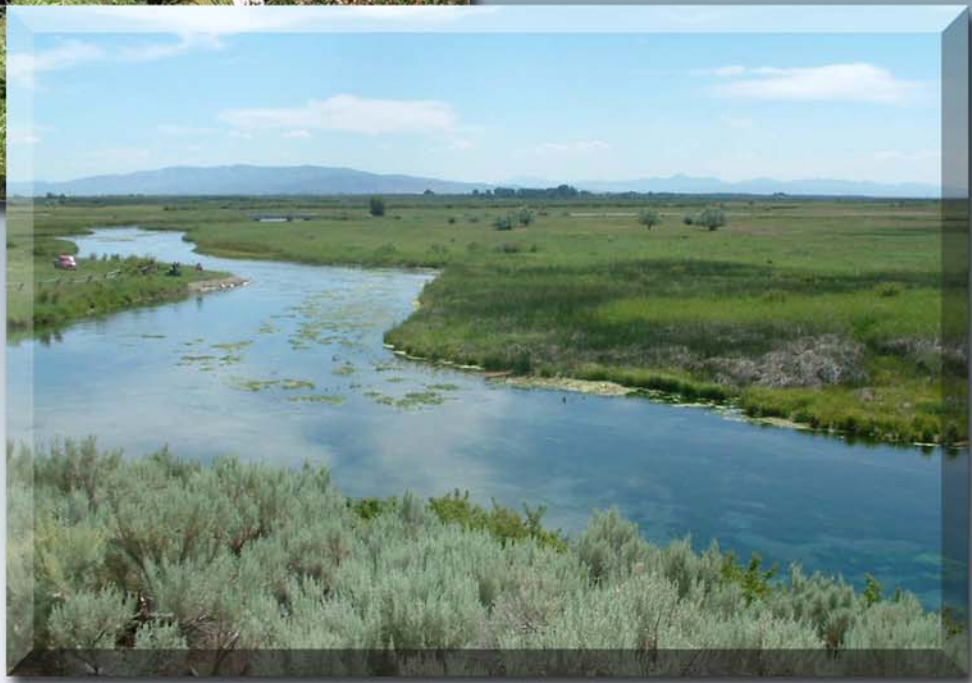


# Crystal Springs Fish Hatchery and Programs for Snake River Chinook Salmon and Yellowstone Cutthroat Trout

## Master Plan

*Volume 2: Appendices*



*Prepared by*  
The Shoshone-Bannock Tribes  
Fort Hall, Idaho

March 2011

This page is intentionally blank.

## **APPENDICES**

<b>Appendix A</b>	<b>Draft Hatchery and Genetic Management Plan: Yankee Fork Salmon Supplementation Program</b>
<b>Appendix B</b>	<b>Draft Hatchery and Genetic Management Plan: Panther Creek Spring Chinook Salmon Program</b>
<b>Appendix C</b>	<b>Draft Hatchery and Genetic Management Plan: Upper Snake River Yellowstone Cutthroat Trout Program</b>
<b>Appendix D</b>	<b>Bioprogramming Reports and Hatchery Operations Schedule</b> Technical Memo: Biological Criteria for Spring Chinook Technical Memo: Biological Criteria for Yellowstone Cutthroat Trout
<b>Appendix E</b>	<b>Crystal Springs Hatchery Site Water Supply Report</b>
<b>Appendix F</b>	<b>Memorandum of Agreement between Shoshone-Bannock Tribes, BPA, Corps of Engineers and Bureau of Reclamation</b>
<b>Appendix G</b>	<b>Preliminary Design Drawings</b> Crystal Springs Design Drawings Yankee Fork Design Drawings
<b>Appendix H</b>	<b>Detailed Program Cost Estimates</b>
<b>Appendix I</b>	<b>Letters of Support</b>
<b>Appendix J</b>	<b>Genetic Analysis of the Origin of Chinook Salmon in Panther Creek, ID</b>

This page is intentionally blank.



## **Appendix A**

---

### *Draft Hatchery and Genetic Management Plan: Yankee Fork Salmon Supplementation Program*

This page is intentionally blank.

# HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

---

**Hatchery Program:**

Yankee Fork Chinook Salmon Supplementation Project

**Species or  
Hatchery Stock:**

Chinook Salmon (*Oncorhynchus tshawytscha*)

**Agency/Operator:**

Shoshone-Bannock Tribes

**Watershed and Region:**

Yankee Fork Salmon River, Idaho

**Date Submitted:**

**Date Last Updated:**

February 11, 2011

This page is intentionally blank.

## EXECUTIVE SUMMARY

Historically, the Shoshone and Bannock peoples harvested salmon throughout the Columbia River Basin for subsistence. Annual salmon and steelhead runs in what are now Oregon, Washington, Idaho and Nevada provided harvest opportunities throughout the year. The Shoshone-Bannock Tribes continue to harvest anadromous fish under rights reserved by the Fort Bridger Treaty of 1868.

Fishing opportunities for the Tribes have been severely constrained by depressed runs of salmon caused in large part by the detrimental effects of hydroelectric development and early overfishing in the lower Columbia River. Current salmon abundance in the Upper Salmon River basin is estimated at about 0.5% of historical runs. Recent harvest opportunities for Tribal members have only provided half a pound of salmon per tribal member compared to historical use of about 700 pounds per person. The Shoshone/Bannock Tribes therefore, seek to restore fishing opportunities for their peoples through Chinook salmon management programs in the Yankee Fork Salmon River and in Panther Creek. Restoration of these ceremonial and subsistence fisheries would be accomplished in a manner compatible with recovery and long-term sustainability of Chinook salmon in the upper Salmon River basin.

The Chinook programs proposed are designed to focus the Tribes' primary Chinook harvest in Yankee Fork and Panther Creek. These locations and populations have been identified by the Interior Columbia Technical Review Team (ICTRT), the Hatchery Scientific Review Group (HSRG), NOAA-Fisheries and fishery co-managers as a low priority for recovery and sustainability of the Snake River Spring/Summer Chinook ESU. By focusing hatchery and harvest effects within these two watersheds, traditional Tribal fisheries and fishing methods could be restored while at the same time, contributions could be made to recovery by establishing locally adapted hatchery and natural spawning populations of Chinook salmon in watersheds not currently priority targets for species recovery.

In developing these management programs, the Tribes have adopted three objectives:

- **Conservation Objective:** Contribute to recovery of Snake River Spring/Summer Chinook ESU by restoring populations of local spring/summer Chinook in Yankee Fork and Panther Creek.
- **Harvest Objective:** Achieve a tribal harvest of about 1,000 spring/summer Chinook from Yankee Fork and 800 Chinook from Panther Creek.
- **Cultural Objective:** Ensure that Shoshone - Bannock peoples can harvest salmon in Yankee Fork and Panther Creek by their traditional hunting methods as well as contemporary methods.

The Tribes will continue working to improve habitat conditions in watersheds throughout the upper Salmon River basin and to advocate passage improvements at hydroelectric dams to improve productivity of Chinook populations in the headwaters. In the long term, the ongoing and proposed tribal and co-manager monitoring programs will allow the Shoshone-Bannock Tribes to adapt their management plans to provide greater conservation benefits should other

populations in the MPG fail to achieve their recovery goals, and ecosystem and biological conditions allow.

## **Yankee Fork Program Component**

Yankee Fork spring/summer Chinook are at an extremely high risk of extinction, prompting the Shoshone-Bannock Tribes to undertake a multi-phase program to restore the population and provide harvest opportunities for Tribal members. The Tribes have three primary objectives for this program identified in Section 2.1. A three-phase program is proposed to meet these objectives, integral to which is construction of the Crystal Springs Hatchery to provide the needed production capacity. In the first (and ongoing) phase, colonization, up to 1,500 surplus adults and 200,000 smolts from Sawtooth Hatchery will be released annually. When these Chinook return as adults, a percent will be collected as broodstock for rearing at the Crystal Springs. Phase 2, local adaptation, will be triggered when approximately 1,000 Chinook return to the Yankee Fork, the estimated population level needed to meet broodstock and natural escapement goals. Use of Sawtooth fish will be eliminated in Phase 2. Tribal harvest in the Yankee Fork will be 1 to 8 percent when runs are less than 500 adults; harvest in excess of that may occur when both broodstock and natural escapement goals are met. If natural productivity rates reach sufficient levels, Phase 3, integrated harvest program, may be implemented if established triggers are met. The program will be transitioned into an integrated harvest program following the guidelines of the HSRG (2009).

## **Panther Creek Program Component**

The spring/summer Chinook program proposed for Panther Creek will recolonize habitat that was severely compromised by mining activities in the subbasin. Over the last decade, significant habitat restoration activities have resulted in documented observations of stray Chinook and various other aquatic species in Panther Creek, signaling the timeliness of the Tribes' proposed program. Three objectives have been identified by the Tribes for Panther Creek that are described in Section 2.1 above. Achieving these objectives will be two-phased and will require new facilities. The proposed Crystal Springs Hatchery will produce 400,000 Chinook smolts for reintroduction into Panther Creek. Broodstock for this program will be collected at a new weir (location to be determined) and holding pond (the Blackbird Pond), held and spawned, and the eggs transported to Crystal Springs. Phase 1 of the program, recolonization, will begin by releasing 1,500 surplus hatchery adults (when available) to spawn in Panther Creek. As their progeny return and become adapted to this watershed, a portion of the adults will be collected, spawned, reared at Crystal Springs (Phase 2), and then released back into Panther Creek to resume a natural life cycle. All other adult and juvenile releases from non-local stocks will cease. When sufficient numbers of Chinook return to achieve broodstock and natural escapement goals, a Tribal harvest will be permitted. The Tribal harvest objective is to harvest 800 Chinook annually.

