatchery and wild steelhead in the Wenatchee River. Cannamela (1992) used existing literature to evaluate potential predation of Chinook salmon fry by hatchery steelhead smolts. He evaluated a 1-1.3 million steelhead smolt release in the upper Salmon River primary production area, where steelhead were released in the vicinity of redds and migrated over redds for several miles. He assumed steelhead smolts at least 105 mm could consume Chinook salmon fry, 35-37 mm in length. Cannamela estimated potential predation by using various percentages of fry in the diet, residualism, and predator size. Using ranges of assumptions, he calculated estimated fry losses to predation by steelhead smolts and residuals for up to a 70-day period from smolt release to June 25. According to his calculations, his scenario of 500,000 steelhead predators using fish as 1 percent of their diet for 40 days resulted in potential consumption of 34,500 fry. Empirical information collected in 1992 infers that this may be an overestimate. IDFG biologists attempted to quantify Chinook salmon fry predation by hatchery steelhead in the upper Salmon River. Their samples were collected from a release of 774,000 hatchery steelhead in the upper Salmon River primary production area where steelhead would migrate directly over redds. The fish were released in early April. The biologists sampled 6,762 steelhead and found that 20 contained fish parts in the cardiac stomach. Of these, three contained 10 Chinook salmon fry. The biologists estimated that the proportion of hatchery steelhead that consumed fry was 0.000444. The estimated predation rate of steelhead smolts on Chinook salmon fry was 1.48 x 10-3 (95% CI 0.55 x 10-3 to 2.41 x 10-3) for the 6,762 hatchery steelhead smolts examined that consumed the ten Chinook fry. Biologists used this consumption rate to estimate that the total number of Chinook fry consumed during the sample period, April 3-June 3, was 24,000 fry (IDFG 1993).

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

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

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

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

The release of a large number of prey items which may concentrate predators has been identified as a potential effect on listed salmon. Hillman and Mullan (1989) reported that predaceous rainbow trout (>200 mm) concentrated on wild salmon within a moving group of hatchery age-0 Chinook salmon. The wild salmon were being "pulled" downstream from their stream margin stations as the hatchery fish moved by. It is unknown if the wild fish would have been less vulnerable had they remained in their normal habitat. Hillman and Mullan (1989) also observed that the release of hatchery age-0 steelhead did not pull wild salmon from their normal habitat.

During their sampling in 1992, IDFG biologists did not observe predator concentration. We have no further information that supports or disproves the concern that predators may concentrate and affect salmon because of the release of large numbers of hatchery steelhead.

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

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

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

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

There is a potential effect to listed salmon from diseases transmitted from hatchery-origin steelhead adults. Pathogens that could be transmitted from adult hatchery steelhead to naturally produced Chinook salmon include Infectious Hematopoietic Necrosis Virus (IHNV) and Bacterial Kidney Disease (BKD) (K. Johnson, IDFG, pers. comm.). The prevalence of BKD is less in hatchery-origin steelhead than in naturally produced Chinook salmon. Idaho Chinook salmon are rarely affected by IHNV (D. Munson, IDFG, pers. comm.). Idaho Department of Fish and Game disease monitoring will continue as part of the IDFG fish health program.

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

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

SECTION 4. WATER SOURCE

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

Oxbow Fish Hatchery – OFH is supplied with both surface water pumped from the Snake River and groundwater pumped from two wells. Surface water from the Snake River supplies the adult holding ponds (for steelhead production and temporary ponding of spring Chinook salmon) and the juvenile raceways (for fall Chinook salmon rearing). Water is pumped from the Snake River by two 100-horsepower production pumps that each convey 8,000 gallons per minute (gpm)and have separate power sources. Only one pump operates at a time, so the second pump acts as an emergency backup. After river water passes over a wedge-wire screen to filter out organic matter, it flows through two aeration pump platforms before entering the four adult ponds. Snake River water temperatures at this site vary throughout the year from seasonal lows of 34°F in the winter to seasonal highs of 72°F in the late summer.

The two groundwater wells are capable of providing a total of 550 gpm of constant temperature, pathogen-free water. One well (well #1) serves as the primary water source for egg incubation and is equipped with a 3-horsepower pump capable of producing 125 gpm. The other well (well #2) is equipped with a 10-horsepower pump capable of producing 425 gpm and has a separate power source from well #1. Water from well #2 is used primarily for fall Chinook salmon production in the juvenile raceways, but also serves as a backup water supply for egg incubation. Groundwater temperature is a constant 54°F in well #1 and a constant 56°F in well #2. Furthermore, a 70-horsepower chiller capable of chilling water to 40°F is available to manipulate incubation temperatures between 54°F and 40°F. Groundwater supplying summer steelhead egg incubation is pumped from well #1 into an elevated surge tank in the hatchery building before distribution through two 4-inch PVC water lines to the 28 incubator stacks. Water discharges from the incubation room to the Snake River. OFH withdraws water per IPC's water rights granted in permit #G 15440 by the Oregon Water Resources Department (OWRD). Because OFH produces less than 20,000 pounds of fish per year and feeds less than 5,000 pounds of feed at any one time, no NPDES wastewater permit is required for this facility.

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

A small pathogen free spring-water source supplies water to the spawning building and hatchery building for rinsing and water hardening green eggs. This water is pumped to a 10,000 gallon holding tank and gravity-fed to the two locations. The spring source can produce up to 200 gpm of 52-56°F water.

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

Niagara Springs Fish Hatchery – IPC holds a water right to divert 132 cfs from Niagara Springs for hatchery operation. Water from Niagara Springs is a constant 59°F and is supplied to NSFH at two separate intakes. Water is gravity fed from Niagara Springs to the incubators, nursery vats, fire hydrants, and irrigation system via one intake and to the outdoor rearing raceways via a second intake. Current rearing operations at NSFH are conducted under NPDES permit IDG130013. The permit specifies waste discharge standards for net total suspended solids and net total phosphorus.

Magic Valley Fish Hatchery – The Magic Valley Fish Hatchery receives water from a spring on the north wall of the Snake River canyon. The spring (Crystal Springs) is covered to prevent contamination. Water is delivered to the hatchery (87.2 cfs as of 2009) through a 42-inch pipe that crosses the Snake River. Water temperature remains a constant 59.0ºF year-round.

Dworshak National Fish Hatchery - The main supply for the hatchery is river water pumped from the North Fork of the Clearwater River. There are six pumps rated at 15,500 GPM each for a total flow of 93,000 gpm or 207 cfs. There is also a reservoir supply source from Dworshak Reservoir to the hatchery for incubation and nursery rearing. It consists of a 24-inch warm water supply line and a 14-inch cold water supply line from the distribution box for the Clearwater Hatchery. The reservoir supply was designed to convey 6,400 gpm or 14 cfs.

Clearwater Fish Hatchery - The Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warm water intake is attached to a floating platform and can be adjusted from five feet to forty feet below the surface. The cool water intake is stationary at 245 feet below the top of the dam. An estimated 10 cfs is provided by the cool water supply and 70 cfs by the warm water supply. The cool water supply has remained fairly constant between 40°F and 45°F. The warm water can reach 80°F but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake is moved to the warmest water available until water temperatures rise in the spring. All water is gravity fed to the hatchery. The intake screens are in compliance with NMFS screen criteria by design of the Corp of Engineers.

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.

Oxbow Fish Hatchery – Water used for hatchery production at OFH is pumped either from the Snake River or from two groundwater wells. Effluent water is discharged into the Snake River in compliance with U.S. Environmental Protection Agency (USEPA) discharge requirements. OFH is located upstream of Hells Canyon Dam, therefore no listed species are present in the vicinity of the hatchery water withdrawal structures.

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

Niagara Springs Fish Hatchery – Listed natural fish are not present in Niagara Springs, therefore no risk aversion measures are provided. However, all effluent water discharged to Niagara Springs Creek is monitored regularly for compliance with NPDES standards.

Magic Valley Fish Hatchery - Listed natural fish are not present in Crystal Springs, therefore no risk aversion measures are provided. However, all effluent water discharged to Niagara Springs Creek is monitored regularly for compliance with NPDES standards.

Dworshak National Fish Hatchery - The intake screens do not comply with current NOAA Fisheries ESA screening criteria. Discharge from the hatchery is permitted by the EPA under a NPDES permit, but does not fully meet the requirements of the permit. Untreated water from the nursery building, Burrows ponds, and cleaning water from the Burrows ponds is discharged directly into the Clearwater River. Direct discharge of unsettled effluent poses ecological and water quality risks to aquatic species in the Clearwater River.

SECTION 5. FACILITIES

5.1 BROODSTOCK COLLECTION FACILITIES (OR METHODS)

Oxbow Fish Hatchery – Steelhead broodstock collection occurs at the Hells Canyon Trap located immediately below Hells Canyon Dam. The Hells Canyon Trap consists of an attraction channel with approximately 150 feet of ladder, the holding area (trap), and a loading hopper. Vertical turbine pumps provide 18 cfs of river water to operate the fish ladder. In addition, 112 cfs of pumped river water is provided in the form of attraction flow to encourage steelhead to enter the fish ladder. Once captured in the holding area, fish are moved into the loading hopper and hoisted up 80 feet to a transport truck that carries them approximately 23 miles to OFH for processing. The broodstock collection strategy is to trap 75% of the necessary broodstock in the fall and 25% in the spring. Collection of adult steelhead commences in the fall when Snake River water temperatures drop to 60°F (late-October). IDFG, ODFW, and IPC have agreed informally to operate the Hells Canyon Trap five days per week until 600 fish are collected. Once this goal is reached, trap operation is reduced to three days per week (Monday–Wednesday) until 1,200 have been trapped and transported to OFH. This reduction in trapping effort is directed at maintaining a quality sport fishery in the Snake River immediately below Hells Canyon Dam. Depending upon the strength of the run in a given year, IDFG and ODFW may then choose to discontinue trapping until spring or continue trapping with the intent of outplanting "surplus" adults to selected Oregon and Idaho waters or making them available to Native American Tribes and charitable organizations. Trapping resumes five days per week in April as river conditions allow, and continues until sufficient broodstock are collected to meet IDFG needs. During both fall and spring trapping, all fish are removed from the trap daily and transported by truck to OFH for interrogation. Any wild Chinook or steelhead identified by the presence of an adipose fin are returned immediately to the Snake River.

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

Dworshak National Fish Hatchery - A fish ladder from the North Fork of the Clearwater River traps returning adults at the hatchery. The holding pond at the top of the ladder is 15 feet x 75 feet x 8feet.

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

Oxbow Fish Hatchery – Two adult tank trucks are available to transport hatchery summer steelhead to OFH from the Hells Canyon Trap. Each truck has a single compartment, approximately 1,000-gallon capacity, insulated stainless steel tank, and is equipped with compressed oxygen gas, microbubble oxygen diffusers and two 12-volt mechanical aerators. Steelhead are transported from the trap to OFH in ambient temperature Snake River water. To minimize handling stress, no more than 125 fish are transported at one time.

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

Dworshak National Fish Hatchery - Broodstock transfer is not necessary for this program.

5.3 BROODSTOCK HOLDING AND SPAWNING FACILITIES

Oxbow Fish Hatchery – Steelhead broodstock trapped below Hells Canyon Dam are held at OFH for spawning. OFH has four holding ponds for this purpose. The two largest ponds measure 105 feet long x 35 feet wide x 5 feet deep, providing 36,750 cubic feet of holding area. The two smaller ponds measure 55 feet long x 35 feet wide x 5 feet deep, providing 19,250 cubic feet of holding area. A center raceway measuring 70 feet long x 4.5 feet wide x 5 feet deep is used to move fish from the ponds into the spawning building. The spawning building is adjacent to the holding ponds and consists of holding and sorting areas and a spawning table where eggs are collected and fertilized.

Pahsimeroi Fish Hatchery – Broodstock are held in two concrete adult holding ponds (each measuring 70 feet long x 16 feet wide x 6 feet deep) that are located on either side of the adult trap described in Section 5.1. Roughly 24 cfs of the 40 cfs of flow diverted into the intake canal is available to supply water to these two holding ponds. Each of the two ponds provide approximately 6,720 cubic feet of holding space. The total holding capacity for the adult trap and holding ponds is approximately 3,000 adult summer steelhead. Steelhead spawning commences in mid-March and continues through early May on a twice-per-week basis.

Dworshak National Fish Hatchery - Broodstock are held in three 15-foot x 75-foot x 88 foot concrete ponds. Adults in these ponds are crowded into a 370 gallon anesthetic tank. From here they lifted to an examining table and are checked for ripeness and either spawned or returned to the holding pond for later examination or outplanting.

5.4 INCUBATION FACILITIES

Oxbow Fish Hatchery – OFH's incubation room is located within a 28-foot x 60-foot single story, hatchery building that also contains the office and shop. The incubation room is equipped with twenty-eight 16-tray stacks of Marisource vertical flow incubators supplied by pumped pathogen-free well water, allowing for a total incubation capacity of 1.6 million eggs. A 70-horsepowerchiller capable of chilling water to 40°F is available. By blending chilled and unchilled well water at the incubator, hatchery personnel can manipulate incubation water temperatures between 54°F and 40°F as needed.

Pahsimeroi Fish Hatchery – PFH's incubation room is located at the upper facility. The incubation room consists of twenty 16-tray stacks of Marisource vertical flow incubators supplied with 120 gpm of chilled (40°F) and unchilled (50°F) pumped well water (240 gpm total). Summer steelhead eggs are incubated to eyed-up or swim-up in this location and then transferred to NSFH for final incubation and rearing.

Niagara Springs Fish Hatchery – NSFH's incubation room consists of 42 upwelling incubators and 21 rectangular vats for hatching and early rearing of steelhead fry. Each incubator provides approximately 0.82 cubic feet of egg incubation space and each vat provides 29 cubic feet or 36 cubic feet of rearing space for fry until they are moved to the outdoor concrete raceways. Depending on water availability, incubator flows range between 20 to 25 gpm and flows in the vats will approach 50 gpm. The incubation room is supplied with 59°F gravity fed spring water from Niagara Springs.

Clearwater Fish Hatchery - Incubation room contains 49 double stack Heath incubators with a total of 784 trays available for egg incubation. The upper and lower half of each stack (eight trays each) has a different water supply and drain. This design aids in segregation of diseased eggs. The maximum capacity of this facility is five million green eggs. The incubation room is supplied by both reservoir water sources to provide the desired temperature for incubation at a flow of 5 to 8 gpm per one-half stack. Isolation incubation consists of 16 double stack Heath incubators with a total of 256 trays available for egg incubation. The maximum capacity of this facility is 1.5 million green eggs. The isolation incubation room is supplied by both reservoir water sources to provide the desired temperature for incubation with a flow of 5 to 8 gpm per stack.

Magic Valley Fish Hatchery – Incubation facilities at the Magic Valley Fish Hatchery consist primarily of forty 12 gallon upwelling incubators. Each incubator is capable of incubating and hatching 50,000 to 75,000 eyed steelhead eggs. Two incubators are placed on 8 inch square aluminum tubes that sit on the floor of the vat. A total of 20 vats are available. Vats measure 40 feet long x 4 feet wide x 3 feet deep. Each vat has the capacity to rear 100,000 to 115,000 steelhead to < 200 fish per pound.

5.5 REARING FACILITIES

Niagara Springs Fish Hatchery - - Early rearing at NSFH occurs within the incubation room of the hatchery building or in the outdoor concrete raceways. The incubation room consists of 21 fiberglass vats that are supplied with constant 59°F spring water from Niagara Springs. Seventeen vats measure 7 feet long x 2½ feet wide x 2½ feet deep (29 cubic feet) and four vats measure 8¾ feet long x 2½ feet wide x 2½ feet deep (36 cubic feet). Fish are reared in these vats until they reach approximately 1,300 fish per pound (fpp), at which point they are transferred to outdoor concrete raceways. These raceways measure 300 feet long x 10 feet wide x 2½ feet deep and are each supplied with up to 6.3 cfs of water from Niagara Springs.