The success of the Yankee Fork and Panther Creek Chinook programs in achieving conservation, harvest and cultural objectives will be quantified by implementing a monitoring and evaluation program which is described in concept in the Crystal Springs Master Plan

# SECTION 1. GENERAL PROGRAM DESCRIPTION

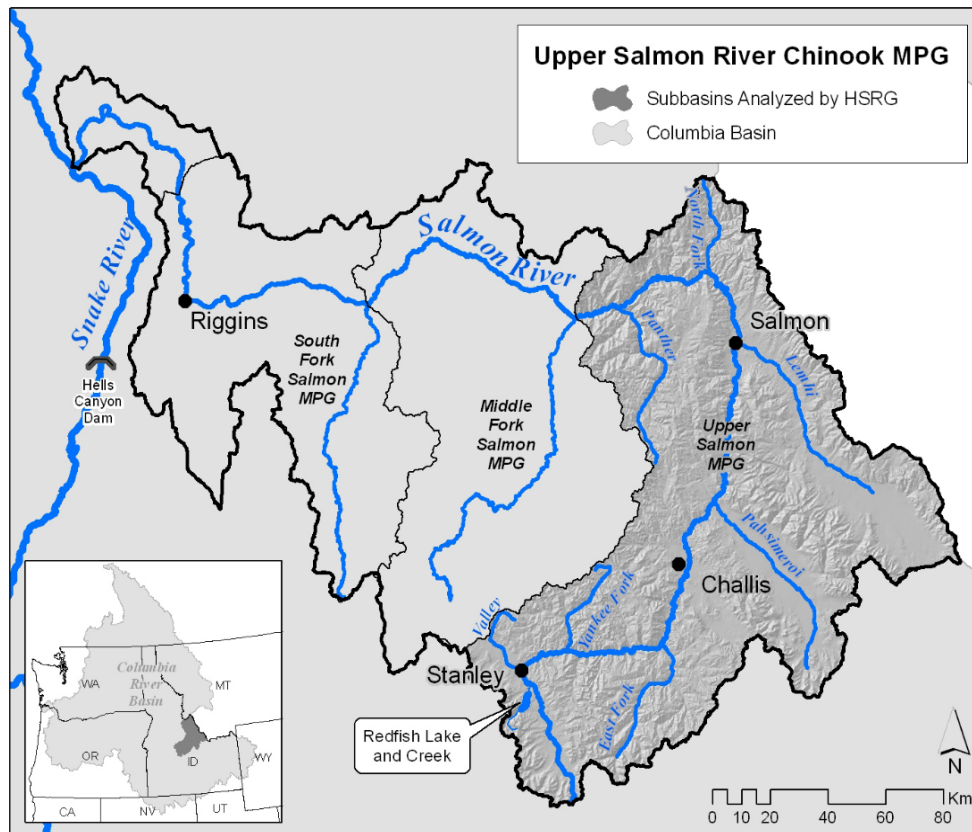
## 1.1 NAME OF HATCHERY OR PROGRAM.

Hatchery:      Sawtooth Fish Hatchery (egg incubation and juvenile rearing)  
                    Yankee Fork Salmon River Pole Flat Weir (adult trapping)  
                    East Fork Salmon River Satellite Facility (current adult holding and spawning)  
                    Yankee Fork Adult/Juvenile Holding Facility (proposed adult holding, spawning  
                    and juvenile stress relief site)  
                    Crystal Springs Fish Hatchery (egg incubation and juvenile rearing)

Program:      Yankee Fork Chinook Salmon Supplementation (YFCSS) Project

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

Chinook salmon (*Oncorhynchus tshawytscha*) native to the Yankee Fork Salmon River will be supplemented with hatchery Chinook salmon returning to the Sawtooth Fish Hatchery. Yankee Fork Chinook salmon are ESA-listed as threatened (57 FR 14653) and part of the Snake River spring/summer Chinook salmon Evolutionarily Significant Unit (ESU) (Figure 1). Hatchery fish returning to Sawtooth are ESA-listed as threatened and part of the Upper Salmon River Chinook salmon distinct population segment, which is also part of the ESU. However, Sawtooth Hatchery Chinook salmon are surplus to recovery.



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

## **1.3 RESPONSIBLE ORGANIZATION AND INDIVIDUALS**

### ***Lead Contact***

**Name (and title):** Lytle P. Denny, Anadromous Fish Manager  
**Agency or Tribe:** Shoshone-Bannock Tribes  
**Address:** 3rd and B Avenue, P.O. Box 306, Fort Hall, ID 83203  
**Telephone:** (208) 239-4560 or cell 221-9058  
**Fax:** (208) 478-3986  
**Email:** [ldenny@sbtribes.com](mailto:ldenny@sbtribes.com)

### ***Sawtooth Fish Hatchery***

**Name (and title):** Brent Snider, Fish Hatchery Manager II, Sawtooth Fish Hatchery  
**Agency or Tribe:** Idaho Department of Fish and Game  
**Address:** HC 64 Box 9905 Stanley, ID 83278  
**Telephone:** (208) 774-3684  
**Fax:** (208) 774-3413  
**Email:** [brent.snider@idfg.idaho.gov](mailto:brent.snider@idfg.idaho.gov)



### *Crystal Springs Fish Hatchery*

**Name (and title):** Chad Colter, Fish and Wildlife Director  
**Agency or Tribe:** Shoshone-Bannock Tribes  
**Address:** 3rd and B Avenue, P.O. Box 306, Fort Hall, ID 83203  
**Telephone:** (208) 478-3761  
**Fax:** (208) 478-3986  
**Email:** ccolter@shoshonebannocktribes.com

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

*U.S. Fish and Wildlife Service* – Lower Snake River Compensation Plan (LSRCP) Office: Administers the LSRCP as authorized by the Water Resources Development Act of 1976. The LSRCP owns Sawtooth Fish Hatchery and funds the Tribes YFCSS.

Idaho Department of Fish and Game (IDFG) receives funding from the LSRCP to operate and maintain (O&M) the Sawtooth Fish Hatchery.

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

The Shoshone-Bannock Tribes (Tribes) are the lead fisheries management agency for the YFCSS project. The Tribes are funded by the LSRCP and Bonneville Power Administration (BPA). IDFG (i.e., Sawtooth Fish Hatchery) is funded by the LSRCP.

In FY 2010, the LSRCP provided the Tribes with \$279,232.00 for the YFCSS. Approximately 47% of FY 2010 LSRCP funds are earmarked for operations and maintenance, with 53% for monitoring and evaluation. In addition, the Tribes are currently developing a statement of work with BPA to assist with YFCSS costs. BPA funding is part of the Tribes Columbia Basin Fish Accord. The exact level of BPA funding specific to the YFCSS for FY2010 has yet to be determined, but it's likely to be at least 60% of the FY2010 proposal, or \$168,540.00. In summary, the Tribes will operate on an estimated \$447,772.00 in FY 2010. This funding estimate will support four permanent staff and three seasonal employees.

The LSRCP provides an estimated \$827,555.00 to Sawtooth Fish Hatchery for operations and maintenance. Current staffing levels include five permanent staff and 80 months of temporary worker time.

For the portion of the Crystal Springs allocated to Chinook production for both Yankee Fork and Panther Creek, it is estimated that planning and design of the Crystal Springs complex will be approximately \$1.15 million and construction will cost approximately \$13.7 million. These estimated costs are for both production facilities at Crystal Springs production and the adult capture and holding facilities at both Yankee Fork and Panther Creek.

Operating and maintenance costs include such items as payroll, utilities, vehicle leases, supplies, maintenance, some specific tagging expenses and potential subcontracted support services. This planning cost estimate includes the Yankee Fork, Panther Creek and Crystal Springs operations

and maintenance costs. The Tribe estimates that the annual budget for operation and maintenance will be \$705,000.

Costs associated with monitoring and evaluation are estimated at about \$374,000 annually. It should be noted that over \$175,000 of the probable costs in 2014 are associated with coded wire-tagging and adipose clipping one million smolts.

Labor is estimated at a total of about 3 full time equivalents (FTE) that are considered permanent staff and an estimated 3 temporary FTE to address specific seasonal fish culture work.

## **1.5 LOCATION(S) OF HATCHERY AND ASSOCIATED FACILITIES.**

**Pole Flat Weir** – Pole Flat weir is located adjacent to Pole Flat Campground approximately 5.2 river kilometers (rkm) upstream from the confluence with the Salmon River. The hydrologic unit code for the weir is 17060201. Pole Flat weir will be used to collect adult broodstock for the YFCSS project and is proposed to be expanded as a permanent satellite facility. Modifications will be needed to accommodate handling and sorting the larger number of fish that are estimated to return from the expanded project. These improvements may include installing a rock sill and safety cable across the Yankee Fork so the weir can be deployed earlier in the summer (during higher water levels). Improved lighting and utility power will also be provided.

**Five Mile Weir** – Five Mile weir is located above Five Mile Creek approximately 21.5 rkm upstream from the confluence with the Salmon River. The hydrologic unit code for the weir is 17060201. Five Mile weir will be used to collect adult broodstock for the YFCSS project and as an adult blocking weir when hatchery adults are outplanted for natural spawning.

**Sawtooth Fish Hatchery** – Sawtooth is located on the upper Salmon River approximately 8.0 km south of Stanley, Idaho. The rkm code for the facility is 503.303.617. The hydrologic unit code for the facility is 17060201. Sawtooth Fish Hatchery will provide egg incubation and juvenile rearing facilities for the YFCSS project, until a permanent facility is constructed at Crystal Springs Fish Hatchery.

**East Fork Salmon River Satellite Facility** – The East Fork Satellite is located approximately 29 rkm upstream of the confluence with the Salmon River. The rkm code for the facility is 522.303.552.029. The hydrologic unit code for the facility is 17060201. The Tribes are using the East Fork Satellite for adult holding and spawning until permanent facilities are constructed in the Yankee Fork (proposed at Pole Flat). It is assumed that East Fork will be used as a back-up facility should it be required for adult holding.

**Crystal Spring Fish Hatchery and Yankee Fork Adult/Juvenile Holding** – Crystal Springs is located 4.7 km southeast of Springfield, Idaho. The Tribes acquired funding from BPA through the Columbia Basin Fish Accords to construct Crystal Springs Fish Hatchery and build a satellite facility in Yankee Fork. It is anticipated that Crystal Springs and the Yankee Fork Satellite will be completed in 2013. Crystal Springs will provide egg incubation and juvenile rearing; the new Yankee Fork facility will hold adult broodstock and, prior to release, juveniles that have been trucked from Crystal Springs.

## 1.6 TYPE OF PROGRAM.

### Integrated Recovery/Harvest Program

The goal of the YFCSS project is to restore Chinook salmon in the Yankee Fork to a level that can provide sustainable fishing opportunities. This will be accomplished when approximately 1,800 adults return to meet the conservation (500 adults) and harvest (1,000 adults) plus hatchery broodstock needs (360 adults) objectives. To meet the conservation and harvest objectives, the Tribes propose to outplant up to 600,000 yearling Chinook salmon smolts, and up to 1,500 adult outplants. For planning purposes, we assumed smolt-to-adult survival for YFCSS smolts at 0.3%. However since Crystal Springs Fish Hatchery is not yet developed, the Tribes, IDFG and LSRCP agree to produce at least 200,000 yearling Chinook salmon for release into the Yankee Fork at Sawtooth Fish Hatchery.

Broodstock will be collected at random at the Yankee Fork weirs. The number of natural-origin adults used each year for broodstock and the number of integrated hatchery-origin fish allowed to spawn naturally above the weir will be monitored, but not controlled. The transition to using only adults returning to Yankee Fork is expected to encourage local adaptation and increase the productivity of the naturally spawning population.

Key performance standards for the program will be tracked in a targeted monitoring and evaluation program. These standards include: (1) abundance and composition of natural spawners and hatchery broodstock (pHOS, pNOB, and PNI); (2) number of smolts released; (3) in-hatchery and post-release survival rates; (4) total adult recruitment, harvest and escapement of the natural and hatchery components; and (5) abundance, productivity, diversity and spatial structure of the naturally spawning spring Chinook population.

## 1.7 PURPOSE (GOAL) OF PROGRAM.

**Restoration** - The goal of the YFCSS project is to contribute to the recovery of Snake River Spring/Summer Chinook ESU by restoring a Maintained (Stabilizing) population of local spring/summer Chinook in Yankee Fork to a level that can provide sustainable fishing opportunities.

## 1.8 JUSTIFICATION FOR THE PROGRAM.

Yankee Fork Chinook salmon are at an extremely high risk of extinction. The ICTRT (2007) recently estimated the 10-year geometric mean adult abundance for Yankee Fork at 13 adults with productivity of 0.80 recruits/spawner (R/S). These abundance and productivity values are the result of degraded habitat conditions in the Yankee Fork and low juvenile and adult survival rates through the FCRPS. Improvements to both habitat condition and migration survival rates are expected to occur over time; however, they will not fully be realized for many decades. Hatchery production is therefore needed to reestablish, develop local adaption and conserve the genetic resources of this population while at the same time providing the fish needed to meet Tribal treaty harvest rights. Supplementation efforts from this program are mandated in the U.S. v Oregon 2008 – 2017 Management Agreement.

## 1.9 LIST OF PROGRAM “PERFORMANCE STANDARDS.”

**Table 1. Spring/summer Chinook hatchery program performance standards, indicators and monitoring and evaluation methods.**

Performance Standard	Indicator	Monitoring and Evaluation Methods
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in the applicable agreements such as under U.S. v. Oregon and U.S. v. Washington.	<ul style="list-style-type: none"> <li>- Total number of fish harvested in Tribal fisheries targeting this program</li> <li>- Total fisher days or proportion of harvestable return taken in Tribal resident fisheries, by fishery</li> <li>- Tribal acknowledgement regarding fulfillment of treaty rights</li> </ul>	<ul style="list-style-type: none"> <li>- The Tribe will conduct harvest surveys in the Yankee Fork and Panther Creek. This information will be combined with work undertaken by the IDFG and others to determine total harvest rate.</li> </ul>
Fish produced 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.	<ul style="list-style-type: none"> <li>- Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery</li> <li>- Annual numbers of each non-target species caught (including fish retained and fish released/discarded) in fisheries targeting this population</li> <li>- Recreational angler days, by fishery</li> </ul>	<ul style="list-style-type: none"> <li>- The Tribe will conduct harvest surveys in the Yankee Fork and Panther Creek. This information will be combined with work undertaken by the IDFG and others to determine total harvest rate.</li> </ul>
Program addresses ESA responsibilities	<ul style="list-style-type: none"> <li>- ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable</li> </ul>	<ul style="list-style-type: none"> <li>- HGMP and Section 7 permits will be submitted to NMFS for approval</li> </ul>
Release groups sufficiently marked/tagged in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries	<ul style="list-style-type: none"> <li>- Marking rate by type in each release group documented</li> <li>- Document the number of marks identified in juvenile and adult groups</li> </ul>	<ul style="list-style-type: none"> <li>- 100% of the hatchery fish will be coded-wire tagged</li> <li>- 15% will be marked with PIT-tags</li> </ul>
Fish collected for broodstock are taken throughout the return in proportions approximating the timing and age structure of the population	<ul style="list-style-type: none"> <li>- Manage temporal distribution of collected broodstock</li> <li>- Manage age composition of collected broodstock</li> <li>- Composition of broodstock (HOR and NOR)</li> </ul>	<ul style="list-style-type: none"> <li>- Fish for broodstock will be collected at random from the run at large (NOR and HOR).</li> <li>- Broodstock collection will occur at the weir</li> </ul>
Weirs do not impact access to spawning and rearing areas	<ul style="list-style-type: none"> <li>- Fish migrate rapidly past the structure</li> <li>- Large numbers of spawners are not observed downstream of weir</li> </ul>	<ul style="list-style-type: none"> <li>- Weir operators will observe fish behavior daily and report indications of delay to managers.</li> <li>- Spawning surveys will be conducted above and below the weir each week</li> </ul>

Performance Standard	Indicator	Monitoring and Evaluation Methods
Weir/trap operations do not result in significant stress, injury, or mortality in natural populations	<ul style="list-style-type: none"> <li>- Mortality rates in trap documented</li> <li>- Document pre-spawning mortality rates of trapped fish in hatchery or after release</li> </ul>	<ul style="list-style-type: none"> <li>- Weirs and Adult Holding facilities will continue to be operated in a manner that reduces mortality.</li> </ul>
Life history characteristics of the natural and hatchery populations remain similar to the extent possible	<ul style="list-style-type: none"> <li>- Life history characteristics of natural and hatchery-produced populations are measured (e.g., juvenile dispersal timing, juvenile size at outmigration, adult return timing, adult age and sex ratio, spawn timing, rearing densities, growth, diet, physical characteristics, fecundity, egg size)</li> </ul>	<ul style="list-style-type: none"> <li>- Tribal staff will continue to monitor juvenile and adult natural populations in the Yankee Fork (and Panther Creek). These same data will be collected at Crystal Springs for HOR fish.</li> </ul>
Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production	<ul style="list-style-type: none"> <li>- Develop genetic profiles of naturally-produced and hatchery-produced adults</li> </ul>	<ul style="list-style-type: none"> <li>- Genetic data will be collected on adults arriving at the weir and on the spawning grounds (i.e., carcasses).</li> </ul>
Juveniles are released in natural acclimation areas to maximize homing ability to intended return locations	<ul style="list-style-type: none"> <li>- Location of juvenile releases</li> <li>- Length of acclimation period</li> <li>- Release type, whether forced, volitional, or direct stream release</li> </ul>	<ul style="list-style-type: none"> <li>- Juvenile acclimation sites are being developed for the program. The parameters listed will be collected and reported yearly.</li> </ul>
Juveniles are released at fully smolted stage of development	<ul style="list-style-type: none"> <li>- Level of smoltification at release is documented</li> </ul>	<ul style="list-style-type: none"> <li>- Fish will be examined for signs of smoltification (transparent fins, silvery appearance, lose of parr marks) prior to release</li> </ul>
Juvenile fish migrate quickly out of the basin after release	<ul style="list-style-type: none"> <li>- Migration timing and survival to traps and Lower Granite Dam</li> </ul>	<ul style="list-style-type: none"> <li>- 15% of the juvenile HOR and NOR (variable rate) fish will be PIT-tagged and released</li> </ul>
The artificial production program uses standard scientific procedures to evaluate various aspects of artificial production	<ul style="list-style-type: none"> <li>- Hatchery culture practices follow best management practices</li> </ul>	<ul style="list-style-type: none"> <li>- Life stage survival rates, flow, rearing densities, mortality and disease will be monitored using standard hatchery practices.</li> <li>- Pathologist will sample fish for disease as needed throughout the culture period</li> </ul>
Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols.	<ul style="list-style-type: none"> <li>- Annual reports indicating level of compliance with applicable standards and criteria</li> </ul>	
Releases do not introduce pathogens not already present in the local populations and do not significantly increase the levels of existing pathogens	<ul style="list-style-type: none"> <li>- Certification of juvenile fish health documented prior to release</li> </ul>	

Performance Standard	Indicator	Monitoring and Evaluation Methods
Hatchery-origin adults do not stray and spawn with other populations	- Stray rate is less than target value	- Carcass and spawning surveys will be used to estimate HOR stray rates to other streams and populations
Smolt to adult (SAR) survival rates of natural-origin and hatchery-origin smolts are known.	- SAR of HOR ; SAR NOR fish	- HOR and NOR fish will be coded-wire tagged and PIT-tagged to quantify smolt-to-adult return rates and total production. Data will be made available to regional data centers for analysis and storage.
Reproductive success of NOR and HOR spawning naturally (NOS and HOS) are known	- Adult recruits per spawner (R/S) of HOR and R/S of NOR fish	- Genetic analysis of returning adults from natural spawners will be used to quantify R/S values for both HOR and NOR
Increasing NOR abundance over time	Counts of NOR fish	NOR abundance will be tracked at weirs and on the spawning grounds through carcass surveys

## 1.10 LIST OF PROGRAM “PERFORMANCE INDICATORS,” DESIGNATED BY "BENEFITS" AND "RISKS."

Note: Performance Standards and Indicators used to develop Sections 1.10.1 and 1.10.2 were taken from the final January 17, 2001 version of Performance Standards and Indicators for the Use of Artificial Production for Anadromous and Resident Fish Populations in the Pacific Northwest. Numbers referenced below correspond to numbers used in the above document. Performance indicators for the proposed Crystal Spring Hatchery program are presented in Table 1. The expected method to determine if a standard has been met is also presented in this table. Benefits and risks to the natural population associated with the indicators are presented in Table 2 below.

### 1.10.1 “Performance Indicators” addressing benefits.

3.1.1 **Standard:** Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in the applicable agreements such as under U.S. v. Oregon and U.S. v. Washington.