Magic Valley Fish Hatchery – The Magic Valley Fish Hatchery has 32 outside raceways available for juvenile steelhead rearing. Each raceway measures 200 feet long x 10 feet wide x 3 feet deep. Each raceway has the capacity to rear approximately 62,000 fish to release size. Raceways may be subdivided to create 64 rearing sections. A movable bridge, equipped with 16 automatic Neilsen fish feeders spans the raceway complex. Two 30,000 bulk feed bins equipped with fish feed fines shakers and a feed conveyor complete the outside feeding system.

5.6 ACCLIMATION/RELEASE FACILITIES

All steelhead released into the Little Salmon River are yearling smolts and are released directly into the river without acclimation. No acclimation facilities exist on the Little Salmon River. For historical release locations, see Tables 23, 24 and 25 in Section 10.3.

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

No operational difficulties or disasters have led to significant steelhead mortality at OFH, PFH, NSFH, or Magic Valley FH.

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.

Oxbow Fish Hatchery – OFH has one full-time employee residing at the facility. The adult holding ponds are supplied with surface water pumped from the Snake River. These pumps are powered from separate sources with only one pump operating at a time, allowing the second to act as a backup for the first in case of a pump or power failure. The incubation room is supplied with pumped groundwater from well #1 and well #2. It has an emergency backup with a separate power source to help prevent catastrophic egg loss resulting from power or water system failure. The holding ponds and incubation head tank are equipped with low water level alarms and all pumps are equipped with power failure alarms which are tied to the hatchery office, employee residence and Oxbow Power Plant control room. If the hatchery staff is absent from the site, the power plant staff will respond to any alarms at OFH. Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

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

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

Niagara Springs Fish Hatchery - NSFH has four full-time employees residing at the facility for security purposes. The incubation room and outdoor raceways are gravity fed from Niagara Springs and are therefore not subject to water supply interruption. Protocols are in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

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

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1 SOURCE

Oxbow Fish Hatchery – The Snake River portion (Oxbow A-run stock) of the NSFH summer steelhead program uses hatchery-origin steelhead returning to the Hells Canyon Trap as the primary broodstock source. Should the number of adult steelhead returning to the Hells Canyon Trap be insufficient to meet production needs, IDFG may elect to supplement the program by using eggs from hatchery-origin adult steelhead trapped and spawned at PFH. Refer to Section 6.2.1 below for more information on the history of NSFH's broodstock.

Pahsimeroi Fish Hatchery – The Pahsimeroi River portion (Pahsimeroi A-run stock) of the NSFH summer steelhead program uses only hatchery-origin summer steelhead returning to the Pahsimeroi River as a broodstock source. For more information on the history of PFH's broodstock sources since the hatchery's completion in 1968, please see Section 6.2.1 below.

Dworshak National Fish Hatchery - Broodstock for the Dworshak NFH B-run steelhead program was originally obtained by collecting natural spawners returning to the North Fork

Clearwater River. This is the only source of broodstock that has ever been used.

6.2 SUPPORTING INFORMATION

6.2.1 History

Oxbow A-run steelhead – Summer steelhead broodstock development for NSFH occurred from 1966 through 1968 when wild summer steelhead adults were trapped at Oxbow and Hells Canyon dams on the Snake River and transferred to OFH for spawning and then to NSFH for rearing. These fish would have likely been a mixture of steelhead that originated from tributaries to the Snake River upstream of Hells Canyon Dam. There are no records to suggest that summer steelhead from other locations contributed to the initial development of this broodstock. Following rearing at NSFH, progeny of these initial broodfish were released into the Pahsimeroi River as yearling smolts, with the intent of transferring Snake River steelhead to the upper Salmon River Basin. Starting in 1969, IDFG began trapping and spawning Snake River origin adult steelhead as they returned to the Pahsimeroi Hatchery. From 1969 to 1986, IDFG spawned returning hatchery-origin steelhead at both OFH and PFH and used the progeny to fulfill stocking needs in both the Salmon and Snake rivers. During this time, some wild Pahsimeroi River steelhead may have contributed to the hatchery population because IDFG records do not indicate that hatchery personnel attempted to segregate hatchery returns from wild returns to the Pahsimeroi weir. Additionally, B-run steelhead smolts originating from Dworshak Hatchery were released into the Pahsimeroi River in 1974 and 1978. Reingold (1977) reports that upon return as adults, these fish were not segregated from Pahsimeroi stock and that eggs and sperm were mixed during spawn-taking operations. Efforts to identify hatchery-origin steelhead using mass marking techniques (i.e., adipose fin-clipping all hatchery-origin steelhead juveniles) began in 1983 (1984 smolt release). Subsequent returns of adipose clipped one-ocean adults in 1986 allowed hatchery staff to select only hatchery-origin fish for broodstock purposes. At the same time, IDFG began managing Snake River and Pahsimeroi River steelhead as distinct stocks.

Pahsimeroi A-run steelhead – The Pahsimeroi River summer steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The natural Pahsimeroi River population is an “A” run, and is classified as threatened under the endangered species act, and is identified as “intermediate” by the Interior Columbia Basin Technical Review Team (ICTRT).

Summer steelhead broodstock development for the PFH summer steelhead program occurred from 1965 through 1968 when wild summer steelhead adults were trapped at Oxbow and Hells Canyon dams on the Snake River and transferred to OFH for spawning and incubation and then to NSFH for rearing. These fish likely would have been a mixture of steelhead that originated from tributaries to the Snake River upstream of Hells Canyon Dam. There are no records to suggest that summer steelhead from other locations contributed to the initial development of this broodstock. Following rearing at NSFH, progeny of these initial broodfish were released into the Pahsimeroi River as yearling smolts in 1967, with the intent of transferring Snake River steelhead to the upper Salmon River Basin. Starting in 1969, IDFG began trapping and spawning Snake River-origin adult steelhead as they returned to the Pahsimeroi Hatchery. From 1969 to 1986, IDFG spawned returning hatchery-origin steelhead at PFH and used the progeny to fulfill stocking needs in both the Salmon and Snake rivers. During this time, some wild Pahsimeroi River steelhead may have contributed to hatchery population because IDFG records do not indicate that hatchery personnel attempted to segregate hatchery returns from wild returns to the Pahsimeroi weir. Additionally, B-run steelhead smolts originating from Dworshak Hatchery were released into the Pahsimeroi River in 1974 and 1978. Reingold (1977) reports that upon return as adults, these fish were not segregated from Pahsimeroi stock and that eggs and sperm were mixed during spawn-taking operations. Efforts to identify hatchery-origin steelhead using mass marking techniques (i.e., adipose fin-clipping all hatchery-origin steelhead juveniles) began in 1983 (1984 smolt release). Subsequent returns of adipose clipped one-ocean adults in 1986 allowed hatchery staff to select only hatchery-origin fish for broodstock purposes.

Dworshak National Fish Hatchery - Broodstock for the Dworshak NFH B-run steelhead program was originally obtained by collecting wild/natural fish returning to the North Fork Clearwater River. Broodstock collection was initiated in 1969, several years before Dworshak Dam was completely closed. The Interior Columbia Technical Recovery Team has excluded the North Fork Clearwater River from their viability analysis for ESA recovery planning because the population currently exists only as a segregated hatchery stock maintained solely by hatchery production.

There has been no purposeful or inadvertent selection applied that has changed characteristics of the founding broodstock. There have been claims that Dworshak NFH has changed the spawn timing of hatchery-propagated steelhead. This belief is based on differences between the current hatchery spawning time (January to May) and spawn timing of natural populations in the Lochsa River (May to July). However, it is much more likely that the change in spawn timing is environmentally linked to closing Dworshak Dam. Water released from the reservoir throughout the winter is much warmer than what historically occurred in the free flowing North Fork Clearwater River. Since Dworshak NFH has spawned more than 1,000 steelhead annually since the program's inception, it is unlikely that there has been any loss of genetic material from the original North Fork Clearwater B-run steelhead.

6.2.2 Annual size

Oxbow Fish Hatchery – All hatchery-origin summer steelhead adults returning to the Hells Canyon Trap are derived from the hatchery program at NSFH. No natural adults are incorporated into the NSFH's steelhead program. A small number of unmarked summer steelhead are collected in the Hells Canyon Trap. Although these unmarked fish are considered natural steelhead and are therefore returned to the Snake River, it is possible that some are mismarked hatchery fish. Hatchery staff attempt to differentiate unclipped hatchery- and natural-origin fish based on dorsal and ventral fin erosion. From 1998 through 2007, the number of hatchery-origin adult steelhead at the Hells Canyon Trap has ranged from 1,943 to 4,934 (mean = 3,299).

Pahsimeroi Fish Hatchery – All hatchery-origin summer steelhead adults returning to the lower PFH are derived from the hatchery program at NSFH. No natural adults are incorporated into the NSFH's steelhead program. All natural-origin adults are passed above the Pahsimeroi hatchery weir to spawn naturally. From 1998 through 2007, the number of hatchery-origin adult steelhead trapped at the lower PFH has ranged from 1,691 to 11,484 (mean = 4,763).

Dworshak National Fish Hatchery - All hatchery-origin summer steelhead adults returning to the Dworshak National Fish Hatchery (DNFH) are derived from the hatchery program at DNFH.

No natural adults are incorporated into the broodstock as there is no source for wild/natural North Fork Clearwater B-run steelhead. Approximately 1,000,000 eyed eggs are required from DNFH to meet the smolt release goals in the Salmon River subbasin. It is important to note that IDFG has initiated the development of a locally adapted B-run broodstock in the Salmon River with the intent of transitioning away from the interbasin transfer of Dworshak hatchery steelhead.

6.2.3 Past and proposed level of natural fish in broodstock

Broodstock for the NSFH program originated from wild summer steelhead adults trapped at Oxbow and Hells Canyon dams on the Snake River from 1966 through 1968. From 1969 through 1985 hatchery broodstock likely included wild Pahsimeroi river summer steelhead and a limited number of Clearwater B-Run steelhead from Dworshak Hatchery. With the establishment of mass marking protocols for positive identification of hatchery-origin adults returning in 1986, the broodstock has been limited to only hatchery-origin returns. There are currently no plans to incorporate naturally produced fish into the NSFH broodstock. Numbers of hatchery- and natural-origin adults trapped at the Hells Canyon Trap and the lower PFH from 1994-2008 are listed in the tables in below (Tables 5 and 6).

Dworshak National Fish Hatchery- Broodstock for the Dworshak NFH B-run steelhead program was originally obtained by collecting wild/natural fish returning to the North Fork Clearwater River. Broodstock collection was initiated in 1969, several years before Dworshak Dam was completely closed. All broodstock collected at Dworshak National Fish Hatchery are hatchery-origin.

Table 5. Oxbow Fish Hatchery (OFH) Adult Summer Steelhead Disposition Summary for adult steelhead trapped at Hells Canyon Dam (HCD) 1994-2008.

Return year	Release Years	Steelhead Trapped at Hells Canyon Dam (HCD)								Total Trapped at HCD	Total Ponded at OFH	Total Held for Broodstock at OFH
		1-ocean				2-ocean						
		Hatchery		Natural		Hatchery		Natural				
		Males	Females	Males	Females	Males	Females	Males	Females			
1994	91,92	83	197	1	2	329	778	4	9	1,403	1,187	1,187
1995	92,93	682	687	7	29	65	121	1	5	1,597	1,488	1,488
1996	93,94	405	403	47	47	110	321	13	37	1,383	940	940
1997	94,95	336	417	0	0	231	286	0	0	1,270	1,265	818
1998	95,96	797	729	1	0	272	608	0	0	2,407	1,283	1,283
1999	96,97	690	623	31	29	145	485	19	20	2,042	1,258	1,258
2000	97,98	959	867	36	68	64	236	4	16	2,250	2,126	957
2001	98,99	880	1,055	2	5	407	928	6	20	3,303	3,223	755
2002	99,00	2,337	2,053	28	8	265	278	12	6	4,988	4,921	828
2003	00,01	1,582	1,384	0	0	247	780	3	6	4,002	3,993	592
2004	01,02	1,651	1,426	10	12	163	571	0	0	3,833	3,811	629
2005	02,03	1,428	1,393	1	1	303	685	0	0	3,811	3,809	601
2006	03,04	914	823	1	1	481	1,360	1	0	3,581	3,578	539

Return year	Release Years	Steelhead Trapped at Hells Canyon Dam (HCD)								Total Trapped at HCD	Total Ponded at OFH	Total Held for Broodstock at OFH
		1-ocean				2-ocean						
		Hatchery		Natural		Hatchery		Natural				
		Males	Females	Males	Females	Males	Females	Males	Females			
2007	04,05	1,002	916	20	14	344	857	3	7	3,163	3,119	576
2008	05,06	1,517	1,453	14	27	217	488	9	8	3,733	3,675	664

Data Source: Oxbow Fish Hatchery Steelhead Run Reports (1994-2008).

Table 6. Pahsimeroi Fish Hatchery Adult Summer Steelhead Disposition Summary (1994-2008).

Return year	Release Years	Steelhead Trapped at PFH								Total Trapped at PFH	Total Ponded at PFH
		1-ocean				2-ocean					
		Hatchery		Natural		Hatchery		Natural			
		Males	Females	Males	Females	Males	Females	Males	Females		
1994	91,92	165	208	4	11	161	280	5	15	849	790
1995	92,93	567	554	2	7	92	188	2	6	1,418	1,364
1996	93,94	1,218	1,072	5	5	151	482	2	5	2,940	2,273
1997	94,95	1,021	529	7	10	233	456	0	8	2,264	1,540
1998	95,96	644	585	12	7	304	561	7	22	2,142	1,775
1999	96,97	781	516	10	12	81	313	6	10	1,729	1,442
2000	97,98	876	781	24	24	64	225	2	8	2,004	1,629
2001	98,99	1,422	1,182	38	36	290	713	18	41	3,740	2,802
2002	99,00	5,580	4,227	101	141	622	1,055	52	85	11,862	9,419
2003	00,01	2,473	1,813	35	41	348	976	21	83	5,790	3,933
2004	01,02	3,015	2,783	32	21	134	371	2	9	6,366	4,532
2005	02,03	1,627	1,581	11	21	89	353	4	6	3,692	3,431
2006	03,04	2,273	1,991	15	25	254	786	8	22	5,373	4,907
2007	04,05	2,705	2,428	3	14	179	629	2	4	5,964	5,491
2008	05,06	3,672	3,322	160	160	129	333	60	70	7,907	7,357

Data Source: Pahsimeroi Fish Hatchery Summer Steelhead Run Reports (1994-2008).

6.2.4 Genetic or ecological differences

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

Genetic reporting groups identified based on 13 microsatellite loci and using a Bayesian genetic clustering approach (BAPS 5.2; Latch et al 2006) have indicated that steelhead populations in the Little Salmon River are part of a large, multi-drainage genetic assemblage associated with the confluence of the Salmon and Little Salmon rivers (IDFG, unpublished data). This assemblage is comprised of populations from the mainstem Salmon River watershed above the Little Salmon (Bargamin and Chamberlain creeks), from the Little Salmon River (Rapid River, Boulder and Hazard creeks), and the mainstem Salmon River below the Little Salmon confluence (Slate and Whitebird creeks). Previous genetic analyses using 11 microsatellite loci have indicated that introgression from hatchery stocking has likely occurred within this genetic assemblage. For example, samples from Hazard Creek and Chamberlin creeks exhibited no significant genetic differences in pairwise comparisons to samples from the Oxbow and Pahsimeroi fish hatcheries (Nielsen et al. 2009). No significant differences in allelic structure were observed among hatchery steelhead populations from the Oxbow, Pahsimeroi, and Sawtooth hatcheries (Nielsen et al. 2009). This is not surprising given that the Pahsimeroi and Oxbow stocks were derived primarily from wild adults trapped at Oxbow and Hells Canyon dams in the mid 1960s, and the Sawtooth stock was founded from the Pahsimeroi stock.