*Indicator 1: Total number of fish harvested in tribal fisheries targeting this program.*

*Indicator 2: Total fisher days or proportion of harvestable return taken in tribal resident fisheries, by fishery.*

*Indicator 3: Tribal acknowledgement regarding fulfillment of tribal treaty rights.*

3.1.2      **Standard:** Program contributes to mitigation requirements.

*Indicator 1: Number of fish returning to mitigation requirements estimated.*

3.1.3      **Standard:** Program addresses ESA responsibilities.

*Indicator 1: ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.*

3.2.1      **Standard:** Fish produced 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.

*Indicator 1: Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery.*

*Indicator 2: Annual numbers of each non-target species caught (including fish retained and fish released/discarded) in fisheries targeting this population.*

*Indicator 3: Recreational angler days, by fishery.*

*Indicator 4: Annual escapements of natural populations that are affected by fisheries targeting program fish.*

3.2.2      **Standard:** Release groups sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.

*Indicator 1: Marking rate by type in each release group documented.*

3.3.1      **Standard:** Artificial propagation program contributes to an increasing number of spawners returning to natural spawning areas.

Indicator 1: Annual number of spawners on spawning grounds, by age.

Indicator 2: Spawner-recruit ratios.

Indicator 3: Annual number of redds in selected natural production index areas.

3.3.2      **Standard:** Releases are sufficiently marked to allow statistically significant evaluation of program contribution.

*Indicator 1: Marking rates and type of mark documented.*

*Indicator 2: Number of marks identified in juvenile and adult groups documented.*

## **1.10.2      “Performance Indicators” addressing risks.**

3.4.1      **Standard:** Fish collected for broodstock are taken throughout the return in

proportions approximating the timing and age structure of the population.

*Indicator 1: Temporal distribution of broodstock collection managed.*

*Indicator 2: Age composition of broodstock collection managed.*

3.4.2      **Standard:** Broodstock collection does not significantly reduce potential juvenile production in natural areas.

*Indicator 1: Number of spawners of natural origin removed for broodstock.*

*Indicator 2: Number and origin of spawners migrating to natural spawning areas.*

*Indicator 3: Number of eggs, juveniles, or adults placed in natural rearing areas.*

3.4.3      **Standard:** Life history characteristics of the natural population do not change as a result of this program.

*Indicator 1: Life history characteristics of natural and hatchery-produced populations are measured (e.g., juvenile dispersal timing, juvenile size at outmigration, juvenile sex ratio at outmigration, adult return timing, adult age and sex ratio, spawn timing, hatch and swim-up timing, rearing densities, growth, diet, physical characteristics, fecundity, egg size).*

3.4.4      **Standard:** Annual release numbers do not exceed estimated basin-wide and local habitat capacity.

*Indicator 1: Annual release numbers from all programs in basin and subbasin, including size and life-stage at release, and length of acclimation, by program.*

*Indicator 2: Location of releases and natural rearing areas.*

*Indicator 3: Timing of hatchery releases, compared to natural populations.*

3.5.1      **Standard:** Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.

*Indicator 1: Genetic profiles of naturally produced and hatchery-produced adults developed.*

3.5.2      **Standard:** Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.

*Indicator 1: Total number of natural spawners reaching the collection facility.*

*Indicator 2: Total number of spawners estimated to pass the collection facility to spawning areas, compared to minimum effective population size (when established) required for those natural populations.*

*Indicator 3: Timing of collection compared to overall run timing.*



3.5.3      **Standard:** Artificially produced adults in natural production areas do not exceed appropriate proportion.

*Indicator 1: The ratio of observed and/or estimated total numbers of artificially produced fish on natural spawning grounds, to total number of naturally produced fish, for each significant spawning area.*

*Indicator 2: Observed and estimated total numbers of naturally produced and artificially produced adults passing a counting station close to natural spawning areas.*

3.5.4      **Standard:** Juveniles are released in natural acclimation areas to maximize homing ability to intended return locations.

*Indicator 1: Location of juvenile releases.*

*Indicator 2: Length of acclimation period.*

*Indicator 3: Release type, whether forced, volitional, or direct stream release.*

*Indicator 4: Adult straying documented.*

3.5.5      **Standard:** Juveniles are released at fully smolted stage of development.

*Indicator 1: Level of smoltification at release documented.*

*Indicator 2: Release type (e.g., forced or volitional) documented.*

3.5.6      **Standard:** The number of adults returning to the hatchery that exceeds broodstock needs is declining.

*Indicator 1: The number of adults in excess of broodstock needs documented in relation to mitigation goals of the program.*

3.6.1      **Standard:** The artificial production program uses standard scientific procedures to evaluate various aspects of artificial production.

*Indicator 1: Scientifically based experimental design with measurable objectives and hypotheses.*

3.6.2.      **Standard:** The artificial production program is monitored and evaluated on an appropriate schedule and scale to address progress toward achieving the experimental objectives.

*Indicator 1: Monitoring and evaluation framework including detailed time line.*

*Indicator 2: Annual and final reports.*

3.7.1      **Standard:** Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols.

*Indicator 1: Annual reports indicating level of compliance with applicable standards and criteria.*

3.7.3      **Standard:** Water withdrawals and in stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning, or impact juveniles.

*Indicator 1: Water withdrawals documented – no impacts to listed species.*

*Indicator 2: NMFS screening criteria adhered to.*

3.7.4      **Standard:** Releases do not introduce pathogens not already existing in the local populations and do not significantly increase the levels of existing pathogens.

*Indicator 1: Certification of juvenile fish health documented prior to release.*

3.7.5      **Standard:** Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines.

*Indicator 1: Number and location(s) of carcasses distributed to habitat documented.*

3.7.6      **Standard:** Adult broodstock collection operation does not significantly alter spatial and temporal distribution of natural population.

*Indicator 1: Spatial and temporal spawning distribution of natural population above and below trapping facilities monitored.*

3.7.7      **Standard:** Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.

*Indicator 1: Mortality rates in trap documented.*

*Indicator 2: Prespawning mortality rates of trapped fish in hatchery or after release documented.*

3.7.8      **Standard:** Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.

*Indicator 1: Size and time of release of juvenile fish documented and compared to size and timing of natural fish.*

*Release time will coincide with natural emigration. Predation will be incidental for two reasons: Chinook salmon are not piscivorous and emigration occurs almost immediately.*

3.8.3      **Standard:** Non-monetary societal benefits for which the program is designed are achieved.

*Indicator 1: Number of adult fish available for tribal ceremonial use.*

*Indicator 2: Recreational fishery angler days, length of season, and number of licenses purchased.*

### 1.10.3 Crystal Springs Performance Indicators

**Table 2. Benefits and risks to natural fish associated with each monitoring and evaluation indicator for Crystal Springs Hatchery program.**

Indicator	Benefits and Risks
Broodstock composition, timing, structure similar to wild fish	<p>Benefit: Achievement ensures that the hatchery population reflects the characteristics of the natural population to the extent possible by including natural- origin fish as broodstock, collecting fish randomly throughout the entire portion of the run, and including jacks in broodstock.</p> <p>Risk: As these indicators less represent the natural population, the more divergent the two populations become, thereby reducing natural population productivity and diversity.</p>
Adult holding and spawning survival rate, and egg-to-fry-to-parr-to smolt survival rates	<p>Benefit: Hatchery culture practices that maximize life-stage survival make the most efficient use of the resource and reduce the need to include additional NOR adults for use as broodstock (due to an increase of total brood).</p> <p>Risk: Low survival rates indicate poor hatchery culture practices. Because of this, the hatchery may be artificially selecting for genes/traits that are more conducive for survival in the hatchery rather than the natural environment.</p>
Mating protocols (percent jacks, percent males, pNOB)	<p>Benefit: Proper mating protocols ensure high fertilization rates (increase survival) and maximize genetic diversity of the broodstock. The use of jacks maintains genetic continuity between generations.</p> <p>Risk: Poor mating protocols may reduce genetic diversity and thereby reduce overall population productivity and reproductive success in the natural environment.</p>
Number and severity of disease outbreaks	<p>Benefit: Having fewer and less severe disease outbreaks reduces the disease risks that hatchery populations and operations pose to natural populations. This results in better natural population productivity, diversity and spatial structure as natural populations located close to the hatchery may be more impacted than those further away.</p> <p>Risk: Frequent and severe disease outbreaks reduce population productivity and require more natural- and hatchery-origin broodstock to produce a similar number of fish. Using more natural-origin fish in the hatchery reduces natural spawning escapement, which may reduce population productivity, spatial structure and diversity.</p>
Hatchery effluent quality	<p>Benefit: Achieving high quality hatchery effluent maintains water quality in the receiving stream. Good water quality is essential for the production of all fish species.</p> <p>Risk: Hatchery effluent that degrades water quality may decrease the survival and overall productivity of the natural population.</p>
Release timing, fish health, size and condition of released fish	<p>Benefit: Releasing healthy fish at the correct size and time increases overall survival and reduces the release numbers needed to achieve conservation and harvest objectives.</p> <p>Risk: Releasing fish that are too large/too small may result in increased predation/competition on natural fish populations or reduced survival of hatchery origin smolts. A mismatch between release timing and environmental conditions required for good survival may reduce overall hatchery performance.</p>