6.2.5 Reasons for choosing

Section 6.2.1 describes the history of NSFH summer steelhead broodstock development.

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

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

SECTION 7. BROODSTOCK COLLECTION

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

Broodstock are collected exclusively from adult steelhead captured at the Hells Canyon Trap, the lower PFH trap and the Dworshak National Fish Hatchery trap. No eggs or juveniles are collected to carry out this program.

7.2 COLLECTION OR SAMPLING DESIGN

Oxbow Fish Hatchery – The HC Trap provides the ability to capture and interrogate summer steelhead returning to the Hells Canyon reach of the Snake River. Only hatchery-origin fish (as evidenced by an adipose fin clip) are retained for broodstock. All unmarked steelhead are released back to the Snake River. The broodstock collection strategy is to trap 75% of the necessary broodstock in the fall and 25% in the spring. Collection of adult steelhead commences in late October or early November when Snake River water temperatures drop to 60°F. IDFG, ODFW, and IPC have agreed informally to operate the Hells Canyon Trap five days per week until 600 fish are collected. Once this goal is reached, trap operation is reduced to three days per week (Monday–Wednesday) until 1,200 have been trapped and transported to OFH. This reduction in trapping effort is directed at maintaining a quality steelhead sport fishery in the Snake River immediately below Hells Canyon Dam. Depending upon the strength of the run in a given year, IDFG and ODFW may then choose to discontinue trapping until spring or continue trapping with the intent of outplanting "surplus" adults to selected Oregon and Idaho waters or making them available to Native American Tribes and charitable organizations. Broodstock are retained from the first 1,200 fish trapped. This may not fully represent the hatchery population. Trapping resumes in April as river conditions allow, and continues until sufficient broodstock are collected to meet IDFG needs. During both fall and spring trapping, all fish are removed from the trap daily and transported by truck to OFH for interrogation.

Pahsimeroi Fish Hatchery – Adult summer steelhead collection occurs at the lower PFH and is facilitated by a removable barrier weir that spans the Pahsimeroi River. Adults retained for broodstock production are selected over the entire return period to avoid a biased sample based on adult return timing. Adults return to the hatchery in late February through early May and are spawned in mid-March through early May.

Dworshak National Fish Hatchery - Broodstock are collected passively using a ladder that enters the hatchery from the North Fork Clearwater River. Adults are collected during two time periods:

- Adults begin entering the Clearwater River in the fall. The ladder is opened in October, is kept open until about 500 adults are collected, and is usually closed by early December.
- The ladder is then reopened in February and is kept open through May, the usual end of the run.

Eggs collected as part of the Little Salmon River program are typically collected across two to three spawning events during the middle of spawn takes at Dworshak Fish Hatchery.

7.3 IDENTITY

All summer steelhead produced from Oxbow, Pahsimeroi and Dworshak fish hatcheries for the Little Salmon River hatchery releases are marked with an adipose fin clip. No natural-origin fish are collected for broodstock. Only those fish bearing an adipose fin clip are retained for broodstock. All unmarked steelhead are released to spawn naturally.

7.4 PROPOSED NUMBER TO BE COLLECTED

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

Section 1.11.1 provides information about adult collection goals.

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

recent years available

Broodstock collection levels at OFH from 1994 to 2008 for the Niagara Springs summer steelhead program are summarized in Table 7 below. This represents broodstock collection for the entire program, not just what was collected for the Little Salmon River releases.

Table 7. Steelhead broodstock collection levels and ponding disposition at Oxbow Fish Hatchery (1994-2008).

Return Year	Adults Ponded for Broodstock		Total Broodstock Ponded	Trap and Pond Mortality	Females Spawned[1]
	Females	Males			
1994	770	417	1,187	179	635
1995	795	693	1,488	154	725
1996	550	390	940	432	433
1997	448	370	818	452	301
1998	685	598	1,283	311	541
1999	722	536	1,258	286	654
2000	498	459	957	227	378
2001	369	386	755	133	341
2002	366	462	828	157	300
2003	309	283	592	36	277
2004	336	293	629	117	251
2005	343	258	601	94	282
2006	264	275	539	58	218
2007	340	236	576	69	294
2008	390	274	664	44	299

Source: Oxbow Fish Hatchery Steelhead Run Reports (1994-2008).
[1] Includes females killed for spawning whose eggs were culled due to egg quality or fish health.

Broodstock collected at PFH from 1994 to 2008 for the Niagara Springs summer steelhead program are summarized in Table 8 below. This represents broodstock collection for the entire program, not just what was collected for the Little Salmon River releases.

Table 8. Steelhead broodstock collection levels and ponding disposition at Pahsimeroi Fish Hatchery (1994-2008).

Return Year	Adults Ponded for Broodstock		Total Ponded at PFH	Trap and Pond Mortality	Females Spawned[1]
	Females	Males			
1994	476	314	790	1	473
1995	726	638	1,364	1	800
1996	1,190	1,083	2,273	2	1,178
1997	767	773	1,540	2	753

Return Year	Adults Ponded for Broodstock		Total Ponded at PFH	Trap and Pond Mortality	Females Spawned[1]
	Females	Males			
1998	1,045	730	1,775	2	1,035
1999	829	613	1,442	1	820
2000	1,005	624	1,629	0	998
2001	1,510	1,292	2,802	1	1,380
2002	4,751	4,668	9,419	4	1,219
2003	1,969	1,964	3,933	3	978
2004	2,249	2,283	4,532	4	1,061
2005	1,884	1,547	3,431	15	1,139
2006	2,687	2,220	4,907	3	981
2007	2,800	2,691	5,491	0	1,215
2008	3,655	3,702	7,357	0	895

Source: Pahsimeroi Fish Hatchery Summer Steelhead Run Reports (1994-2008).
[1] Includes females killed for spawning whose eggs were culled due to egg quality or fish health.

Dworshak National Fish Hatchery - Broodstock collection at Dworshak National Fish Hatchery included fish collected for several programs. The number of adults collected for the Little Salmon River accounts for approximately 75 females and an equivalent number of males annually.

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

Oxbow Fish Hatchery – Disposition of surplus hatchery steelhead collected at the Hells Canyon Trap varies based on adult return numbers and management objectives. Surplus fish have been transported to urban locations to create fisheries, carcasses distributed to tribal entities for subsistence or ceremonial use, carcasses distributed to charitable organizations, fish provided for research or educational purposes, and carcasses used for nutrient enhancement research..

Pahsimeroi Fish Hatchery – Disposition of surplus hatchery-origin adults collected at PFH varies based on adult return numbers and management objectives. Disposition of surplus fish has included hauling fish downriver to reenter the sport fishery, killing fish and freezing the carcasses for rendering at a later date, and distributing carcasses to the public, tribal entities, or charitable organizations.

Dworshak National Fish Hatchery - Excess broodstock is handled in several ways, depending on the level of excess. The first option is to outplant excess steelhead into the South Fork Clearwater River for harvest augmentation and South Fork tributaries for natural production. If it is early in the season, adults are typically released to augment sport harvest. Closer to spawning periods and when the tributaries are accessible, fish are released for natural spawning. When fish have to be culled, it is normally done by selecting those fish that are coded-wire tagged. This ensures recovery of the tags for evaluation purposes.

7.6 FISH TRANSPORTATION AND HOLDING METHODS

Oxbow Fish Hatchery – Two adult tank trucks are available for transporting hatchery summer steelhead to OFH from the Hells Canyon Trap. Each truck has a single compartment, approximately 1,000-gallon capacity, insulated stainless steel tank, which is equipped with compressed oxygen gas, microbubble oxygen diffusers and two 12-volt mechanical aerators. Steelhead are transported from the Hells Canyon Trap to OFH in ambient temperature Snake River water. To minimize handling stress, no more than 125 fish are transported at one time. At OFH, steelhead are offloaded into a holding tank located inside the spawn shed building and then examined for fin clips, tags, and/or external injuries, measured to the nearest centimeter for fork length and identified by sex. All hatchery-origin fish are placed in concrete holding ponds where they may remain for up to five months before spawning occurs. Any unmarked steelhead that are incidentally trapped and transported to the hatchery are returned to the Snake River below Hells Canyon Dam.

Pahsimeroi Fish Hatchery – Adult summer steelhead migrate into the adult holding/spawning facility at the lower PFH therefore no fish transportation is needed. Sections 5.2 and 5.3 describe the trapping and holding facilities. All fish interrogated in the adult trap are handled in accordance with protocols established by NOAA Fisheries. Upon removal from the trap, adults are identified by sex, examined for fin clips and/or tags, and measured to the nearest centimeter for fork length.

Dworshak National Fish Hatchery - Wild/natural fish that are incidentally captured during broodstock collection are typically held in fish transportation tanks or tubs with running water until they are released in the mainstem Clearwater River. The fish are usually released within an hour of collection.

7.7 DESCRIBE FISH HEALTH MAINTENANCE AND SANITATION PROCEDURES APPLIED

At both OFH and PFH, fish health monitoring at spawning includes sampling for viral, bacterial and parasitic disease agents. Ovarian fluid and kidney/spleen tissue samples are collected from at least 150 females to test for Infectious Hematopoietic Necrosis (IHN) and Infectious Pancreatic Necrosis (IPN) (120 ovarian fluid samples and 30 kidney/spleen samples). After egg collection and fertilization, kidney samples are collected from 60 females spawned and tested for BKD. Head wedges are taken from 20 of the adults spawned and tested for whirling disease. Necropsies are performed on pre-spawn mortalities as dictated by IDFG's Eagle Fish Health Laboratory.

7.8 DISPOSITION OF CARCASSES

Oxbow Fish Hatchery – Historically, all spawned carcasses were sent to a local landfill for disposal. Beginning in 2008 and continuing to present, all spawned steelhead carcasses from OFH are being heat pasteurized and frozen for later distribution as part of a marine derived nutrient research program being conducted cooperatively by IDFG, BPA, ISU, U of I, WSU, U of A Fairbanks and IPC.

Pahsimeroi Fish Hatchery – During the spawning season, all carcasses not suitable for donation to the public, tribal entities, or charities are placed in a refrigeration unit and frozen. At the conclusion of spawning, these carcasses are transported to a rendering plant in Kuna, ID for disposal.

Dworshak National Fish Hatchery - If carcasses are in good condition, they are commonly given to a food bank or to the Nez Perce Tribe for subsistence purposes. If the carcasses are unsuitable for human consumption, they are given to the wildlife programs at either the U of I or WSU to feed eagles or bears and finally, as a last resort, carcasses are taken to the landfill for disposal.

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.

Oxbow Fish Hatchery – Adult steelhead collected and retained for broodstock are hatchery-origin steelhead as confirmed by the presence of an adipose fin clip. Any unmarked steelhead returning to the Hells Canyon Trap are returned to the Snake River. Fish health maintenance and hatchery facility sanitation guidelines are established and monitored by IDFG's EFHL.

Pahsimeroi Fish Hatchery – Broodstock selection criteria have been established to comply with ESA Section 10 permit and Section 7 consultation language in addition to meeting IDFG and cooperator mitigation objectives. Fish health maintenance and hatchery facility sanitation guidelines are established and monitored by IDFG's Eagle Fish Health Laboratory.

Dworshak National Fish Hatchery - Adult steelhead collected and retained for broodstock are hatchery-origin steelhead as confirmed by the presence of an adipose fin clip. Any unmarked steelhead captured are returned to the Clearwater River.

SECTION 8. MATING

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

8.1 SELECTION METHOD

Oxbow Fish Hatchery – No natural-origin fish are used for spawning. Currently, spawning occurs two days per week and sexes are spawned in a 1:1 ratio as they ripen, although males are kept and may potentially be used a second time. On a given spawn day, spawners are chosen randomly from ripe fish. If adult escapement is low (e.g., < 100 females), a random split cross mating strategy may be used to minimize genetic drift and maintain genetic diversity.

Pahsimeroi Fish Hatchery – All natural-origin adults are released upstream of the weir to spawn naturally. Broodstock are retained throughout the run to represent the full spectrum of the population. During spawning, ripe steelhead that enter the trap on spawn days are spawned first.

Then, previously trapped fish are sorted and ripe fish are spawned to meet production goals. During sorting, males and females will be collected in equal numbers. Currently, spawning occurs two days per week and males and females are spawned in a 1:1 ratio as they ripen, although males are kept and may potentially be used a second time. On a given spawn day, a random cross section of the run will be used to maximize the genetic diversity and to maintain a wide run and spawn period.

Dworshak National Fish Hatchery - Broodstock are selected randomly from ripe fish on a certain day. Fish collected over the past week are used first, and then if more are needed, ripe fish from previous weeks are selected.

8.2 MALES

Oxbow and Pahsimeroi fish hatcheries - At both OFH and PFH, males are generally used only once for spawning. Males that expel bloody or watery milt will not be used. In cases where skewed sex ratios exist (fewer males than females), or in situations where males mature late, males may be used twice. In addition, if factorial spawning designs are followed, males will be used more than once.

Dworshak National Fish Hatchery - No backup males are used for spawning. Fish are spawned randomly on a certain day. Repeat spawners are used as needed when the number of males returning during steelhead spawning is extremely low.

8.3 FERTILIZATION

Oxbow Fish Hatchery – During spawning, eggs from each female are drained of ovarian fluid and fertilized with milt from a single male. Females with poor egg quality or bloody ovarian fluid will not be used for production. Males that expel bloody or watery milt will not be used. After fertilization, eggs from each female are water hardened separately.

Pahsimeroi Fish Hatchery – During spawning, eggs from each female are drained of ovarian fluid and fertilized with milt from one male (1:1 spawn ratio). Females with poor egg quality or bloody ovarian fluid will not be used for production. Males that expel bloody or watery milt will not be used. Following fertilization, one cup of spring water is added to each bucket to activate the sperm and allowed to set for 2 minutes. Eggs are then carried into the hatchery building where they are allowed to water harden in a 100 ppm solution of iodophor for 30 minutes. At the conclusion of each spawn day, eggs are transported from the lower PFH to the upper PFH via 75 quart coolers and loaded into Marisource vertical flow incubator trays. Each incubator will contain the eggs from two females. Tissue samples for DNA analysis will be collected from all fish spawned for production purposes. Lengths will be collected during this time to determine age structure of the run. All carcasses are sampled for disease pathogens and then frozen or distributed to the public.

Dworshak National Fish Hatchery - Adults are crowded from a fish trap at the end of the fish ladder into a crowding channel, moved into a channel basket, and placed into an anesthetic bin. Steelhead adults are anesthetized with carbon dioxide at a rate of 400 to 1000 mg/l solution buffered with 8 to 10 pounds of sodium bicarbonate. Although carbon dioxide is more stressful on the fish than MS-222, carcasses anesthetized with CO_2 can be used for human consumption.

Spinal columns of ripe females are severed using a pneumatic knife. The females are then placed on a table for 1-20 minutes for blood drainage. The ventral side is then cut open using a spawning knife and eggs are collected in disinfected colanders. After ovarian fluid is drained, the eggs are poured into a clean bucket.

Milt from ripe males is stripped into Styrofoam cups and a one-percent saline solution is added to assist in milt motility. The milt solution is poured onto the eggs and swirled for more complete fertilization. After sufficient time has elapsed for fertilization to take place (one to two minutes), the eggs are rinsed of sperm, blood, and other organic matter.

After rinsing, eggs are placed in Heath incubator trays at approximately 6,650 eggs per tray (1 female) for steelhead and 3,500 for Chinook. The tray contains a 75 mg/l iodophor solution buffered with sodium bicarbonate. Eggs are maintained in this solution for approximately 30 minutes as a precaution against horizontal disease transmission. The egg trays are then pushed into the incubator, flushing the iodine. The water flow rate is approximately five gallons/minute and incubation temperatures average 54° F.

Although a 1:1 ratio is attempted in steelhead spawning, the final male:female ratio is usually closer to 1:3 due to the lack of males trapped at the hatchery.

8.4 CRYOPRESERVED GAMETES

Cryopreserved milt is not collected or used as part of the steelhead mitigation program in the Little Salmon River.

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.

Natural fish are not collected as part of this hatchery program.

SECTION 9. INCUBATION AND REARING

This section describes management goals (e.g. “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections. Data are provided on the success of meeting the desired hatchery goals.

9.1 INCUBATION

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

Oxbow and Pahsimeroi fish hatcheries - The current management objective is to produce 275,000 Oxbow A-run steelhead smolts and 170,000 Pahsimeroi A-run steelhead smolts to be stocked annually in the Little Salmon River. Calculations using the 10-year average (1998-2007) for green egg to smolt survival of Oxbow A-run (65.6%) and Pahsimeroi A-run (70.9%) steelhead at NSFH indicate a necessary egg take of 419,976 and 243,270 green eggs, respectively, to achieve this objective. Tables 9 and 10 below for Oxbow and Pahsimeroi fish hatcheries list the egg take and survival rates for the entire mitigation program, not just the production associated with the releases into the Little Salmon River.

Table 9. Niagara Springs Fish Hatchery Oxbow A-run summer steelhead survival rates from green egg to ponding (fry) and release (smolts) by brood year (1994-2007).

Brood Year	Total Green Egg Take at OFH	Total Green Egg Take for OFH Production	Total Eyed Eggs for OFH Production	Percent Eye Up	Number of Fry Ponded	Percent Survival to Ponding as Fry	Number of Smolts Released	Percent Survival to Release as Smolts[1]
1994	3,348,066	1,402,467	1,132,912	80.8%	1,099,915	78.4%	741,180	52.8%
1995	3,156,929	1,688,517	1,416,666	83.9%	1,374,753	81.4%	776,267	52.4%
1996	2,062,797	1,595,080	1,327,904	83.3%	1,288,772	80.8%	824,166	59.7%
1997	1,583,235	1,583,235	1,271,496	80.3%	1,195,502	75.5%	684,436	43.2%
1998	2,798,775	1,742,365	1,451,739	83.3%	1,408,727	80.9%	842,081	50.7%
1999	3,063,596	1,993,700	1,157,143	58.0%	1,122,970	56.3%	792,902	48.8%
2000	1,523,428	1,220,670	1,061,983	87.0%	1,030,589	84.4%	846,546	83.0%
2001	2,086,405	1,149,319	953,935	83.0%	925,760	80.5%	804,652	77.1%
2002	1,716,313	1,365,877	1,100,147	80.5%	1,067,567	78.2%	828,198	60.6%
2003	1,720,666	1,135,148	910,317	80.2%	883,414	77.8%	807,937	71.2%
2004	1,397,284	1,192,142	966,345	81.1%	937,771	78.7%	769,489	64.5%
2005	1,540,577	1,146,674	905,193	78.9%	878,440	76.6%	761,572	66.4%
2006	1,399,162	1,239,473	1,012,303	81.7%	982,356	79.3%	767,569	61.9%
2007	1,728,208	1,128,079	932,618	82.7%	905,064	80.2%	810,278	71.8%

Data Source: Oxbow Fish Hatchery Steelhead Run Reports (1994 - 2007) and Niagara Springs Fish Hatchery Steelhead Brood Year Reports (1994 - 2007).
[1] Percent survival to smolt adjusted to reflect fry or fingerlings releases.

Table 10. Niagara Springs Fish Hatchery Pahsimeroi A-run summer steelhead survival rates from green egg to ponding (fry) and release (smolts) by brood year 1994-2007.

Brood Year	Total Green Egg Take at PFH	Total Green Egg Take for PFH Production	Total Eyed Eggs for PFH Production	Percent Eye Up	Number of Fry Ponded	% Survival to Ponding as Fry	Number of Smolts Released	Percent Survival to Release as Smolts[1]
1994	2,365,000	no data	1,074,010	no data	1,042,728	no data	960,429	no data
1995	3,240,000	1,761,633	1,402,260	79.6%	1,360,230	77.2%	957,228	55.8%

Brood Year	Total Green Egg Take at PFH	Total Green Egg Take for PFH Production	Total Eyed Eggs for PFH Production	Percent Eye Up	Number of Fry Ponded	% Survival to Ponding as Fry	Number of Smolts Released	Percent Survival to Release as Smolts[1]
1996	5,398,600	1,637,074	1,321,119	80.7%	1,282,194	78.3%	929,487	56.8%
1997	3,910,369	1,839,134	1,472,030	80.0%	1,428,518	77.7%	969,388	52.7%
1998	5,366,086	1,707,808	1,416,800	83.0%	1,374,296	80.5%	1,001,119	59.1%
1999	3,962,649	2,013,205	1,717,897	85.3%	1,666,360	82.8%	1,011,633	72.1%
2000	5,031,178	1,670,914	1,438,458	86.1%	1,395,898	83.5%	1,084,258	80.4%
2001	6,866,248	1,831,147	1,364,602	74.5%	1,324,250	72.3%	1,032,501	77.9%
2002	6,390,094	1,297,179	1,153,722	88.9%	1,119,622	86.3%	1,028,488	79.3%
2003	5,238,152	1,367,068	1,142,848	83.6%	1,109,071	81.1%	1,080,371	79.0%
2004	4,922,931	1,521,492	1,134,017	74.5%	1,100,685	72.3%	935,589	61.5%
2005	5,212,678	1,405,447	1,146,929	81.6%	1,113,038	79.2%	1,051,302	74.8%
2006	4,970,004	1,858,369	1,230,110	66.2%	1,193,761	64.2%	1,097,185	59.0%
2007	5,100,016	1,340,207	1,124,513	83.9%	1,091,252	81.4%	879,594	65.6%

Data Source: Pahsimeroi Fish Hatchery Summer Steelhead Run Reports (1994 - 2007) and Niagara Springs Fish Hatchery Steelhead Brood Year Reports (1994 - 2007).

[1] Percent survival to smolt adjusted to reflect fry or fingerlings releases.

Dworshak National Fish Hatchery- Table 11 lists the egg take and eye-up rates for eggs taken as part of the Dworshak program in the Clearwater River. It also represents typical survival of eggs for the Little Salmon River program.

Table 11. Steelhead egg take and the survival rate to eye-up stage at the Dworshak National Fish Hatchery, 1988-2001.

Brood Year	Percent Eggs Taken	Percent Survival Green to Eyed
1988	3,832,200	88.7
1989	3,166,750	86.7
1990	2,279,500	84.1
1991	3,285,415	80.3
1992	4,012,449	81.0
1993	3,279,638	90.6
1994	3,389,400	91.5
1995	2,989,909	90.7
1996	2,882,040	88.5
1997	2,877,552	88.6
1998	2,737,400	87.5

1999	2,523,010	91.9
2000	2,720,961	90.7
2001	2,700,715	87.6

9.1.2 Cause for, and disposition of surplus egg take

Oxbow and Pahsimeroi fish hatcheries - Both OFH and PFH have collected surplus eggs during years when the adult return numbers exceeded the number needed for the mitigation program. Surplus eggs generated from this program have allowed managers to guard against catastrophic incubation losses and to transfer eggs to other hatcheries to supplement other mitigation programs. Eggs or fry identified as surplus to production needs are destroyed, outplanted as fry to local reservoirs to enhance resident fisheries, transported to other hatcheries for use in their programs or transported to NSFH and outplanted as fingerlings to local reservoirs as fingerlings.

Dworshak National Fish Hatchery - Surplus egg are not collected at Dworshak Fish Hatchery.

9.1.3 Loading densities applied during incubation

Oxbow Fish Hatchery – After spawning, green eggs are carried into the hatchery incubation building where they are loaded into Marisource 16-tray vertical flow incubator stacks. Each tray is loaded with the eggs from one female, averaging 5,526 eggs per incubator tray. Incubator flows are set at approximately 5 gpm. Dead eggs are picked at approximately 350 Fahrenheit temperature units (FTUs) and at 380 FTUs.

Pahsimeroi Fish Hatchery – Eggs are transported from the lower PFH to the upper PFH in 75 quart coolers and loaded into Marisource vertical flow incubator trays. Each incubator tray is loaded with the eggs from two females. Depending on fecundity, loading densities in the incubators can range from 9,000 to 12,000 eggs.

Niagara Springs Fish Hatchery – Eyed eggs are transported from OFH to NSFH at approximately 400 Fahrenheit Temperature Units (FTUs). Eggs are loaded into 54 quart coolers containing chilled 42°F well water at a loading density of approximately 55,000 eggs per cooler. Upon arrival at NSFH, all eggs are tempered and disinfected with iodine at 100-ppm and then loaded into upwelling incubators located inside the vats. Loading densities in the incubators range from 20,000 to 55,000 eggs, depending on water availability. Each vat contains two upwelling incubators.

Dworshak National Fish Hatchery - Steelhead eggs are initially loaded at 1 female/tray = approximately 6,500 green eggs. After enumeration, eggs are put into incubation jars at 16,500 eggs/jar. Water flow for both incubation trays and jars is approximately 5 gallons/minute.

9.1.4 Incubation conditions

Oxbow Fish Hatchery – Steelhead eggs are reared on well water that is pumped from one of two wells to a surge tank in the hatchery building before being distributed to the incubator stacks. Well #1 can provide up to 125 gpm of 54°F water and well #2 can produce 425 gpm of 56°F water. A 70-horsepower water chiller capable of chilling water to 40°F is also available to allow hatchery personnel to manipulate incubation water temperatures. Steelhead eggs are incubated at regulated well water temperatures ranging between 54°F and 40°F to consolidate egg shipments to NSFH. Incubation stacks use catch basins to prevent silt and fine sand from circulating through incubation trays. Incubator flows are typically 5 gpm. Oxygen levels average 9.8 ppm for influent water and 9.2 ppm for effluent discharge. All eggs receive an iodophor flush three times a week.

Pahsimeroi Fish Hatchery – All summer steelhead egg incubation occurs at the upper PFH facility. The incubation room includes twenty 16-tray stacks of Marisource vertical flow incubators supplied with 120 gpm of chilled (40°F) and unchilled (50°F) pathogen-free well water (240 gpm total). A 200-gallon head tank provides thermal buffering for any temperature fluctuation. Each incubator stack uses a catch basin to prevent silt and fine sand from circulating through the incubation trays. Incubator flows are initially set at 5 gpm and are eventually increased to 6 gpm. Summer steelhead eggs are incubated to eye-up or swim-up stages in the incubation room and then transported to NSFH for final incubation and rearing.

Niagara Springs Fish Hatchery – Depending on water availability, incubator flows range between 20 to 25 gpm and flows in the vats will approach 50 gpm. Maximum flow indices should not exceed 0.8 lbs/gpm/in and density indices will peak at 1.13 lbs/cubic feet/in inside the vats. Swim-up fry attain a density index of 0.57 lbs/cubic feet/in when they leave the incubators for the vats.

Magic Valley Fish Hatchery - Water flow to incubation jars is adjusted so eggs gently roll. Temperature is tracked daily to monitor the accumulation of temperature units. Water temperature at both facilities is a constant 15.0ºC.

Dworshak National Fish Hatchery- Temperature for steelhead incubation is 54°F.Temperature is monitored at least once/day and minimum dissolved oxygen is 6-7ppm in the bottom tray

9.1.5 Ponding

Niagara Springs Fish Hatchery - Fry are transferred from OFH and PFH to NSFH when they are approximately 3,100 fpp. Swim-up fry that are transported from OFH are loaded into fry hauling tubes and then placed inside a 1,000 gallon transport tank containing unchilled 54°F well water. Swim-up fry that are transported from PFH are loaded into fry hauling tubes and then placed inside a 500 gallon transport tank containing 50°F pathogen-free well water. During transport from both facilities, supplemental oxygen is used to maintain dissolved oxygen levels within the transport tank. Swim-up fry that are transported from OFH and PFH are tempered in the hauling trailer prior to ponding directly into the outside nursery raceways at approximately 950 FTUs. Fry hatched at NSFH from Oxbow A-run and Pahsimeroi A-run eyed eggs are transferred from the indoor vats to the nursery raceways when they reach approximately 1,300 fpp. Rearing space is increased as fish grow and their density index approaches 0.30 lbs/ft3/in.

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

9.1.6 Fish health maintenance and monitoring

Oxbow Fish Hatchery – Following fertilization, eggs are water-hardened and disinfected in a 100-ppm solution of iodophor and water for 30 minutes. Beginning 48 hours after fertilization, eggs are treated for 15 minutes three times per week with a 1,667-ppm formalin treatment to prevent fungal growth. This treatment continues until the eggs acquire approximately 500 FTUs. At eye-up (around 300 FTUs), the eggs are shocked by pouring them from the incubator trays into a shallow pan of water. One day later, dead eggs are picked, enumerated with a Jensorter electronic counter/picker, and returned to clean trays. Dead eggs are picked again (by hand) at approximately 350 and 380 FTUs.

Pahsimeroi Fish Hatchery – Following fertilization, eggs are typically rinsed with well water and then water-hardened in a 100-ppm solution of iodophor for 30 minutes. From 48 hours after spawning until eye-up, eggs are treated three times per week with a 1,667-ppm formalin treatment to prevent fungal growth on the eggs and three times per week with a 100-ppm iodophor treatment to prevent soft shell disease. At eye-up (approximately 360 FTUs), the eggs are shocked once by dropping them into a bucket of water from a height of approximately 16 inches. Dead eggs are then picked and enumerated with a Jensorter electronic counter/picker.

Niagara Springs Fish Hatchery – Upon arrival at Niagara Spring FH, eyed eggs are disinfected with Iodine at 100-ppm for 30 minutes prior to tempering and placing in upwelling incubators. Fish health inspection and diagnostic services are provided by IDFG personnel at the Eagle Fish Health Laboratory (EFHL). Diagnostic services are provided as needed at the request of hatchery personnel. Quarterly on-site inspections include tests for the presence of viral replicating agents, *Renibacterium salmoninarum* and other pathogens. Therapeutics may be used to treat specific disease agents via a medicated feed treatment (i.e., Oxytetracycline). Approximately one half of the juvenile fish are typically vaccinated against furunculosis (*Aeromonas salmonicida*) using a commercially obtained immersion vaccine.

Magic Valley Fish Hatchery -. Eggs produced at the Sawtooth and Pahsimeroi fish hatcheries are transferred to rearing hatcheries when they have accumulated approximately 450 FTUs. Fish health inspection and diagnostic services are provided by IDFG personnel at the Eagle Fish Health Laboratory (EFHL). Diagnostic services are provided as needed at the request of hatchery personnel. Quarterly on-site inspections include tests for the presence of viral replicating agents, *Renibacterium salmoninarum* and other pathogens. Therapeutics may be used to treat specific disease agents via a medicated feed treatment (i.e., Oxytetracycline).

Dworshak National Fish Hatchery- Eggs are treated 3-5 days/week with formalin to control fungus. Yolk-sac malformation is very low. Dead eggs are removed either with an electronic egg sorter or by hand.

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 since no natural-origin fish are used in the broodstocks. To offset potential risk from overcrowding and disease transmission, eggs from no more than two females are placed in individual incubation trays to keep loading densities low.

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.

Tables 12 and 13 for Oxbow and Pahsimeroi fish hatcheries list the egg take and survival rates for the entire mitigation program, not just the production associated with the releases into the Little Salmon River.

Table 12. Oxbow A-run summer steelhead survival rates by hatchery life stage at Niagara Springs Fish Hatchery[1] (1994-2007).