Indicator	Benefits and Risks
Smoltification level	<p>Benefit: Achieving proper physiological condition creates a fish that rapidly migrates to the ocean and is able to make the physical changes needed to enter the marine environment; resulting in increased survival.</p> <p>Risk: Releasing fish that are not ready to migrate results in these fish residing in the receiving streams where they compete with wild fish for food and space, reducing natural population productivity. If the hatchery fish are larger than wild fish, they may predate on these wild juveniles, decreasing their abundance.</p>
Smolt-to-adult return rate (SAR)	<p>Benefit: High SAR is an indicator that the hatchery is producing a high quality smolt able to survive in the natural environment from point of release to return as an adult. The higher the survival rates, the fewer hatchery fish that need to be produced to achieve conservation and harvest objectives. Decreased hatchery production reduces competition with the natural population, which may result in increased natural fish production.</p> <p>Risk: Low survival rates indicate that rearing practices are producing a fish of lesser quality. Hatchery production levels required to achieve conservation and harvest objectives may be higher than optimal and represent a risk to natural populations.</p>
Natural adult abundance	<p>Benefit: High natural adult abundance levels indicate that the population is healthy and has low risk of extinction. Abundance is an indicator of the need for a hatchery program. As natural production levels increase, conservation and harvest objectives can be met with less reliance on hatchery programs.</p> <p>Risk: Low natural abundance is indication that environmental conditions may be insufficient to maintain the population over time (high extinction risk). Hatchery production, with all of its inherent risks to natural populations, is needed to achieve conservation and harvest objectives.</p>
Adult run-timing (HOR and NOR)	<p>Benefit: For integrated programs, the run-timing of hatchery and natural runs should match, as this is an indicator that the two populations are expressing similar life histories, and that both are being exposed and adapting to the full range of environmental conditions present in the basin.</p> <p>Risk: A mismatch in run-timing between the two populations (HOR and NOR) indicate that hatchery practices are selecting for life histories dissimilar to those being expressed by the natural population. The two populations may become more divergent over time, resulting in greater genetic impacts to natural populations from hatchery fish spawning in the natural environment. This could include a loss in productivity, diversity and spatial structure.</p>
pHOS	<p>Benefit: Limiting the proportion of hatchery fish on the spawning grounds (pHOS) reduces possible genetic impacts to the natural population.</p> <p>Risk: The more dissimilar the two populations, the larger the risk hatchery strays pose. In a well integrated program, the proportion of natural-origin fish in the hatchery brood (pNOB) must exceed the proportion of hatchery fish on the spawning grounds (pHOS). This is to ensure that the populations possess similar genetic and phenotypic traits.</p>
HOR straying	<p>Benefit: Good homing fidelity of HOR fish to the release site is important for eliminating the genetic risks hatchery fish pose to wild fish from interbreeding. The higher the homing fidelity, the lower the risk. High homing rates also ensure that broodstock are available for culture so that wild populations do not need to be excessively used to achieve production targets.</p> <p>Risk: High HOR straying rates may result in the population becoming more and more adapted to the hatchery rather than the natural environment. This makes the population less resistant or adaptable to environmental change and reduces population diversity.</p>

Indicator	Benefits and Risks
Reproductive success of NOR and HOR spawning naturally (NOS and HOS)	<p>Benefit: The reproductive success of both NOR and HOR fish in nature is an indicator of the ability of each to maintain themselves in a natural environment. The ideal conservation hatchery program should produce a fish with the reproductive success of a natural fish. This indicates that the two components of the population are virtually identical in their ability to reproduce themselves in the wild and that hatchery culture practices have been successful.</p> <p>Risk: Low reproductive success of hatchery fish, or decreasing productivity of natural-origin fish spawning with hatchery fish, may be indicative that the hatchery is having negative impacts on population productivity.</p>

## 1.11 EXPECTED SIZE OF PROGRAM.

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

To achieve the full smolt release target of 600,000 smolts, approximately 358 Chinook salmon broodstock are needed to meet the long-term program management objectives. However, while we are operating with Sawtooth Fish Hatchery, we will need approximately 120 Chinook salmon to sustain the interim smolt release objective of 200,000 juveniles. It is assumed that Crystal Springs will provide all needed rearing space for the programs; however, if additional rearing space becomes available at Sawtooth, then more adults may be collected for broodstock.

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

**Table 3. Actual and Proposed releases of Chinook salmon in Yankee Fork for years 2008-2017.**

Brood Year	Broodstock	Releases
2008	Sawtooth	1,438 adults; 400,000 smolts
2009	Sawtooth	1,517 adults; 400,000 smolts; 450,000 eyed eggs
2010	Sawtooth	Surplus adults; 200,000 smolts
2011	Sawtooth	Surplus adults; 200,000 smolts
2012	Integrated	200,000 smolts
2013	Integrated	200,000 smolts
2014	Integrated	600,000 smolts
2015	Integrated	600,000 smolts
2016	Integrated	600,000 smolts
2017	Integrated	600,000 smolts

**Table 4. Release locations for YFCSS project.**

Life Stage	Release Location	Elevation (ft)	Annual Release
Adult	Eightmile Creek Confluence 11T 689401 E – 4921950 N	6,817	1,500
Yearling	Jordan Creek Confluence 11T 681560 E – 4916396 N	6,375	200,000
	Proposed stress relief ponds (below town of Custer)	~6,300	600,000
Eyed-Eggs <sup>1</sup>	Pond Series 1 and/or 4		
	P1: 11t 682150E – 4909094 N	6,161	225,000
	P4: 11T 681309 E – 4912923 N	6,269	225,000

<sup>1</sup> The eyed-egg program will be discontinued in 2011.

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

Performance, production, and survival rates from Chinook salmon releases into the upper Salmon River at the Sawtooth and for Yankee Fork (BY04) are presented as production guidelines for the YFCSS (Tables 5 and 6). East Fork Salmon River smolt releases were terminated in 1995 and Valley Creek supplementation was never implemented and, consequently, no information is provided.

**Table 5. Performance of Chinook salmon released into the upper Salmon River at SFH from 1987-2006.**

Brood Year	Number Released	Year Released	Return Age From BY			Total	SAR (%)
			1-ocean	2-ocean	3-ocean		
1986	1,705,500	1987 - 88	428	1,410	326	2,164	0.127
1987	2,092,595	1988 - 89	112	199	109	420	0.020
1988	1,895,600	1989 - 90	41	246	475	762	0.035
1989	650,600	1991	15	77	26	118	0.018
1990	1,263,864	1992	29	63	6	98	0.008
1991	774,583	1993	5	7	7	19	0.002
1992	213,830	1994	8	24	25	57	0.026
1993	334,313	1994 - 95	20	74	23	117	0.035
1994	25,006	1996	0	3	4	7	0.028
1995	4,650	1997	0	12	37	49	1.010
1996	43,161	1998	60	135	32	227	0.526
1997	217,336	1999	279	1,219	327	1,825	0.840
1998	123,425	2000	176	531	131	838	0.679
1999	57,134	2001	65	98	27	190	0.033
2000	385,761	2002	522	1,281	175	1,978	0.500

Brood Year	Number Released	Year Released	Return Age From BY			Total	SAR (%)
			1-ocean	2-ocean	3-ocean		
2001	1,105,169	2003	654	1182	(2006)	-	-
2002	821,415	2004	204	(2006)	(2007)	-	-
2003	134,812	2005	(2006)	(2007)	(2008)	-	-
2004	1,416,610	2006	(2007)	(2008)	(2009)	-	-

Source: SFH Brood Year and Run Year Reports.

**Table 6. YFCSS returns for BY04 release.**

Brood Year	Number Released	Year Released	Return Age From BY			Total	SAR (%)
			1-ocean	2-ocean	3-ocean		
2004	135,934	2006	NA	357	24	> 381	> 0.280

Table 7 states the performance measures used for planning the YFCSS project. The performance values were obtained from performance of Chinook salmon at Sawtooth Fish Hatchery.

**Table 7. Expected performance measures used to develop broodstock needs for YFCSS.**

Total Number of Females Taken	179	Calculations	Results
Pre-spawning Mortality <sup>1</sup>	8%	179 x .92	165 females spawn
Fecundity <sup>2</sup>	4,300	4,300 x 165	709,500 green eggs
Green Egg to Smolt Survival <sup>3</sup>	85%	709,500 x .85	≈ 600,000 smolt
Smolt to Adult Return <sup>4</sup>	0.3%	600,000 x .003	~1800 adults

<sup>1</sup> The ten-year average (brood year 1992-2001) of adult mortality for SFH is 4%. YFCSS expects 8% mortality for additional trap and weir mortality as well as handling and transportation stress.

<sup>2</sup> Fecundity at SFH is 4,300 eggs per female

<sup>3</sup> SFH average of green egg to smolt survival is 85%.

<sup>4</sup> Tribes anticipate a 0.3% SAR to achieve a return of approximately 600 adults.

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

First operations were initiated in 2006 with the release of 135,934 BY04 smolts. Chinook salmon trapping began in 2008 and will continue annually throughout the duration of the program. In BY 08 and 09, adults in excess of programmatic needs at Sawtooth were outplanted in upper Yankee Fork for natural spawning. The Tribes proposed to outplant up to 1,500 adult Chinook salmon in 2008 – 2011, prior to transitioning to an integrated broodstock. A total of 1,438 and 1,517 adults were outplanted in 2008 and 2009, respectively. In addition, approximately 450,000 eyed eggs were outplanted in 2009. Crystal Springs Fish Hatchery is expected to be complete in 2013. The first Chinook produced in the program will be released in 2014.

## **1.14 EXPECTED DURATION OF PROGRAM.**

This program is expected to continue until the 5-year running average NOR escapement exceeds 2,000 adults, at that time the program will be eliminated.

## **1.15 WATERSHEDS TARGETED BY PROGRAM.**

Listed by hydrologic unit code –Yankee Fork Salmon River: 17060201

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

The Tribes have implemented intensive habitat restoration measures and minimized harvest opportunities for Tribal members in the Yankee Fork. Habitat, although degraded within the dredged reach, is not the primary limiting factor for Chinook salmon and adult returns have not increased as a result of habitat enhancement efforts. Harvest opportunities have ranged from limited to complete curtailments in the past to less than three fish in the present. The Tribes' habitat and harvest management has little effect on the number of adults that return annually. One obvious candidate to explain the decline in productivity is the increase in the number of dams that smolts (juvenile downstream migrants) and returning adults must pass to survive and complete their life cycle (e.g., Schaller et al. 1999; Deriso et al. 2001).

Chinook salmon productivity must be greater than 1.0 recruits per spawner to produce a sustainable population. As mentioned above, the current productivity estimate for Yankee Fork is 0.80, far less than replacement. If productivity is not at least at 1.0, then supplementation is considered our only alternative to prevent near-term extinction or avoid further losses of genetic variation. In response to the declining Chinook population in Yankee Fork, the Tribes developed the YFCSS project to increase the number of Chinook salmon returning to Yankee Fork. This decision resulted from a number of factors including: (1) an immediate need to prevent local extinction; (2) a long history of introductions of out-of-basin stocks; (3) an emphasis on achieving the conservation objective of 500 adults; (4) the importance of the area as a Tribal subsistence fishery and harvest objective of 1,000 adults; (5) the proximity of a donor hatchery that could provide broodstock (i.e. Sawtooth) to support an enhancement effort; and (6) the importance of preserving any remaining genetic integrity.