Brood Year	Total Green Egg Take at OFH	Total Green Egg Take for OFH Production	Total Eyed Eggs for OFH Production	Percent Eye Up	Number Marked as Fingerlings	% Survival from Eyed Egg to Fingerlings	Percent Released as Smolts	% Survival from Fingerlings to Smolts[2]
1994	3,348,066	1,402,467	1,132,912	80.8%	750,725	66.3%	741,180	98.7%
1995	3,156,929	1,688,517	1,416,666	83.9%	1,078,933	76.2%	843,360	89.1%
1996	2,062,797	1,595,080	1,327,904	83.3%	1,105,480	83.3%	824,166	86.2%
1997	1,583,235	1,583,235	1,231,862	80.3%	816,478	66.3%	684,436	83.8%
1998	2,798,775	1,742,365	1,451,739	83.3%	1,088,659	75.0%	842,081	81.2%
1999	3,063,596	1,993,700	1,157,143	58.0%	1,061,679	91.8%	792,902	91.5%
2000	1,523,428	1,220,670	1,061,983	87.0%	1,042,230	98.1%	846,546	97.2%
2001	2,086,405	1,149,319	953,935	83.0%	919,307	96.4%	804,652	96.4%
2002	1,716,313	1,365,877	1,100,147	80.5%	1,005,535	91.4%	828,198	82.4%
2003	1,720,666	1,135,148	910,317	80.2%	831,484	91.3%	807,937	97.2%
2004	1,397,284	1,192,142	966,345	81.1%	821,006	85.0%	769,489	93.7%
2005	1,540,577	1,146,674	905,193	78.9%	866,813	95.8%	761,572	87.9%
2006	1,399,162	1,239,473	1,012,303	81.7%	896,293	88.5%	767,569	85.6%
2007	1,728,208	1,128,079	932,618	82.7%	871,532	93.5%	810,278	93.0%

Source: Oxbow Fish Hatchery Steelhead Run Reports (1994 - 2007) and Niagara Springs Fish Hatchery Steelhead Brood Year Reports (1994 - 2007).

[1] Survival rate data is for all Oxbow A-run steelhead reared at NSFH regardless of release location.

[2] Percent survival to smolt adjusted to reflect fry or fingerlings releases.

Table 13. Pahsimeroi A-run summer steelhead survival rates by hatchery life stage at Niagara Springs Fish Hatchery[1] (1994-2007).

Brood Year	Total Green Egg Take at PFH	Total Green Egg Take for PFH Production	Total Eyed Eggs for PFH Production	Percent Eye Up	Number Marked as Fingerlings	% Survival from Swim-Up to Fingerlings	Number Released as Smolts	% Survival from Fingerlings to Smolts[2]
1994	2,365,000	no data	1,074,010	no data	972,694	90.6%	960,429	98.7%
1995	3,240,000	1,855,601	1,402,260	75.6%	1,090,958	77.8%	957,228	89.8%
1996	5,398,600	1,637,074	1,321,119	80.7%	1,032,851	78.2%	929,487	90.0%
1997	3,910,369	1,839,134	1,472,030	80.0%	1,124,484	76.4%	969,388	86.2%
1998	5,366,086	1,707,808	1,416,800	83.0%	1,113,463	78.6%	1,001,119	90.6%
1999	3,962,649	2,013,205	1,717,897	85.3%	1,322,892	91.4%	1,011,633	87.7%
2000	5,031,178	1,670,914	1,438,458	86.1%	1,385,091	96.3%	1,084,258	96.3%
2001	6,866,248	1,831,147	1,364,602	74.5%	1,335,809	97.9%	1,032,501	95.9%
2002	6,390,094	1,297,179	1,153,722	88.9%	1,033,620	89.6%	1,028,488	99.5%
2003	5,238,152	1,367,068	1,142,848	83.6%	1,107,877	96.9%	1,080,371	97.5%
2004	4,922,931	1,521,492	1,134,017	74.5%	950,193	83.8%	935,589	98.5%
2005	5,212,678	1,405,447	1,146,929	81.6%	1,139,359	99.3%	1,051,302	92.3%
2006	4,970,004	1,858,369	1,230,110	66.2%	1,139,205	92.6%	1,097,185	96.3%
2007	5,100,016	1,340,207	1,124,513	83.9%	952,350	84.7%	879,594	92.4%

Source: Pahsimeroi Fish Hatchery Summer Steelhead Run Reports (1994 - 2007) and Niagara Springs Fish Hatchery Steelhead Brood Year Reports (1994 - 2007).

[1] Survival rate data is for all Pahsimeroi A-run steelhead reared at NSFH regardless of release location.

[2] Percent survival to smolt adjusted to reflect fry or fingerlings releases.

Magic Valley Fish Hatchery- Egg take and in-hatchery survival of Pahsimeroi A-run and Dworshak B-run steelhead raised at Magic Valley Fish Hatchery is listed in Table 14 below. These numbers represent all of the Pahsimeroi A-run and Dworshak B-run fish reared at Magic Valley Fish Hatchery, not just those released into the Little Salmon River.

Table 14. Pahsimeroi A-run and Dworshak B-run steelhead reared at Magic Valley Fish Hatchery 1997-2008.

Brood Year	Spawning Hatchery	Eyed-Eggs Received	Eyed-Egg to Hatch Survival	Eyed-Egg to Smolt Survival	Number of Smolts Released
1997	Dworshak	1,403,900	88.7%	46.7%	655,475
1998	Dworshak	1,303,112	98.0%	86.1%	1,121,504
1999	Dworshak	1,446,208	87.0%	76.5%	1,106,133
2000	Dworshak	544,006	87.0%	58.4%	317,650
2001	Dworshak	1,131,722	87.0%	57.1%	646,739

Brood Year	Spawning Hatchery	Eyed-Eggs Received	Eyed-Egg to Hatch Survival	Eyed-Egg to Smolt Survival	Number of Smolts Released
2002	Dworshak	1,131,722	87.0%	57.1%	646,739
2003	Dworshak	932,191	87.0%	69.9%	651,637
2004	Dworshak	1,145,829	87.0%	65.2%	747,157
2005	Dworshak	945,000	87.0%	77.8%	735,324
2006	Dworshak	932,190	87.0%	65.9%	614,383
2007	Dworshak	863,651	87.0%	79.9%	690,329
2008	Dworshak	834,242	87.0%	85.6%	714,349
1997	Pahsimeroi	325,000	98.0%	89.7%	291,625
1998	Pahsimeroi	887,000	99.0%	92.4%	819,902
1999	Pahsimeroi	515,375	99.0%	93.5%	481,712
2000	Pahsimeroi	946,319	99.0%	83.5%	790,258
2001	Pahsimeroi	906,282	99.0%	95.0%	860,824
2002	Pahsimeroi	910,249	99.0%	85.0%	773,272
2003	Pahsimeroi	854,718	99.0%	80.5%	688,397
2004	Pahsimeroi	846,410	99.0%	76.4%	647,023
2005	Pahsimeroi	624,365	99.0%	71.5%	446,277
2006	Pahsimeroi	747,535	99.0%	71.8%	536,450
2007	Pahsimeroi	496,518	99.0%	75.0%	372,394
2008	Pahsimeroi	423,881	99.0%	88.6%	375,682

9.2.2 Density and loading criteria (goals and actual levels)

The target maximum density and flow indices for summer steelhead are 0.35 lbs/ft3/in and 1.5 lbs/gpm/in, respectively. Actual density and flow indices achieved at NSFH are typically below these levels for most of the rearing cycle and peak just prior to smolt release. Observed density and flow indices for Oxbow A-run and Pahsimeroi A-run steelhead are summarized in Tables 15 and 16.

Table 15. Average density and loading criteria for Oxbow A-run summer steelhead at NSFH by brood year.

Brood Year	Density Index (lbs/cuft/in)		Flow Index (lbs/gpm/in)		Inflow (cfs)[1]	
	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release
1995	0.34	0.28	0.24	0.75	0.87	6.21

Brood Year	Density Index (lbs/cuft/in)		Flow Index (lbs/gpm/in)		Inflow (cfs)[1]	
	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release
1996	0.37	0.29	0.29	0.74	1.43	7.02
1997	0.51	0.30	0.22	0.76	1.50	6.33
1998	0.38	0.31	0.17	0.80	4.00	6.32
1999	0.35	0.36	0.53	0.88	1.70	6.32
2000	0.47	0.34	0.38	0.91	1.00	6.32
2001	0.20	0.37	0.12	0.96	0.96	6.46
2002	0.22	0.32	0.30	0.77	0.54	7.78
2003	0.20	0.28	0.26	0.74	0.56	7.87
2004	0.20	0.32	0.34	0.86	0.43	6.03
2005	0.22	0.29	0.35	0.78	0.47	7.37
2006	0.36	0.29	0.16	0.52	0.38	10.50
2007	0.33	0.40	0.04	0.82	1.92	6.59
2008	0.27	0.35	0.05	0.97	1.30	6.09

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (2000 - 2009).
[1] Inflow at ponding and release are per raceway.

Table 16. Average density and loading criteria for Pahsimeroi A-run summer steelhead at NSFH by brood year.

Brood Year	Density Index (lbs/cuft/in)		Flow Index (lbs/gpm/in)		Inflow (cfs)[1]	
	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release
1995	0.29	0.28	0.21	0.74	0.95	6.21
1996	0.44	0.34	0.16	0.79	1.80	5.69
1997	0.60	0.30	0.25	0.73	0.90	6.32
1998	0.50	0.33	0.12	0.87	5.00	6.32
1999	0.24	0.37	0.47	0.91	1.70	6.32
2000	0.35	0.34	0.36	0.91	1.00	6.32
2001	0.19	0.37	0.14	0.97	1.51	6.36
2002	0.19	0.33	0.15	0.78	0.85	7.49
2003	0.15	0.27	0.18	0.72	0.87	8.12
2004	0.12	0.28	0.15	0.73	0.63	7.03
2005	0.19	0.34	0.21	0.89	0.70	6.12

Brood Year	Density Index (lbs/cuft/in)		Flow Index (lbs/gpm/in)		Inflow (cfs)[1]	
	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release
2006	0.26	0.31	0.12	0.80	1.31	6.73
2007	0.24	0.27	0.10	0.74	1.44	7.46
2008	0.41	0.36	0.15	0.93	0.95	6.10

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (1995 - 2009).
[1] Inflow at ponding and release are per raceway.

The flow and density index for summer steelhead raised at Magic Valley hatchery from 1998-2009 is displayed in Table 17 below. Indices are averaged over all stocks and raceways.

Table 17. Magic Valley Hatchery flow and density indices, 1998-2008.

Brood Year	Flow Index (lbs/gpm/in)	Density Index (lbs/cuft/in)
1998	1.22	0.32
1999	1.32	0.33
2000	1.22	0.31
2001	1.25	0.31
2002	1.21	0.3
2003	1.37	0.29
2004	1.42	0.28
2005	1.27	0.25
2006	1.32	0.31
2007	1.19	0.31
2008	1.21	0.29

9.2.3 Fish rearing conditions

Niagara Springs Fish Hatchery - All eyed eggs received at NSFH are placed in upwelling incubators located inside fiberglass vats. Swim-up fry volitionally emerge from these incubators into the vats where they continue early rearing until reaching approximately 1,300 fpp. Initial flows in the vats are set at approximately 20 to 25 gpm per vat during egg incubation and fry emergence. As fish grow, flows are increased up to a maximum of approximately 50 gpm per vat. The vats are supplied with constant 59°F spring water that is gravity fed from Niagara Springs. When fish reach the target size, they are transferred to the outdoor concrete raceways via a system of pipes temporarily installed between the vats and the raceways.

Inventory received as swim-up fry are typically around 3,100 fpp and are loaded directly into the outdoor concrete raceways upon arrival at NSFH. Fry are placed into nursery sections that are created at the head end of the raceways by installing screens at approximately 35 feet from the headrace. The raceways are supplied with constant 59°F water from Niagara Springs at an intake lower in the spring than the incubation room intake. Initial flows in the concrete raceways are typically around 1.0 cfs per raceway. As fish grow, screens are moved further down the raceway, providing more rearing space for fish and reducing density and flow indices. At the peak of production, the screens are installed at 300 feet providing the maximum rearing space in each raceway. As the fish grow, flows are increased to a maximum of approximately 6.3 cfs per raceway.

Magic Valley Fish Hatchery – Fish rear on constant 59.0ºF water. Dissolved oxygen, flows, total suspended solids, settable solids, phosphorus, and water temperature are recorded monthly. Density and flow indices are monitored on a regular basis. Rearing groups are split or moved as needed to adhere to these indices. Fish are fed in outside raceways from a traveling bridge fitted with 16 Nielson automatic feeders. Raceway cleaning takes place on an as needed basis; raceways are swept manually with brooms. Sample counts are conducted monthly and dead fish are removed daily.

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

Juvenile summer steelhead are reared for approximately 11 months before being released as smolts into the Little Salmon. After swim-up, all fish are reared in outdoor concrete raceways. While on station at NSFH, steelhead growth is tracked each month and pound counts and lengths are recorded throughout the rearing period. Fish length, weight, and condition factor vary from year-to-year but typically average the following:

Oxbow A-run steelhead*:*

- At ponding (English units) = 1.3 inches, 1,450 fish/pound, condition factor (C) = 3.5
- At transfer from indoor vats to outside rearing raceways = 2.9 inches, 130 fish/pound, condition factor (C) = 2.8

Pahsimeroi A-run steelhead*:*

- At ponding (English units) = 1.1 inches, 2,327 fish/pound, condition factor (C) = 3.2
- At transfer from indoor vats to outside rearing raceways = 2.9 inches, 130 fish/pound, condition factor (C) = 2.6

Fish are sample-counted monthly throughout the rearing period. Tables 18 and 19 below summarize NSFH monthly fish growth data for Oxbow A-run and Pahsimeroi A-run steelhead for the past 10 years (2000 – 2009).

Table 18. Monthly growth of Oxbow A-run summer steelhead at Niagara Springs Fish Hatchery from ponding as fry in raceways to release as smolts.

Month	Average Fish Per Pound (fpp)	Average Length (inches)	Avg. Length Increase by Month (inches)	Condition Factor C (x 104)	Average Monthly Mortality
June	1450.42	1.26	0.62	3.4	29,960
July	424.73	2.03	0.90	2.8	25,256
August	120.20	2.95	0.92	3.2	5,044
September	58.55	3.62	0.67	3.6	2,238
October	35.57	4.28	0.63	3.6	2,984
November	18.97	5.27	0.97	3.6	1,069
December	12.03	6.13	0.86	3.6	679
January	7.81	7.07	0.94	3.6	740
February	5.94	7.76	0.69	3.6	838
March	4.85	8.30	0.53	3.6	1,661
April	4.68	8.38	0.03	3.6	71,893
May	4.64	8.52	0.01	3.5	0

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (2000 - 2009).

Table 19. Monthly grown of Pahsimeroi A-run summer steelhead at Niagara Springs Fish Hatchery from ponding as fry in raceways to release as smolts.

Month	Average Fish Per Pound (fpp)	Average Length (inches)	Avg. Length Increase by Month (inches)	Condition Factor C (x 104)	Average Monthly Mortality
June	2326.68	1.10	0.76	3.2	35,053
July	644.32	1.81	0.77	2.6	34,612
August	136.01	2.80	0.99	3.3	6,324
September	63.78	3.50	0.75	3.7	2,641
October	39.55	4.13	0.59	3.6	2,143
November	21.80	5.04	0.89	3.6	844
December	12.91	5.96	0.92	3.7	746
January	8.40	6.87	0.91	3.7	718
February	6.14	7.63	0.77	3.7	876
March	4.49	8.45	0.82	3.7	1,611
April	4.19	8.69	0.21	3.6	1,693
May	4.09	8.89	0.21	3.5	185

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (2000 - 2009).

Magic Valley Fish Hatchery - Summer steelhead are reared at Magic Valley Fish Hatchery under constant water temperature (59.0ºF) conditions. Feeding schedules are designed to produce fish between 180 and 250 mm at release. Length gained per month for the first three months of culture is typically between 0.8 and 1.0 inches (20.3 to 25.4 mm). Fish gain approximately 0.65 to 0.75 inches per month (16.5 to 19.1 mm) thereafter. To meet the release size target, fish may be fed on an intermittent schedule beginning in their fourth month of culture.

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

For fish growth data, see Section 9.2.4 above.

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

performance).

Niagara Springs Fish Hatchery - Juvenile summer steelhead are fed a dry pelleted diet produced by Rangen, Inc. The conversion rate from first ponding to release averages 1.02 and 0.93 pounds of food fed for each pound of weight gain for Oxbow A-run and Pahsimeroi A-run steelhead, respectively. Food types used, application rates and feed conversions by rearing period and by stock from swim-up to smolt release are presented in Tables 20 and 21 below.

Table 20. Food types, application rates and feed conversions by month for Oxbow A-run steelhead from swim-up to smolt release at Niagara Springs Fish Hatchery.

Month	Food Type	Application Schedule (number feedings/day)	Feeding Rate Range (% B.W./day)	Food Conversion During Period
June	Rangen #0, #1	10	feed to satiation	0.79
July	Rangen #0, #1, #2, #3	8	3.05	0.74
August	Rangen #3	8	2.54	0.89
September	Rangen #3, 2.0mm 470	8	2.11	0.91
October	Rangen 2.0mm 470	8	2.36	1.20
November	Rangen 2.0 mm, 3/32 470	8	1.19	0.75
December	Rangen 3/32, 1/8 470	8	1.18	0.86
January	Rangen 1/8 470	8	0.98	0.82
February	Rangen 1/8 470	8	1.15	1.07
March	Rangen 1/8 470	8	1.74	1.72
April	Rangen 1/8 470	8	1.53	1.52

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (2000 - 2009) and NSFH staff.

Table 21. Food types, application rates and feed conversions by month for Pahsimeroi A-run steelhead from swimup to smolt release at Niagara Springs Fish Hatchery.

Month	Food Type	Application Schedule (# feedings/day)	Feeding Rate Range (% B.W./day)	Food Conversion During Period
June	Rangen #0, #1	10	feed to satiation	0.80

Month	Food Type	Application Schedule (# feedings/day)	Feeding Rate Range (% B.W./day)	Food Conversion During Period
July	Rangen #0, #1, #2, #3	8	3.24	0.70
August	Rangen #3	8	2.31	0.77
September	Rangen #3, 2.0mm 470	8	1.88	0.78
October	Rangen 2.0mm 470	8	1.98	0.97
November	Rangen 2.0 mm, 3/32 470	8	1.39	0.83
December	Rangen 3/32, 1/8 470	8	1.19	0.85
January	Rangen 1/8 470	8	1.11	0.91
February	Rangen 1/8 470	8	0.97	0.88
March	Rangen 1/8 470	8	1.08	1.08
April	Rangen 1/8 470	8	1.56	1.62

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (2000 - 2009) and NSFH staff.

Magic Valley Fish Hatchery – Dry and semi-moist diets have been used at the Magic Valley Fish Hatchery in the past. Currently, fish are fed the Rangen 470 extruded salmon dry diet. First feeding fry are fed at a rate of approximately 5% body weight per day. As fish grow, percent body weight fed per day decreases. While occupying early rearing vats, fry are fed with Loudon solenoid activated feeders. Following transfer to outside raceways, fish are fed by hand and with the assistance of the traveling bridge. First feeding fry are typically fed up to eight times per day. Prior to release, pre-smolts are typically fed four times per day. Feed conversion averages 1.00 pounds of feed fed for every pound of weight gain (from first feeding through release).

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures

Niagara Springs and Magic Valley fish hatcheries - IDFG Eagle Fish Health Laboratory staff conducts routine fish health inspections on a routine basis at NSFH and MVFH. This includes necropsies performed on sample fry to detect bacterial and viral rates of infection, to assess organ development, and to evaluate fish conformation. More frequent inspections occur if needed. Therapeutics may be used to treat specific disease agents via a medicated feed treatment (i.e., Oxytetracycline) or to inhibit disease agents via prophylactic vaccinations (i.e., Furogen Dip). Disinfection protocols are in place for equipment, trucks and nets and the hatchery building has foot baths containing disinfectant at each entrance to the building. The raceways are thoroughly pressure washed, chlorinated and air dried annually after all fish are removed from the facility.

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

No smolt development indices are developed in this program.

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

No natural or semi-natural rearing methods are intentionally applied. However, as a byproduct of the rearing regime, some natural food items are present in the spring water supply. Additionally, predator avoidance behaviors may be strengthened in the hatchery population by the presence of avian and mammalian predators that occasionally visit the outdoor rearing raceways.

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

ESA listed steelhead are not propagated at Niagara Spring or Magic Valley fish hatcheries for this program.

SECTION 10. RELEASE

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

10.1 PROPOSED FISH RELEASE LEVELS

Table 22. Proposed release numbers and location of Little Salmon River steelhead.

Age Class	Stock	Maximum Number	Size (fpp)	Release Date	Location
Yearling	Oxbow A-run	275,000	4.5	March - May	Little Salmon River
Yearling	Pahsimeroi A-run	170,000	4.5	March - May	Little Salmon River

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

- Stream, river, or watercourse: Little Salmon River (hydrologic unit code = 17060210)
- Release point: Little Salmon River (river kilometer code = 522.303.140)
- 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

Releases of hatchery-origin steelhead into the Little Salmon River has occurred from three rearing hatcheries in Idaho; Niagara Springs, Hagerman National and Magic Valley fish hatcheries. Between 1995 and 2009 and average of 920,000 (655,000 min, 1,157,000 max) hatchery-origin steelhead have been released into the Little Salmon River.

Release information for summer steelhead reared at NSFH and released into the Little Salmon River is summarized in Table 23 below.

Table 23. Date, total number, and average size of steelhead smolts released into the Little Salmon River and mainstem Salmon River from NSFH.

Brood Year	Release year	Release Dates	Total No. Smolts (Yearlings) Released	Avg. Size (fpp)	Stock	Release Location(s)
1994	1995	April 15 - 16	131,152	4.41	PAH-A	Little Salmon River @ Warm Springs
		April 26	29,400	4.90	OX-A	Salmon River @ Pine Bar
		April 27 - 28	97,220	4.70	OX-A	Salmon River @ Hammer Creek
1995	1996	March 25 - 27	158,008	5.23	PAH-A	Little Salmon River @ Warm Springs
		April 27	30,090	5.10	OX-A	Salmon River @ Pine Bar
		April 28 - 29	116,025	5.10	OX-A	Salmon River @ Hammer Creek
1996	1997	April 6	29,700	4.50	OX-A	Salmon River @ Pine Bar
		April 7 - 9	133,815	5.20	OX-A	Salmon River @ Hammer Creek
		April 9	4,018	4.90	PAH-A	Salmon River @ Hammer Creek
		April 29 - 30	94,815	4.90	PAH-A	Little Salmon River @ Hazard Creek
1997	1998	April 6	31,160	4.10	OX-A	Salmon River @ Pine Bar
		April 7 - 9	141,320	4.16	PAH-A	Salmon River @ Hammer Creek
		April 29	26,527	3.93	PAH-A	Little Salmon River @ Hazard Creek
1998	1999	April 5	30,369	4.76	OX-A	Salmon River @ Pine Bar
		April 6 - 8	154,047	5.49	OX-A	Salmon River @ Hammer Creek
		April 28 - May 1	171,920	3.90	PAH-A	Little Salmon River @ Hazard Creek
1999	2000	April 10 - 13	190,995	4.67	OX-A	Little Salmon River @ Stinky Springs
		May 5 - 8	181,317	4.31	PAH-A	Salmon River @ Hammer Creek
2000	2001	April 8 - 12	267,079	4.51	OX-A	Little Salmon River @ Stinky Springs
		May 6 - 9	194,303	4.16	PAH-A	Little Salmon River @ Stinky Springs
2001	2002	April 6 - 13	278,484	4.23	OX-A	Little Salmon River @ Stinky Springs
		May 5 - 9	195,788	3.94	PAH-A	Little Salmon River @ Stinky Springs
2002	2003	April 5 - 10	302,314	4.70	OX-A	Little Salmon River @ Stinky Springs

		May 2 - 6	185,231	3.98	PAH-A	Little Salmon River @ Stinky Springs
2003	2004	April 2 - 7	274,993	4.99	OX-A	Little Salmon River @ Stinky Springs
		April 30 - May 2	240,194	4.28	PAH-A	Little Salmon River @ Stinky Springs
2004	2005	March 25 - 29	243,465	4.71	OX-A	Little Salmon River @ Stinky Springs
		March 30 - 31	114,922	4.90	PAH-A	Little Salmon River @ Stinky Springs
2005	2006	March 30 - April 5	241,114	4.60	OX-A	Little Salmon River @ Hazard Creek
		April 5-7, 26-27	222,419	4.28	PAH-A	Little Salmon River @ Hazard Creek
2006	2007	March 29 - April 4	239,868	5.27	OX-A	Little Salmon River @ Stinky Springs
		April 4-5, 24-26	266,738	5.11	PAH-A	Little Salmon River @ Stinky Springs
2007	2008	April 2 - 9	272,907	4.59	OX-A	Little Salmon River @ Pinehurst Bridge
		April 5-7, 26-27	48,700	3.87	PAH-A	Little Salmon River @ Pinehurst Bridge
2008	2009[1]	April 2 - 9	243,727	4.53	OX-A	Little Salmon River @ Stinky Springs
		April 9-10, May 3-4	178,849	3.96	PAH-A	Little Salmon River @ Stinky Springs
Averages			384,200	4.55		

Source: Niagara Springs Fish Hatchery Brood Year Reports (1994 - 2007) and Niagara Springs Fish Hatchery Monthly Production Summary (May 2009).
[1] Data reported in the Monthly Production Summary is considered preliminary; final data will be reported in the NSFH Steelhead Brood Year Report (2008).

Release information for summer steelhead reared at Magic Valley Fish Hatchery and released into the Little Salmon River is summarized in Table 24 below. Beginning in BY09, managers reprioritized which stocks of fish are reared at the Magic Valley and Hagerman National fish hatcheries. Beginning with releases in 2010, Hagerman NFH will no longer rear fish for release into the Little Salmon River. Only fish reared at Niagara Springs and Magic Valley fish hatcheries will be released into the Little Salmon.

Table 24. Dates and total number of steelhead smolts released from Magic Valley Fish Hatchery into the Little Salmon River, 1994-2008.

Brood Year	Release year	Release Dates	Total No. Smolts (Yearlings) Released	Avg. Size (fpp)	Stock
1994	1995	4/26-5/1	342,680	4.4	DWOR B
1995	1996	4/9-4/12	403,281	4.6	DWOR B
1996	1997	4/9-4/10	240,530	5.2	DWOR B
1997	1998	4/13-4/15	280,950	4.2	DWOR B
1998	1999	4/12-4/16	324,555	4.7	DWOR B
1998	1999	4/12-5/6	41,620	4.4	PAH A
1999	2000	4/11-4/27	300,523	4.2	DWOR B
1999	2000	4/11-4/12	115,423	4.3	OXA
2000	2001	4/9-4/16	58,346	4.3	DWOR B
2000	2001	4/9-4/16	430,210	4.7	PAH A

2001	2002	4/8-4/9	105,167	4.4	DWOR B
2001	2002	4/12-4/12	54,000	4.5	PAH A
2002	2003	4/9-5/1	336,983	4.5	DWOR B
2003	2004	4/6-4/7	198,623	5	DWOR B
2004	2005	3/17-4/6	151,393	5	DWOR B
2004	2005	3/15-4/6	147,878	1.6	PAH A
2005	2006	4/11-4/14	248,105	4.4	DWOR B
2006	2007	4/10-4/12	215,170	4.5	DWOR B
2007	2008	4/7-4/10	217,180	4.9	DWOR B
2008	2009	4/6-4/8	218,101	5	DWOR B

Release information for summer steelhead reared at Hagerman National Fish Hatchery and released into the Little Salmon River is summarized in Table 25 below.

Table 25. Dates and total number of steelhead smolts released from Hagerman National Fish Hatchery into the Little Salmon River, 1994-2008.

Brood Year	Release year	Release Dates	Total No. Smolts (Yearlings) Released	Avg. Size (fpp)	Stock
1994	1995	4/10-4/26	315,339	3.98	OXA
1994	1995	4/10-4/10	85,165	4.87	PAHA
1995	1996	4/8-4/24	464,209	4.73	OXA
1995	1996	4/8-4/8	65,057	5.52	PAHA
1996	1997	4/14-5/2	311,141	4.65	PAHA
1996	1997	4/16-4/16	31,140	4.72	SAWA
1997	1998	4/13-4/29	347,470	4.39	PAHA
1998	1999	4/14-5/10	419,036	4.14	OXA
1999	2000	4/3-5/8	447,085	4.23	OXA
2000	2001	4/2-4/9	207,169	4.54	PAHA
2001	2002	4/1-4/1	218,124	4.17	PAHA
2002	2003	3/31-4/7	195,725	4.49	PAHA
2003	2004	4/7-4/7	100,494	4.58	DWORB
2003	2004	3/29-4/7	219,095	4.24	PAHA
2004	2005	4/6-4/8	91,264	4.38	DWORB
2004	2005	3/28-4/5	201,015	4.30	PAHA
2006	2007	3/26-3/26	92,523	4.63	DWORB
2006	2007	3/26-4/2	197,131	4.49	PAHA
2007	2008	4/7-4/7	92,103	4.61	DWORB
2007	2008	3/31-4/10	205,546	4.33	PAHA

2008	2009	4/8-4/8	86,196	4.53	DWORB
2008	2009	3/30-4/3	200,290	4.73	PAHA

10.4 Actual Dates of Release and Description of Release Protocols

Tables 23, 24 and 25 provide specific release date information. All steelhead smolts are direct released into the Little Salmon River following transportation from NSFH and MVFH in 5,000 gallon smolt tankers. Please see section 10.5 for a description of these transport vehicles. Annual adjustments to release dates may occur based on water conditions, smolt size, and other environmental conditions.

10.5 Fish Transportation Procedures, if Applicable

Niagara Springs Fish Hatchery - Steelhead smolts are transported to their release sites in three 5,000 gallon, fully insulated smolt tankers owned by IPC. Each smolt tanker has 3 compartments (2,000 gallon front, 1,000 gallon middle, 2,000 gallon rear) and is equipped with liquid oxygen, 5 mechanical aerators (2 in front, 1 in middle, 2 in rear), 8 microbubble oxygen diffusers (3 in front, 2 in middle, 3 in rear), 6 oxygen flow meters, and a low pressure liquid oxygen regulator. The tankers are loaded with spring water which is chilled to approximate the temperature of the receiving water. Approximately 5,000 pounds of fish (at 4.5 fpp) are loaded into each truck. Transport duration to the release sites at the Little Salmon River is approximately 4.5 hours. Fish are kept off of feed for a minimum of 48 hours prior to loading and transporting.

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

10.6 Acclimation Procedures

No acclimation occurs. Steelhead smolts are direct released into the Little Salmon River after transport from the rearing facilities.

10.7 Marks Applied, and Proportions of the Total Hatchery Population Marked, to Identify Hatchery Adults

Niagara Springs Fish Hatchery - All yearling smolts released as part of IPC's summer steelhead program are marked with an adipose fin-clip for identification as a hatchery-origin fish. A percentage of the population also receives either PIT or CWT to satisfy various fishery management or research needs.

The marking history for IPC steelhead released into the Little Salmon and lower Salmon rivers is summarized in Table 26.

Table 26. Niagara Springs Fish Hatchery steelhead marking history, 1994-2008.