Four hatchery options were considered for the new Crystal Springs Hatchery program. Each is described briefly below.

- Option 1: An adult outplant and 600,000 smolt program would transition to locally adapted broodstock to achieve a Maintained population status in the Yankee Fork
- Option 2: Adult outplant and 800,000 smolt program transitioning to locally adapted broodstock to achieve a Maintained population status
- Option 3: Adult outplant and smolt program transitioning to locally adapted broodstock to achieve Contributing population status



- Option 4: Eliminate hatchery production

Options 1 and 2 differ only in the total number of juveniles produced for the program. Option 1 would release 600,000 Chinook smolts in the Yankee Fork, while under Option 2, 800,000 would be released. Both would achieve a Maintained population status. Under Option 3, the conservation goal for the program is increased to produce a population that would be managed to achieve a Viable status (rather than Maintained) and be managed as a Contributing population for the broodstock and for the level of hatchery influence. Option 4 eliminates all hatchery production and releases to the Yankee Fork and therefore relies on natural production to achieve all objectives.

The options were evaluated using the All-H-Analyzer (AHA) model developed by the HSRG. The results of modeling work indicate that Option 1 will best meet the conservation, harvest and cultural objectives identified for the program. A discussion of the modeling results for Options 2, 3, and 4, is presented in Section 4.4.1 of the Crystal Springs Fish Hatchery and Programs for Snake River Chinook Salmon and Yellowstone Cutthroat Trout Master Plan. AHA modeling results for Option 1, which is the preferred alternative, were discussed in the Master Plan in Section 4.2.1.

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

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

The YFCSS project currently operates under the Tribes ESA 1127-3R NOAA permit for scientific research, monitoring and evaluation. The Tribes have been covered under the LSRCF Section 6 Biological Opinion for Bull Trout. In addition, the Tribes received an IDFG Scientific Collection Permit.

### **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.**

The following excerpts describing the current ESA-listed Snake River spring/summer Chinook salmon population were taken from the Draft Salmon Subbasin Summary prepared for the Northwest Power Planning Council (NPPC 2001).

#### *Salmon Subbasin*

The Salmon Subbasin lies within the northern Rocky Mountains of central Idaho and

encompasses 10 major watersheds. The Salmon River flows 410 miles north and west through central Idaho to join the Snake River in lower Hells Canyon. The Salmon is one of the largest subbasins in the Columbia River Basin and encompasses some of the most pristine terrestrial and aquatic temperate ecosystems.

The Salmon River subbasin covers approximately 14 thousand square miles, 16.7 percent of the land area of Idaho. Ten major hydrologic units (watersheds) occur within the sub-basin: the Upper Salmon, Pahsimeroi, Middle Salmon-Panther, Lemhi, Upper Middle Fork Salmon, Lower Middle Fork Salmon, South Fork Salmon, Lower Salmon, and Little Salmon watersheds.

Idaho's stream-type Chinook salmon are truly unique. Smolts leaving their natal rearing areas migrate 700 to 950 miles downstream every spring to reach the Pacific Ocean.

Mature adults migrate the same distance upstream, after entering freshwater, to reach their place of birth and spawn. The life history characteristics of spring/summer Chinook are well documented by IDFG et al. 1990; Healey 1991; NMFS: 57 FR 14653 and 58FR68543). Kiefer's (1987) An Annotated Bibliography on Recent Information Concerning Chinook salmon in Idaho, prepared for the Idaho Chapter of the American Fisheries Society, provides a reference of information available through the mid-1980s on life history, limiting factors, mitigation efforts, harvest, agency planning, and legal issues. Snake River Spring/Summer Chinook salmon, of which spawning populations in the Salmon River subbasin are a part, were listed as Threatened under the Endangered Species Act in 1992 (57 FR 14653); critical habitat was designated in 1993 (58 FR 68543).

Recent and ongoing research has provided managers with more specific knowledge of the Salmon River subbasin stocks. Intensive monitoring of summer parr and juvenile emigrants from nursery streams has provided insights into freshwater rearing and migration behavior (Walters et al. 2001; Achord et al. 2000; Hansen and Lockhart 2001; Nelson and Vogel 2001). Recovered tags and marks on returning adults at hatchery weirs and on spawning grounds have indirectly provided stock specific measures of recruitment and fidelity (Walters et al. 2001; Berggren and Basham 2000). Since 1992, hatchery produced Chinook has been marked to distinguish them from naturally produced fish.

Age-length frequency and age composition of individual stocks are currently being refined for specific stocks (Kiefer et al. 2001). Distribution and abundance of spawning is being monitored with intensity in specific watersheds (Walters et al. 2001; Nelson and Vogel 2001). Ongoing since the mid-1980s, annual standard surveys continue to provide trends in abundance and distribution of summer parr (Hall-Griswold and Petrosky 1997, 2001 in progress). Resultant data show an erratic trend toward lower abundance of juvenile Chinook salmon in their preferred habitat (Rosgen C-type channels), both in hatchery influenced streams and in areas serving as wild fish sanctuaries.

Analysis of recent stock-recruitment data (Kiefer et al. 2001) indicates that much of the freshwater spawning/rearing habitat of Snake River Spring/Summer Chinook salmon is still productive. The average production for brood years 1990-1998 was 243 smolts/female. Stock-recruitment data show modestly density-dependent survival for the escapement levels observed in recent years and have been used to estimate smolt-to-adult survival necessary to maintain or rebuild the Chinook populations. A survival rate of 4.0% (this is less than historic levels) would result in an escapement at Lower Granite Dam of approximately 40,000 wild adult spring/

summer Chinook salmon.

In the mid-1900s, the Salmon subbasin produced an estimated 39% of the spring and 45% of the summer Chinook salmon that returned as adults to the mouth of the Columbia River. Natural escapements approached 100,000 spring and summer Chinook from 1955 to 1960; with total escapements declining to an average of about 49,300 (annual average of 29,300 spring Chinook salmon and 20,000 summer Chinook salmon) during the 1960s. Smolt production within the Salmon Subbasin is estimated to have ranged from about 1.5 million to 3.4 million fish between 1964 and 1970 (IDFG 1985).

Populations of stream-type (spring and summer) Chinook in the sub-basin have declined drastically and steadily since about 1960. This holds true despite substantial capacities of watersheds within the sub-basin to produce natural smolts and significant hatchery augmentation of many populations. For example, counts of spring and summer Chinook redds in IDFG standard survey areas within the sub-basin declined markedly from 1957 to 1999. The total number of spring and summer Chinook redds counted in these areas surveys ranged from 11,704 in 1957 to 166 in 1995 (Elms-Cockrum in press). Stream-type Chinook redds counted in all of the sub-basins monitored spawning areas have averaged only 1,044 since 1980, compared to an average 6,524 before 1970. Land management activities have affected habitat quality for the species in many areas of the sub-basin, but spawner abundance declines have been common to populations in both high-quality and degraded spawning and rearing habitats (IDFG 1998).

Kucera and Blenden (1999) have reported that all five “index populations” (spawning aggregations) of stream-type Chinook in the Salmon Sub-basin, fish that spawn in specific areas of the Middle Fork and South Fork Salmon watersheds, exhibited highly significant ( $p < 0.01$ ) declines in abundance during the period 1957-95. NMFS (2000) estimated that the population growth rates ( $\lambda$ ) for these populations during the 1990s were all substantially less than needed for the fish to replace themselves: Poverty Flats ( $\lambda = 0.757$ ), Johnson Creek (0.815), Bear Valley/Elk Creek (0.812), Marsh Creek (0.675), and Sulphur Creek (0.681). Many wild populations of stream-type Chinook in the subbasin are now at a remnant status and it is likely that there will be complete losses of some spawning populations. Annual redd counts for the index populations have dropped to zero three times in Sulphur Creek and twice in Marsh Creek, and zero counts have been observed in spawning areas elsewhere within the Salmon Sub-basin. All of these Chinook populations are in significant decline, are at low levels of abundance, and at high risk of localized extinction (Oosterhout and Mundy 2001).

Large reductions in historic fisheries on Chinook from the Salmon Sub-basin occurred as populations declined. Historic tribal and recent non-tribal sport fisheries targeted naturally produced salmon. Current fisheries are focused on the harvest of mitigation hatchery-produced fish while attempting to minimize impacts to fish produced in the wild. Sport harvest is now limited to only hatchery produced salmon with an acceptable incidental harvest of naturally produced salmon. Tribal fisheries are still focused in natural-origin origin populations; however harvest is minimal at best.

#### *Yankee Fork Salmon River*

The Yankee Fork Salmon River historically supported large runs of anadromous salmonids. The decline of anadromous fish in the Yankee Fork can be linked to the combined effects of downstream hydroelectric developments and local mining activities. The construction of Lower

Monumental (1969), Ice Harbor (1962), Little Goose (1970), and Lower Granite (1974) dams on the Snake River, and Bonneville, Dalles, McNary, and John Day dams on the Columbia River, all served to reduce the number of adults returning to the Yankee Fork and the number of smolts successfully migrating to the ocean. The historic mining activities in the Yankee Fork have further aggravated the tenuous status of Chinook stocks, resulting in further decline.

Yankee Fork, located in Custer County, Idaho, constitutes one of the major tributaries of the upper Salmon River. The Yankee Fork drainage historically supported large runs of anadromous salmonids, primarily spring Chinook salmon and steelhead trout. These runs have been dramatically reduced in the last 20-25 years due to localized mining activities and the effects of downstream hydroelectric developments (Reiser and Ramey 1987). The mining activities have resulted in the complete re-channeling of lower portions of the Yankee Fork and the deposition of extensive unconsolidated dredge piles. Such activities have eliminated or degraded much of the rearing and spawning habitat in the lower Yankee Fork. As a result, the Yankee Fork drainage is grossly underutilized with respect to salmon and steelhead production (Reiser and Ramey 1987).

Chinook destined for the Yankee Fork would enter the Columbia River during March-May, with spawning occurring in August and September (Bjornn 1960). The runs of upper Salmon River spring Chinook, an exceptionally large fish, were found to be comprised of primarily 4-5 year old fish having fork lengths exceeding 32 inches (Bjornn et al 1964). Egg incubation extended into December, with emergence occurring in February or March (Reiser and Ramey 1987). The juveniles would typically rear in freshwater until the spring (March-April) of their second year, generally at a length of 4-5 inches (Bjornn 1960).