Brood Year	Release year	Total No. Smolts Released	No. of Smolts Released by Location	Stock	Release Location(s)	Adipose fin clips	CWT tags[1]	PIT-tags[1]
1994	1995	257,772	131,152	PAH-A	Little Salmon River @ Warm Springs	100%	38,390	295
			29,400	OX-A	Salmon River @ Pine Bar	100%	0	0
			97,220	OX-A	Salmon River @ Hammer Creek	100%	64,058	299
1995	1996	304,123	158,008	PAH-A	Little Salmon River @ Warm Springs	100%	59,507	300
			30,090	OX-A	Salmon River @ Pine Bar	100%	0	0
			116,025	OX-A	Salmon River @ Hammer Creek	100%	61,313	300
1996	1997	262,348	29,700	OX-A	Salmon River @ Pine Bar	100%	0	0
			133,815	OX-A	Salmon River @ Hammer Creek	100%	61,921	300
			4,018	PAH-A	Salmon River @ Hammer Creek	100%	0	0
			94,815	PAH-A	Little Salmon River @ Hazard Creek	100%	21,701	298
1997	1998	199,007	31,160	OX-A	Salmon River @ Pine Bar	100%	0	0
			141,320	PAH-A	Salmon River @ Hammer Creek	100%	59,153	300
			26,527	PAH-A	Little Salmon River @ Hazard Creek	100%	26,528	298
1998	1999	356,336	30,369	OX-A	Salmon River @ Pine Bar	100%	0	0
			154,047	OX-A	Salmon River @ Hammer Creek	100%	38,003	300
			171,920	PAH-A	Little Salmon River @ Hazard Creek	100%	17,325	298
1999	2000	372,312	190,995	OX-A	Little Salmon River @ Stinky Springs	100%	63,587	0
			181,317	PAH-A	Salmon River @ Hammer Creek	100%	60,636	298
2000	2001	461,382	267,079	OX-A	Little Salmon River @ Stinky Springs	100%	60,692	299
			194,303	PAH-A	Little Salmon River @ Stinky Springs	100%	0	0
2001	2002	474,272	278,484	OX-A	Little Salmon River @ Stinky Springs	100%	0	0
			195,788	PAH-A	Little Salmon River @ Stinky Springs	100%	0	300
2002	2003	487,545	302,314	OX-A	Little Salmon River @ Stinky Springs	100%	31,467	298
			185,231	PAH-A	Little Salmon River @ Stinky Springs	100%	32,830	300
2003	2004	515,187	274,993	OX-A	Little Salmon River @ Stinky Springs	100%	30,694	298
			240,194	PAH-A	Little Salmon River @ Stinky Springs	100%	29,277	300
2004	2005	358,387	243,465	OX-A	Little Salmon River @ Stinky Springs	100%	30,529	298
			114,922	PAH-A	Little Salmon River @ Stinky Springs	100%	29,785	299
2005	2006	463,533	241,114	OX-A	Little Salmon River @ Hazard Creek	100%	30,422	298
			222,419	PAH-A	Little Salmon River @ Hazard Creek	100%	31,340	300
2006	2007	506,606	239,868	OX-A	Little Salmon River @ Stinky Springs	100%	31,378	295
			266,738	PAH-A	Little Salmon River @ Stinky Springs	100%	30,096	298
2007	2008	321,607	272,907	OX-A	Little Salmon River @ Pinehurst	100%	29,647	298

Brood Year	Release year	Total No. Smolts Released	No. of Smolts Released by Location	Stock	Release Location(s)	Adipose fin clips	CWT tags[1]	PIT-tags[1]
					Bridge			
			48,700	PAH-A	Little Salmon River @ Pinehurst Bridge	100%	30,442	301
2008	2009[2]	422,576	243,727	OX-A	Little Salmon River @ Stinky Springs	100%	20,790	4,174
			178,849	PAH-A	Little Salmon River @ Stinky Springs	100%	19,840	2,581

Source: Niagara Springs Fish Hatchery Brood Year Reports (1994 - 2007) and Niagara Springs Fish Hatchery Monthly Production Summary (May 2009).
[1] CWT and PIT tag numbers reported in this table include mortality and shed rates applied by the hatchery manager.
[2] Data reported in the Monthly Production Summary is considered preliminary; final data will be reported in the NSFH Steelhead Brood Year Report (2008).

Magic Valley and Hagerman National fish hatcheries - Releases from both MVFH and Hagerman NFH have occurred in the Little Salmon River. Between 1995 and 2000, all releases were 100% adipose fin-clipped. Between 2001 and 2009, an average of 60% of all fish released from these hatcheries were adipose fin-clipped. The unclipped fish were part of the US v. OR Interim Management Agreements. Beginning with the releases in 2010, all fish released into the Little Salmon River will be adipose fin-clipped to allow differentiation between hatchery and natural-origin steelhead.

10.8 Disposition Plans for Fish Identified at the Time of Release as Surplus to Programmed or Approved Levels

Inventories in excess of the smolt production goals for steelhead releases in the Little Salmon River are removed as fingerlings, not as full term smolts. Fingerling releases generally occur in the fall at local reservoirs.

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 both Oxbow A-run and Pahsimeroi A-run stocks to assess the prevalence of viral replicating agents and to detect the bacterial pathogens. Fish are sampled randomly across the raceways at NSFH and MVFH. In addition, an organosomatic index is developed for each raceway. Diagnostic services are provided by the IDFG Eagle Fish Health Laboratory.

10.10 Emergency Release Procedures in Response to Flooding or Water System Failure

Emergency procedures are in place to guide activities in the event of potential catastrophic event. Plans include a trouble shooting and repair process followed by the implementation of an emergency action plan if the problem cannot be resolved. Emergency actions include fish consolidations, transfers to other rearing hatcheries in the Hagerman Valley, and supplemental oxygenation and removal of screens to allow fish to exit to the Snake 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:

- Continuing fish health practices to minimize the incidence of infectious disease agents. Follow IHOT, AFS, and PNFHPC guidelines.
- Marking hatchery-produced summer steelhead for harvest management.
- Not releasing summer steelhead in the Little Salmon River in excess of estimated carrying capacity.
- Continuing to reduce the effect of releasing large numbers of hatchery steelhead at a single site by spreading annual releases over a number of days.
- Monitoring hatchery effluent to ensure compliance with National Pollutant Discharge Elimination System permit.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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. Additionally, links to reference documents that describe monitoring efforts for some indicators are also provided. The two columns on the right hand side of the tables are provided to indicate whether each indicator is:

1. Applicable to the hatchery program/s described in this HGMP (yes “Y” or no “N”). It is important to note that while some indicators are listed as applicable, they may not currently

be. See item 2d. below for further explanation.

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, some of the M&E components will not occur. If funding for these indicators expires, managers and funding entities will collaboratively determine their priority and need for continued funding. Prioritization of monitoring activities will, in part, be guided by ESA requirements, best management practices consistent with recommendations from the HRT and HSRG, and regionally identified hatchery effectiveness monitoring priorities.
   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 indicators indentified as applicable but not currently monitored, managers and funding entities will collaboratively determine an indicator’s priority for funding, and when appropriate, the level of funding necessary to effectively monitor the indicator. Prioritization of monitoring activities will, in part, be guided by ESA requirements, best management practices consistent with recommendations from the HRT and HSRG, regionally identified hatchery effectiveness monitoring priorities, and the feasibility of completing certain monitoring activities. We do not necessarily intend to pursue funding to address all applicable indicators. For all indicators applicable to this HGMP that are not being monitored (N), a brief narrative is provided in Section 11.1.2 describing why the particular indicator is not being monitored. The reason generally falls into one of three categories: a) it is not logistically feasible, b) funding is not available, or c) it is a low priority

Table 27, 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

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 though 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

- 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.

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. IMPLEMENTATION AND COMPLIANCE	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 N N	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. 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	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 to 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. The marking rate by mark type for each release group of steelhead are inventoried 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 programs 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 and in mainstems 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 Sates Marine Fisheries Commission

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 SUPPLEMENTATION PROGRAMS	3.1. Release groups are marked in a manner consistent with information needs and protocols for monitoring impacts to natural- and hatchery-origin fish at the targeted life stage(s)(e.g. in juvenile migration corridor, in fisheries, etc.).	3.1.1. All hatchery origin fish recognizable by mark or tag and representative known fraction of each release group marked or tagged uniquely. 3.1.2. Number of unique marks recovered per monitoring stratum sufficient to estimate number of unmarked fish from each release group with desired accuracy and precision.	Y Y	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. 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.	Y Y Y Y Y	N N N N N
	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 of adult returns by release group harvested 3.3.3. Number of non-target species encountered in fisheries for targeted release group.	Y Y Y	Y 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. 3.4.2. Fraction of strays in non-target populations that originate from in-subbasin releases. 3.4.3. Fraction of hatchery strays in out-of-basin natural population.	Y Y Y	N N N
	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.	N N	
	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.	N N N N	

Category	Standards	Indicators	Applicable	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.	N	
		3.7.2. Natural spawning success of hatchery-origin fish must be similar to that of natural-origin fish.	N	
		3.7.3. Temporal and spatial distribution of hatchery-origin spawners in nature is similar to that of natural-origin fish.	N	
		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).	N	
		3.7.5. Post-release life stage-specific survival is similar between hatchery and natural-origin population components.	N	
	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.	N	
		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.	N	
		3.8.3. Genetic characteristics of the supplemented population remain similar (or improved) to the unsupplemented populations.	N	
	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.	N	
		3.9.2. Life history characteristics of hatchery-origin adult fish are similar to natural-origin fish.	N	
		3.9.3. Juvenile emigration timing and survival differences between hatchery and natural-origin fish are minimized.	N	
	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. The marking rate by mark type for each release group of steelhead are inventoried 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 and 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.

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. At hatchery programs where integrated broodstock are maintained or are being 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.

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.

At all broodstock collection sites for 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 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.

Category	Standards	Indicators	Applicable	Monitored
4. OPERATION OF ARTIFICIAL PRODUCTION FACILITIES	4.1. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.	4.1.1 Annual reports indicating level of compliance with applicable standards and criteria.	Y	Y
		4.1.2 Periodic audits indicating level of compliance with applicable standards and criteria.	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 natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	4.3.1. Water withdrawals compared to applicable passage criteria.	N	
		4.3.2. Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria.	N	
		4.3.3. Number of adult fish aggregating and/or spawning immediately below water intake point.	N	
		4.3.4. Number of adult fish passing water intake point.	N	
		4.3.5. Proportion of diversion of total stream flow between intake and outfall.	N	
	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.	Y	Y
		4.4.2. Juvenile densities during artificial rearing.	Y	Y
		4.4.3. Samples of natural populations for disease occurrence before and after artificial production releases.	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.	Y	Y
		4.5.2. Statement of compliance with applicable regulations and guidelines.	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.	N	
	4.7. Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.	4.7.1. Mortality rates in trap.	Y	Y
		4.7.2. Prespawning mortality rates of trapped fish in hatchery or after release.	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.	Y	C
		4.8.2. Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition.	Y	N

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, and adult return age and sex composition. Spawn timing and distribution data is not typically monitored for steelhead due to logistical constraints associated with turbidity and high flow conditions during the period of spawning activity.

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.

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

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

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

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

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

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

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

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, some M&E components will not occur.

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.

For indicators not currently monitored or for indicators that are currently monitored but funding expires, managers and funding entities will collaboratively determine each indicator's priority and need for funding. Prioritization of monitoring activities will, in part, be guided by ESA requirements, best management practices consistent with recommendations from the HRT and HSRG, regionally identified hatchery effectiveness monitoring priorities, and the feasibility of completing certain monitoring activities. We do not necessarily intend to pursue funding to address all applicable indicators.

Standard or Indicator- Standards are in bold font, Indictors are in italic font and underlined

3.2 **The current status and trends of natural origin populations likely to be impacted by hatchery production are monitored**- monitoring of adult steelhead in the Little Salmon River mainstem population is primarily limited to the area upstream of Rapid River Hatchery. Genetic samples and life history characteristics of natural origin adult steelhead trapped at the Rapid River adult trap are collected and recorded. Snorkel surveys are conducted in the mainstem and tributaries of the Little Salmon River annually.

Abundance and run timing of natural-origin steelhead is monitored at the Rapid River fish trap. High flow conditions during spawning preclude monitoring of the spatial distribution of steelhead spawners in the Little Salmon River and Rapid River.
A screw trap, near the Rapid River Hatchery, is operated from March through mid-November annually as part of the INPM program to monitor the abundance of juvenile steelhead. Snorkel surveys in the Little Salmon River, and Rapid River are conducted annually as part of the GPM and INPM programs.

3.4.1-3.4.3 While IDFG does not have a formalized monitoring program to estimate stray rates from this hatchery program, releases of hatchery origin-steelhead in the Little Salmon River population are representatively marked with CWT so fish recovered at other locations can be identified. Beginning in 2008, genetic samples have been taken from 100% of the adults used for broodstock that contribute to these releases enabling us to assign any subsequent progeny collected at any point in its lifecycle back to the hatchery of origin. Funding is currently available to genotype the broodstock but funds to sample returning adults in the future will need to be identified.

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

4.8.2 *Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition-* IDFG has evaluated predation rates of steelhead on naturally produced salmon (See Cannamela 1992, and IDFG 1993) but has not prioritized the development of a program to sample fish stomachs..

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.

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).

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

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

12.1 OBJECTIVE OR PURPOSE

There is no research being conducted in the Little Salmon River in association with the hatchery program.

12.2 COOPERATING AND FUNDING AGENCIES

12.3 PRINCIPLE INVESTIGATOR OR PROJECT SUPERVISOR AND

STAFF

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

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

12.6 DATES OR TIME PERIOD IN WHICH RESEARCH ACTIVITY OCCURS

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

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

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

12.10 ALTERNATIVE METHODS TO ACHIEVE PROJECT OBJECTIVES

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

12.12 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE ECOLOGICAL EFFECTS, INJURY, OR MORTALITY TO LISTED FISH AS A RESULT OF THE PROPOSED RESEARCH ACTIVITIES

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE 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

For this hatchery program, no traps or weirs are operating within the Little Salmon River. Effects on non-anadromous species associated with this program are provided in the hatchery specific HGMPs for the broodstock collection and rearing facilities. See Pahsimeroi A-Run steelhead HGMP, Hells Canyon A-run steelhead HGMP and Dworshak B-run steelhead HGMP.

15.1 LIST ALL ESA PERMITS OR AUTHORIZATIONS FOR BULL TROUT ASSOCIATED WITH THE HATCHERY PROGRAM

ESA Section 6 Cooperative Agreement for Bull Trout Take Associated with IDFG Research

IDFG prepares an annual bull trout conservation program plan and take report that describes their management program for bull trout designed to meet the provisions contained in Section 6 of the ESA and to comport with the spirit of Section 10(a)1(A). This plan identifies the benefits to bull trout from management and research conducted or authorized by the state, documents bull trout take conducted and authorized by IDFG, and estimates take for the coming year. By March 31st of each year, the report is submitted to the USFWS which then makes a determination whether this program is in accordance with the ESA. A summary of recent take is further discussed in Section 15.3 of this HGMP.

15.1.1 Description of bull trout and habitat that may be affected by hatchery program

This program releases hatchery juvenile steelhead into the Salmon River subbasin, and collects broodstock in the Salmon, Clearwater, and Snake rivers. Bull trout (threatened) are the only listed non-anadromous aquatic ESA-listed species present. Bull trout life history, status and habitat use in these areas are summarized below.

General Species Description, Status, and Habitat Requirements

Bull trout (members of the family Salmonidae) are a species of char native to Nevada, Oregon, Idaho, Washington, Montana, and western Canada. While bull trout occur widely across the western United States, they are patchily distributed at multiple spatial scales from river basin to local watershed, and individual stream reach levels. Due to widespread declines in abundance, bull trout were initially listed as threatened in Idaho in 1998, and listed throughout their coterminous range in the United States in 1999. On January 13, 2010, the USFWS proposed to revise its 2005 designation of critical habitat for bull trout to include a substantial portion of the Salmon River subbasin (5,045 stream miles are proposed as critical habitat in the subbasin). The Snake River, including the entire mainstem downstream of Hells Canyon Dam, and 207 stream miles within the Imnaha-Snake Rivers bull trout Recovery Unit, was also included in the proposed designation. The Clearwater River subbasin contains 1,679 stream miles proposed as critical habitat.

Throughout their range, bull trout have declined due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management (such as over-harvest and bounties), and the introduction of non-native species such as brown, lake and brook trout. Range-wide, several local extinctions have been documented. Many of the remaining populations are small and isolated from each other, making them more susceptible to local extinctions. However, recent work in Idaho concluded that despite declines from historical levels, Idaho bull trout are presently widely distributed, relatively abundant, and apparently stable (High et al. 2008). High et al. (2008) estimated that over half of the Idaho bull trout population (0.64 million bull trout) occurred in the Salmon River Recovery Unit, although overall density was relatively low (4.4 bull trout/100 m). High et al. (2008) further concluded that the Clearwater River bull trout Recovery Unit exhibited an overall increasing trend. Three of four available post-1994 abundance trends were significantly positive in this subbasin, although it had the lowest mean linear bull trout density of all recovery units sampled across Idaho (1.2 bull trout/100 m in the Clearwater River recovery unit compared to the high of 22.1 bull trout/100 m in the Clark Fork River recovery unit). The Imnaha-Snake Rivers bull trout Recovery Unit was not analyzed by High et al. (2008).

Bull trout exhibit a wide variety of life history types, primarily based on general seasonal migration patterns of subadults and adults between headwater spawning and rearing streams to other habitats (usually downstream) for foraging and overwintering, including resident (residing in small headwater streams for their entire lives); fluvial (migrating to larger river systems); adfluvial (migrating to lakes or reservoirs); and anadromous (migrating to estuarine or marine waters) (Goetz et al. 2004). Each of these life history strategies is present in the Salmon River subbasin, except anadromy. Fluvial and resident bull trout populations have been commonly observed throughout the current range of bull trout in the Salmon River subbasin, and adfluvial populations are present, associated with several natural lakes (USFWS 2002a). Resident and fluvial populations occur in the Clearwater and Imnaha-Snake Rivers Recovery Units.

Bull trout spawning and rearing requires cold water temperatures (generally below 16°C) during summer rearing, and less than about 10°C during spawning (Dunham et al. 2003). Juvenile bull trout require complex rearing habitats (Dambacher and Jones 1997, Al-Chokhachy et al. 2010). Migratory adults and subadults are highly piscivorous (Lowery et al. 2009), and migratory adults need unobstructed connectivity to diverse habitats where forage fish species are plentiful and where water temperatures are relatively cool (less than about 18°C maximum) during migration (Howell et al. 2009).

Population Status and Distribution

Bull trout are well distributed throughout most of the Salmon River Recovery Unit in 125 identified local populations located within 10 core areas (USFWS 2002a). The recovery team also identified 15 potential local populations. The Little Salmon River A-B run steelhead program releases hatchery juveniles into the Little Salmon River. Broodstock are collected at the Pahsimeroi Hatchery (within Salmon River subbasin) and at out-of-subbasin trapping facilities including Hells Canyon Dam (Snake River) and Dworshak National Fish Hatchery (Clearwater

River). These activities occur in three bull trout core areas, the Little-Lower Salmon River, Lower and Middle Fork Clearwater River, Pahsimeroi River, and within the Imnaha-Snake Rivers Recovery Unit at Hells Canyon Dam, which is not a designated core area. The following information on these four areas, and local population status and habitat use within, is summarized from the bull trout draft recovery plan (USFWS 2002a, b, c) unless otherwise cited.

Little-Lower Salmon River Core Area

Local populations include the Rapid River, and Slate, John Day, Boulder, Hard, Lake/Lower Salmon, and Partridge creeks. Potential local populations include Hazard, Elkhorn and French creeks. The mainstem Salmon River provides habitat for migration, and adult and subadult foraging, rearing, and wintering. Resident and migratory populations are known to be present. Annual runs of fluvial bull trout in the Rapid River drainage have been monitored since 1973, and abundance data has been collected since 1992 at the Rapid River Hatchery trap. Upstream migrant spawner counts at the trap have ranged from 91 to 420 fish from 1992 to 2009 (IDEQ 2006).

Adult abundance was estimated to be 500 to 5,000 individuals in the draft recovery plan. The bull trout 5-year status review conducted in 2006 (USFWS 2008) determined that the Little-Lower Salmon River Core Area had an adult abundance level of from 50 to 250 fish, occupying from 125 to 620 stream miles, had an unknown short-term trend, a substantial/imminent threat to persistence, and a final ranking of "high risk" to become extirpated (Table 28). More recent analysis by High et al. (2008) determined that a weakly negative rate of population change occurred prior to1994, but the trend became weakly positive after 1994 (19-year record at 34 survey sites, snorkel surveys) (Table 29). High et al. (2008) reported a similar trend for trap counts of upstream migrant fluvial bull trout in the Rapid River over 32 years of record (Table 29).

Table 28. Summary table of core area rankings for population abundance, distribution, trend, threat, and final rank, Salmon River Recovery Unit.

Core Area	Population Abundance Category (individuals)	Distribution Range Rank (stream length miles)	Short-term Trend Rank	Threat Rank	Final Rank
Upper Salmon River	unknown	620-3000	Unknown	Moderate, imminent	Potential Risk
Pahsimeroi River	unknown	125-620	Unknown	Substantial, imminent	At Risk
Lemhi River	250-1000	125-620	Unknown	Substantial, imminent	At Risk
Middle Salmon River / Panther	unknown	125-620	Unknown	Moderate, imminent	At Risk
Lake Creek	50-250	25-125	Unknown	Widespread, low-severity	At Risk
Opal Lake	unknown	2.5-25	Unknown	Widespread, low-severity	Potential Risk
Middle Fork Salmon R.	unknown	620-3000	Unknown	Slightly	Low Risk
Middle Salmon River / Chamberlain	unknown	125-620	Unknown	Widespread, low-severity	Potential Risk
South Fork Salmon R.	unknown	125-620	Unknown	Moderate, imminent	At Risk
Little-Lower Salmon R.	50-250	125-620	Unknown	Substantial, imminent	High Risk

Source: USFWS (2008).

Table 29. Intrinsic rates of population change (r) with 90% confidence limits (CLs) for bull trout in the core areas of the Salmon River Recovery Unit of Idaho with available data.

Drainage or core area	Starting year	Years of record	Sites	Pre-1994 r Estimate	Pre-1994 r Lower CL	Pre-1994 r Upper CL	Post-1994 r Estimate	Post-1994 r Lower CL	Post-1994 r Upper CL	r for all years Estimate	r for all years Lower CL	r for all years Upper CL
Little–Lower Salmon River (S)	1985	19	34	−0.010	−0.097	0.077	0.063	−0.021	0.146	0.015	−0.016	0.045
Rapid River (W)	1973	32	1	−0.013	−0.039	0.012	0.047	−0.026	0.119	−0.001	−0.015	0.014
South Fork Salmon River (S)	1985	19	36	−0.365*	−0.670	−0.060	0.305*	0.200	0.411	0.032	−0.078	0.143
Middle Fork Salmon River (S)	1985	19	77	0.035	−0.082	0.152	−0.043	−0.131	0.046	−0.007	−0.043	0.030
Middle Salmon River–Chamberlain (S)	1985	16	10	−0.007	−0.456	0.443	0.006	−0.102	0.115	0.060	−0.017	0.138
Middle Salmon River–Panther (S)	1985	17	12	0.054	−0.195	0.303	−0.309*	−0.600	−0.018	−0.202*	−0.307	−0.096
Lemhi River (S)	1985	19	10	−0.176*	−0.335	−0.016	0.064	−0.016	0.144	−0.038	−0.089	0.014
East Fork Salmon River (W)	1984	8	1	0.003	−0.115	0.121	0.075	−0.474	0.624	0.057*	0.001	0.114
Upper Salmon River (S)	1985	17	25	0.068	−0.103	0.240	0.536*	0.312	0.759	0.557*	0.453	0.660

Source: High et al. (2008).

Note: The sampling method used in each drainage or area is shown (S = snorkeling, R = redd count). Trends in r were evaluated for the period before 1994, the period after 1994, and all years; asterisks indicate trends that were significant (i.e., confidence intervals did not include zero).

Pahsimeroi River Core Area

Bull trout are found in most of the Pahsimeroi River tributaries that drain the eastern, southern and southwestern portion of the core area. Local populations include the upper Pahsimeroi River, and Big, Patterson, Falls, Morse, Morgan (includes the lower Pahsimeroi River), Tater, and Ditch creeks. The creeks in the upper Pahsimeroi River drainage were considered a population stronghold in this core area during the subbasin review process. The mainstem Pahsimeroi River serves as a migratory corridor to the mainstem Salmon River.

Adult abundance was estimated to be between 500 and 5,000 individuals in the draft recovery plan. The bull trout 5-year status review conducted in 2006 (USFWS 2008) determined that the Pahsimeroi River Core Area had an unknown adult abundance level, occupied from 125 to 620 stream miles, had an unknown short-term trend, a substantial/imminent threat to persistence, and a final ranking of "at risk" to become extirpated (Table 28). The Pahsimeroi River Core Area population growth rates were not analyzed by High et al. (2008).

Lower and Middle Fork Clearwater River Core Area

Adult and subadult bull trout probably use the lower (mainstem) Clearwater River, Middle Fork Clearwater River, and their tributaries primarily as foraging, migratory, subadult rearing, and overwintering habitat, although the extent of use is unclear. Bull trout abundance is at very low levels within this core area; no tributary streams have recent documentation of bull trout spawning. Lolo Creek has documented occurrence of juveniles and is considered a local population because some small juveniles have been found above a small falls that would preclude fish of their size from migrating upstream to this location. Clear Creek is the only potential local population, where 2 to 4 bull trout are collected annually at a salmon trap during spring and released above the trap. The length of captured bull trout has been 254 to 356 mm.

The bull trout 5-year status review conducted in 2006 (USFWS 2008) reported that the Lower and Middle Fork Clearwater River Core Area had an unknown adult abundance level, occupied from 125 to 650 stream miles, had an unknown short-term trend, a substantial/imminent threat to persistence, and a final ranking of "at risk" to become extirpated. This core area was not evaluated by High et al. (2008).

Hells Canyon Dam Vicinity – Imnaha-Snake Rivers Recovery Unit

The Hells Canyon Dam fish trap (where some broodstock are collected for the Little Salmon River A-B run steelhead program) is in the Imnaha-Snake Rivers bull trout Recovery Unit. There are three core areas composed of six known local populations residing in tributaries to the Snake River between Hells Canyon Dam and Lower Granite Dam. Four local populations occur on the Oregon side of the Snake River in the Imnaha River subbasin (Imnaha River, and Upper Big Sheep, Lowe Big Sheep, and McCully creeks) and two are on the Idaho side: Granite and Sheep creeks (which are also considered individual core areas). Although this reach of the Snake River is not within a defined bull trout core area, bull trout from nearby core areas are known to use the Snake River for foraging and overwintering, such as the Imnaha River and Sheep Creek core areas. Radio-tagged bull trout from the Imnaha River have reportedly migrated out of the Imnaha River and moved upstream in the Snake River until they reach Hells Canyon Dam (Chandler et al. 2003). These fluvial migrations occur post-spawning after about October. Most migratory bull trout return to their natal watershed during the following spring.

Imnaha River core area adult abundance was estimated at approximately 4,000 individuals in the draft recovery plan. However, the USFWS (2008) estimated the adult abundance category as from 250 to 1,000 adults (Table 30). No estimate was made for the Granite or Sheep Creek core areas in either document. A recent and comprehensive population trend analysis of Idaho bull trout did not include these core areas (High et al. 2008). He USFWS (2008) listed the short-term abundance trend as stable for the Imnaha River, but unknown for Granite and Sheep creeks. The final ranking for extirpation risk was "potential risk" for the Imnaha River core area, and "unknown risk" for the Granite and Sheep Creek core areas (Table 30).

Table 30. Summary table of core area rankings for population abundance, distribution, trend, threat, and final rank, Salmon River Recovery Unit.

Core Area	Population Abundance Category (individuals)	Distribution Range Rank (stream length miles)	Short-term Trend Rank	Threat Rank	Final Rank
Granite Creek	unknown	2.5-25	Unknown	Unthreatened	Unknown Risk
Imnaha River	250-1000	125-620	Stable	Widespread, low-severity	Potential Risk
Sheep Creek	unknown	2.5-25	Unknown	Unthreatened	Unknown Risk

Source: USFWS 2008.

15.1.2 Analysis of effects on bull trout

Direct Effects

Direct effects primarily arise through collection of steelhead broodstock when migratory bull trout are captured. However, captures of bull trout during steelhead broodstock collection is rare. See Pahsimeroi A-run Steelhead HGMP, Hells Canyon A-run steelhead HGMP, and Dworshak B-run Steelhead HGMP. Traps may also have a short-term effect through potential alternation of migration routes or delay in movement.

A small percentage of bull trout sampled in a fish trap may be injured or killed (generally less than 1%) as evidenced by the very small level of mortality reported in IDFG (2006, 2007, 2008, 2009). These trapping activities have occurred for many years in the Salmon River and Clearwater River subbasins, apparently without hindering positive population growth rates of bull trout since 1994 (High et al. (2008), and are not expected to limit future bull trout population growth rates.

Competition is possible between residualized juvenile steelhead and subadult bull trout. Efforts are ongoing to reduce and minimize residualism rates of hatchery steelhead. Release of juvenile hatchery steelhead likely provides an increased forage base (beneficial effect) for migratory adult and subadult bull trout, which are highly piscivorous.

Indirect Effects

Indirect effects may arise through hatchery operations such as water withdrawals, effluent discharge, routine operations and maintenance activities, non-routine operations and maintenance activities (e.g., intake excavation, construction, emergency operations, etc.). Hatchery operations are not expected to affect bull trout population productivity. These activities have occurred for many years in the Salmon River and Clearwater River subbasin and according to High et al. (2008), have not hindered positive bull trout population growth rates since 1994, and are not expected to limit bull trout population growth rates into the future.

Cumulative Effects

Cumulatively, the Little Salmon River A-B run steelhead hatchery program results in increased forage for migratory adult and subadult bull trout, possible competition and predation of bull trout by residual hatchery steelhead, and contributes knowledge on bull trout population distribution and abundance through incidental captures in broodstock collection traps. Such knowledge can be used to evaluate bull trout population trends over time, such as analysis conducted by High et al. 2008

Take

Direct take associated with broodstock collection at Pahsimeroi , Hells Canyon, and Dworshak fish traps are essentially non-existent but has been reported in separate HGMPs. (see Pahsimeroi A-Run steelhead HGMP, Hells Canyon A-run steelhead HGMP and Dworshak B-run steelhead HGMP). No steelhead broodstock collection occurs in the Little Salmon River.

15.1.3 Actions taken to mitigate for potential effects on bull trout

Actions taken to minimize adverse effects on bull trout include:

1. Continuing to reduce the effect of releasing large numbers of juvenile steelhead at a single site by spreading the release over a number of days.

2. Continuing fish health practices to minimize the incidence of infectious disease agents by

following IHOT, AFS, and PNFHPC guidelines.

3. Continuing Hatchery Evaluation Studies to comprehensively monitor and evaluate LSRCP steelhead, which provides valuable incidental bull trout data.

4. Continuing to modify broodstock collection traps to minimize bull trout mortality as necessary.

5. Conducting snorkel surveys to assess juvenile steelhead abundance and density, examining only index sections to minimize disturbance to target and not-target species. Displacement of fish is kept to a minimum.

6. Preparing the annual bull trout conservation program plan and take report and submitting it to the USFWS to ensure compliance with the ESA.

15.4 References

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