Over six percent of the Chinook redds found in the upper Salmon River have been located in the Yankee Fork system (Reiser and Ramey 1987). Chinook redd counts taken in the upper Yankee Fork have ranged from a high of 250 in 1967, to 0 in 1980, 1982, and 1983 (Pollard 1985). For the whole drainage, the number of redds have ranged from over 600 in 1967 to less than 10 in the mid-1980's (Konopacky et al. 1986). Intensive multiple-ground redd counts conducted by the Tribes for the whole drainage from 1986-2005 have averaged 36.9 redds/year (Ray unpublished data).

The large runs of salmon not only afforded a sport fishery for the upper Salmon River but also provided a subsistence and ceremonial fishery for the SBT. The Yankee Fork system in particular is an important and treaty-guaranteed anadromous fishing area for the Tribes and one which has been used for many generations (Reiser and Ramey 1987). The Tribes have volunteered to help with the restoration of anadromous fish by temporarily curtailing salmon fishing in the Yankee Fork, with the exception of bath tub fisheries provided during Pahsimeroi Fish Hatchery management shifting from spring Chinook to summer Chinook during 1985 and 1986.

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

The population directly affected by the YFCSS program is the Yankee Fork Salmon River Chinook population.

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

All juvenile and adult Chinook salmon released from the YFCSS occur within the Yankee Fork

Salmon River. However, populations that could be affected by the YFCSS adult strays include six extant Chinook salmon populations within the Upper Salmon River MPG. To a lesser extent, Chinook salmon MPGs downstream of the Upper Salmon River MPG potentially could be affected by the YFCSS.

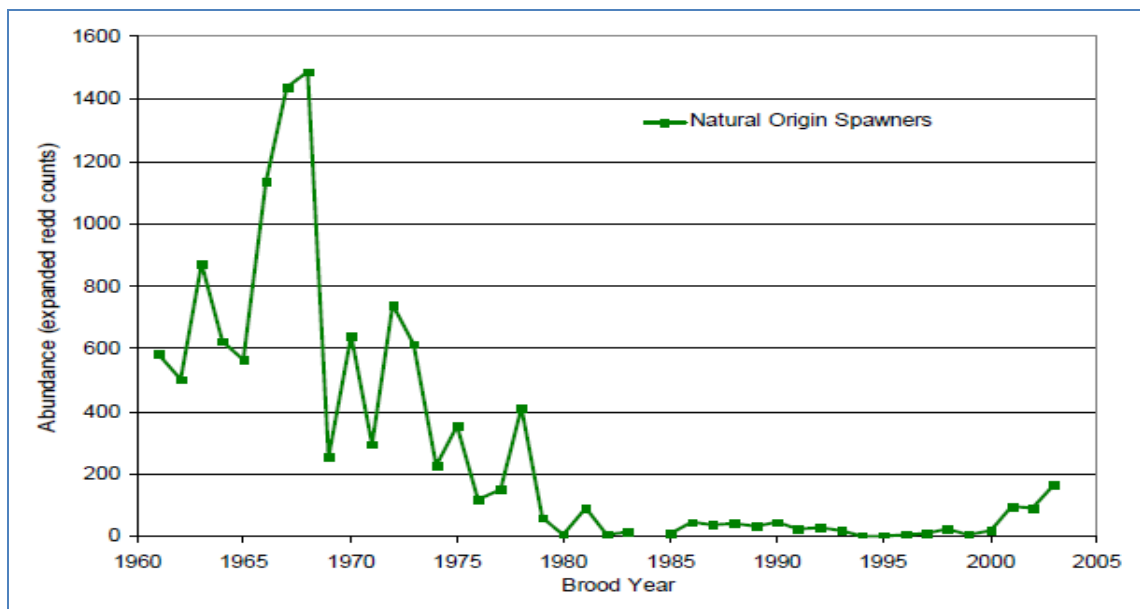
Other ESA-listed populations include the Snake River sockeye salmon ESU (listed as endangered in 1991), Snake River Basin steelhead ESU (listed as threatened in 1997) and bull trout (listed as threatened in 1998). In 2009, two adult sockeye salmon were trapped at the Pole Flat Weir, of which one was transported to Sawtooth Fish Hatchery.

### **2.2.2 Status of NMFS ESA-listed salmonid population(s) affected by the program.**

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

The ICTRT classified the Yankee Fork Salmon River population as a “basic” population based on historical habitat potential (ICTRT 2007). A Chinook population classified as basic has a mean minimum abundance threshold criteria of 500 naturally produced spawners with a sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

Current (1961 to 2003) natural population abundance (number of adults spawning in natural production areas) has ranged from 0 fish in 1995 to 1,488 fish in 1968. Abundance in recent years has been highly variable. The most recent 10-year geometric mean number of natural spawners was 13 fish (NOAA Draft Recovery Plan). The ICTRT status assessment indicates that the Yankee Fork Salmon River population is at high risk based on current abundance and productivity. The current program management is attempting to address these deficiencies by using a segment of the returning integrated adults to supplement natural spawners above the hatchery weir to increase the abundance of natural spawners. Additionally, if sufficient numbers of integrated adults return, managers will use them to integrate the production component of the program, thereby reducing the effects of domestication when hatchery fish spawn with natural-origin fish in the wild (modeled increase in productivity). A sliding scale will be used to maximize PNI, particularly in years of low natural-origin adult escapement.



**Figure 1. Yankee Fork abundance trends 1961 – 2003.**

Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage or other measures of productivity for the listed population. Indicate the source of these data.

Estimates of Yankee Fork Salmon River Chinook abundance and productivity were developed by the ICTRT and are presented below (Table 8).

**Table 8. Yankee Fork abundance and productivity measures.**

10-year geomean natural abundance	13
20-year return/spawner productivity	0.68
20-year return/spawner productivity, SAR adj. and delimited*	0.80
20-year Bev-Holt fit productivity, SAR adjusted	n/a
20-year Lambda productivity estimate	n/a
Average proportion natural origin spawners (recent 10 years)	1.0
Reproductive success adj. for hatchery origin spawners	n/a

\*Delimited productivity excludes any spawner/return pair where the spawner number exceeds 75% of the size category threshold for this population. This approach attempts to remove density dependence effects that may influence the productivity estimate.

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

Annual spawner abundance and other key population metrics developed by the ICTRT for the Yankee Fork Salmon River population are shown in Table 9 and 10 (ICTRT 2005).

**Table 9. Yankee Fork Chinook population metrics for brood years 1979-2003.**

Brood Year	Spawners	%Wild	Natural Run	Nat. Rtns	R/S	Rel. SAR	Adj. Rtns	Adj. R/S
1979	60	1	60	7	0.12	0.87	6	0.10
1980	4							
1981	90							
1982	2							
1983	15	1	15	41	2.77	0.58	24	1.60
1984								
1985	11	1	11	37	3.26	1.57	57	5.11
1986	45	1	45	35	0.78	1.41	49	1.10
1987	37	1	37	33	0.91	1.83	61	1.66
1988	40	1	40	25	0.61	0.75	18	0.46
1989	30	1	30	23	0.75	1.79	40	1.34
1990	43	1	43	11	0.25	4.65	50	1.16
1991	22	1	22	2	0.07	3.01	5	0.20
1992	29	1	29	3	0.09	1.65	4	0.15
1993	20	1	20	8	0.39	1.61	12	0.62
1994	2							
1995	0							
1996	4							
1997	9	1	9	57	6.64	0.30	17	1.96
1998	21	1	21	101	4.88	0.30	30	1.45
1999	2	1	2					
2000	20	1	20					
2001	95	1	95					
2002	92	1	92					
2003	161	1	161					

**Table 10. Yankee Fork abundance trends 1986-2009.**

Year	YANKEE FORK REDDS				Estimated Adult Escapement <sup>1</sup>	Estimated Smolt Production <sup>2</sup>
	Upper (Stratum 4 & 5)	Lower (Strata 1-3)	WFYF Strata 6	Total		
1986	NC	35	NC	35	88	8,505
1987	5	4	17	26	65	6,318
1988	2	4	31	37	93	8,991
1989	0	16	6	22	55	5,346
1990	5	2	20	27	68	6,561
1991	9	3	8	20	50	4,860
1992	10	9	6	25	63	6,075
1993	4	11	13	28	70	6,804
1994	0	0	9	9	23	2,187
1995	0	0	0	0	0	0
1996	0	1	7	8	20	1,944
1997	5	7	7	19	48	4,617
1998	1	14	12	27	68	6,561
1999	2	0	0	2	5	486
2000	10	1	4	15	38	3,645
2001	32	50	36 <sup>3</sup>	118	295	28,674

Year	YANKEE FORK REDDS				Estimated Adult Escapement <sup>1</sup>	Estimated Smolt Production <sup>2</sup>
	Upper (Stratum 4 & 5)	Lower (Strata 1-3)	WFYF Strata 6	Total		
2002	21	56	53 <sup>4</sup>	130	325	31,590
2003	9	77	24	110	275	26,730
2004	15	13	15 <sup>5</sup>	43	108	10,449
2005	17	6	14 <sup>6</sup>	37	93	8,991
2006	10	5	14 <sup>7</sup>	29	73	7,047
2007	8	7	10 <sup>8</sup>	25	63	6,075
2008	589	64	7	660	1935 <sup>9</sup>	160,380
2009	366	45	3	414	1640 <sup>10</sup>	100,602
TOTAL	1120	430	316	1866	1980	453,438
AVG	48.7	34.4	13.7	78	90	18893

<sup>1</sup> Adult estimates obtained by assuming 2.5 spawners/redd (Matthews and Wapels 1991).

<sup>2</sup> Estimated smolt production determined from Kiefer et al. (2001); average of 243 smolts per redd.

<sup>3</sup> 18 wild/natural and 18 captive rearing from IDFG observations.

<sup>4</sup> 20 wild/natural and 33 captive rearing from IDFG observations.

<sup>5</sup> 4 wild/natural and 11 captive rearing from IDFG observations.

<sup>6</sup> 4 wild/natural and 8 captive rearing from IDFG observations.

<sup>7</sup> 6 wild/natural and 8 captive rearing from IDFG observations.

<sup>8</sup> 3 wild/natural and 7 captive rearing from IDFG observations.

<sup>9</sup> Actual count from weir, adult outplanting, mark-recapture, and carcass recovery data.

<sup>10</sup> Actual count from weir, adult outplanting, mark-recapture, and carcass recovery data.

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

Numbers of hatchery and natural-origin Chinook salmon released for natural spawning are presented in Table 11. In 1986 IDFG released over 2,000 adult Chinook into the upper Yankee Fork above Fivemile Creek. These adults not only provided the Tribes with a ceremonial spear fishery, but many spawned successfully and contributed to juvenile production. In 2006, 135,934 Chinook salmon smolts of Sawtooth origin were released into Yankee Fork. Prior to 2006, Yankee Fork was supplemented with several stocks including Rapid River, Salmon River, and Pahsimeroi from 1977 to 1994. More recently, a management agreement has allowed adult outplants in Yankee Fork above Sawtooth broodstock requirements under the objectives of the YFCSS project. Information from the Salmon Subbasin Plan (1990), Fish Passage Center (2005), and Sawtooth Fish Hatchery Annual Report (1992) is summarized below (Table 11).

**Table 11. Yankee Fork Chinook salmon artificial propagation history 1977-2006.**

BY	RY	Number	Location	Stock	Size	fish/lb	Hatchery
	1977	56,700	WFYK	Rapid River	fry-fingerling		Mackay
	1978	75,036	Yankee Fork	Rapid River	fry-fingerling		Mackay
	1985	61	Yankee Fork	Sawtooth	adult		Sawtooth
	1985	659	Yankee Fork	Rapid River	adult		Pahsimeroi
	1986	61	Yankee Fork	Sawtooth	adult		Sawtooth



BY	RY	Number	Location	Stock	Size	fish/lb	Hatchery
	1986	1,505	Yankee Fork	Rapid River	adult		Pahsimeroi
	1986	386,348	Yankee Fork	Rapid River	fry-fingerling		Pahsimeroi
	1987	157,877	Yankee Fork	Rapid River	fry-fingerling		Sawtooth
	1987	600	Yankee Fork	Rapid River	adult		Pahsimeroi
1986	1987	158,000	Yankee Fork Ponds	Salmon R.	pre-smolt	250	Sawtooth
1986	1988	725,500	Yankee Fork Ponds	Pahsimeroi	smolt	20	Sawtooth
1987	1988	50,100	Yankee Fork Ponds	Rapid River	fry-fingerling	120	Sawtooth
1987	1989	198,200	Yankee Fork Ponds	Salmon R.	smolt	24	Sawtooth
1988	1989	125,000	Yankee Fork Ponds	Salmon R.	fry-fingerling	100	Sawtooth
1988	1990	200,800	Yankee Fork Ponds	Salmon R.	smolt	21	Sawtooth
1989	1990	50,000	Yankee Fork Ponds	Rapid River	fry-fingerling	100	Yakima
1989	1990	491,300	Yankee Fork	Salmon R.	smolt	45	Sawtooth
1989	1990	50,000	Yankee Fork Ponds	Salmon R.	fry-fingerling	111	Sawtooth
1990	1991	50,000	Yankee Fork Ponds	Rapid River	fry-fingerling	120	Sawtooth
	1994	25,025	WFYF	Sawtooth	smolt		Sawtooth
2004	2006	135,934	Yankee Fork	Sawtooth	smolt	21.3	Sawtooth
2008	2008	1,438	Yankee Fork	Upper Salmon	adult		Sawtooth
2009	2009	1,517	Yankee Fork	Upper Salmon	adult		Sawtooth

### **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 take may occur, the risk potential for their occurrence, and the likely effects of the take.

Broodstock collection will result in the direct take of ESA-listed Snake River spring/summer Chinook salmon. There is the possibility that steelhead or bull trout may be incidentally captured at the Yankee Fork weir. Non-target captured individuals will be immediately released either upstream or downstream of the weir with minimal handling.

The Tribes developed a monitoring and evaluation (M&E) plan to assess the success of hatchery supplementation activities in the Yankee Fork Salmon River. Monitoring and evaluation of Chinook salmon will occur by fin clips for genetic analysis, a non-lethal method of data collection. DNA typing will be used to differentiate Chinook salmon of hatchery-origin or natural-origin. Additional M&E activities will include creel surveys, redd counts, and carcass recoveries.

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

IDFG has spawned three brood years of Chinook salmon for the YFCSS project. The first release of smolts occurred in 2006 and adults were collected for broodstock in 2004. Adult broodstock for the YFCSS was not collected with brood years 2005 – 2007. In brood years 2008 and 2009, IDFG has collected broodstock to produce 400,000 smolts. In addition, 450,000 eyed eggs were outplanted in Yankee Fork in 2009. Adults for the eyed egg outplants were collected at Sawtooth.

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

All adult Chinook salmon are trapped and handled at the Yankee Fork weirs. The number of returning hatchery and natural-origin adults varies annually. In 2008, 185 hatchery and 43 natural-origin Chinook salmon were trapped at Pole Flat weir, with no fish trapped at Five Mile weir. In 2009, 20 hatchery and 29 natural-origin Chinook salmon were trapped at Pole Flat weir. Three of the 29 natural-origin Chinook salmon were trapped again at Five Mile weir. One hatchery fish was trapped at Five Mile weir in 2009.

To meet the juvenile release objectives of the YFCSS (Table 18), the Tribes plan to collect up to 358 adults. To collect broodstock from the entire Chinook salmon run, all adult Chinook salmon entering Yankee Fork will be trapped at Pole Flat weir and/or Five Mile weir. An 85% survival is expected from green egg to smolt phase.

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

It is unlikely that take levels for natural-origin Chinook salmon will exceed projected take levels presented in Table 18. If adult collection exceeds broodstock take levels, those individuals not required for the YFCSS will be released upstream of the Yankee Fork weir for natural spawning. However, in the unlikely event that stated levels of take are exceeded, the Tribes will consult with NOAA-Fisheries Sustainable Fisheries Division to agree to an action plan.

## **SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES**

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

The YFCSS project conforms to the plans and policies of the LSRCP administered by the U.S. Fish and Wildlife Service to mitigate for the loss of Chinook salmon production caused by the

construction and operation of the four dams on the lower Snake River. In addition, the Tribes have developed the YFCSS to assist with the recovery of the Upper Salmon Major Population Group as described by the Interior-Columbia Technical Recovery Team. The YFCSS will also assist in meeting the objectives of the Salmon Sub-basin Plan (Ecovista 2004) and the Council's Fish and Wildlife Program funded by BPA.

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

- Shoshone-Bannock Tribes Salmon River Production Program Master Plan - draft
- Shoshone-Bannock Tribes Tribal Resource Management Plan for Snake River spring/summer Chinook salmon fisheries in the Salmon River subbasin.
- Cooperative Agreement between the U.S. Fish and Wildlife Service and the Shoshone-Bannock Tribes, USFWS Agreement No.: 14110-A-J015 (2010 cooperative agreement number for YFCSS project).
- 2008 - 2017 Management Agreement pursuant to U.S. v Oregon, U.S. District Court, District of Oregon.
- Tribes, IDFG, and LSRCP Memorandum of Agreement (2008 and 2009)

Description of cooperating agencies and programs:

#### *Lower Snake River Compensation Plan (LSRCP)*

The LSRCP was authorized by Congress in 1976. Its purpose is to mitigate for losses of adult Chinook salmon and steelhead, along with angling days for resident species due to the construction and operation of four dams on the lower Snake River.

The goals of the LSRCP are to return 55,100 adult steelhead and 58,700 adult spring and summer Chinook salmon above Lower Granite Dam, along with returning 18,300 adult fall Chinook salmon above Ice Harbor Dam. To mitigate lost angler days for resident species, the LSRCP program stocks 86,000 pounds of trout into inland lakes and ponds close to the project area. Many LSRCP programs emphasize conservation of salmon and steelhead.

Sawtooth Fish Hatchery is a LSRCP program initiated to mitigate for spring Chinook losses caused by the four federal dams constructed on the lower Snake River. The goal of the Sawtooth is to return approximately 19,445 adult spring Chinook salmon above Lower Granite. Sawtooth was constructed in 1985 with production targets of 1.3 million smolts for release in the Salmon River, 700,000 into the East Fork Salmon River, and 300,000 smolts for release into Valley Creek.

#### *Idaho Department of Fish and Game (IDFG)*

IDFG is a co-manager with the YFCSS project and operator of Sawtooth Fish Hatchery and East

Fork Satellite. Sawtooth will provide egg incubation and juvenile rearing facilities for the YFCSS. East Fork Satellite will be used to hold adult broodstock until an adult holding facility is constructed on Yankee Fork.

#### *Snake River Salmon and Steelhead Recovery Plan*

NOAA-Fisheries developed the draft Snake River Salmon and Steelhead Recovery Plan. The goal of the plan is to restore the health of the Columbia and Snake River ecosystem and to recover listed Snake River salmon and steelhead stocks. Two major actions include improving environmental factors associated with reducing stocks and rebuilding populations to a level to provide sustainable fisheries. In order to rectify the latter, an improvement in smolt emigration and adult immigration into Yankee Fork is necessary.

#### *Snake River Subbasin Plan*

Under the Northwest Power Planning Council (NPPC), a sub-basin plan was developed for the Salmon River. This plan documents current and potential salmon and steelhead production, summarizes goals and objectives, and provides proper management strategies. The NPPC created the System Planning Group and the Monitor and Evaluation Group to document habitat quality and potential smolt capacity for regions within the sub-basin. The YFCSS will increase adult returns which is an objective of the plan.

#### *Columbia River Fish Management Plan (CRFMP)*

The Columbia River Fish Management Plan (CRFMP) is a court approved settlement between the parties in U.S. v Oregon, a case addressing treaty fishing rights in the Columbia River basin. The signatories to the settlement are the United States of America acting through the Department of the Interior and the Department of Commerce; the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian reservation; the Confederated Tribes of the Warm Springs Reservation of Oregon; the Confederated Tribes and bands of the Yakama Nation; the Shoshone-Bannock Tribes and the states of Oregon, Washington, and Idaho. The plan is a framework for these parties to protect, rebuild, and enhance Columbia River Fish runs while providing fish for both treaty Indian and non-Indian fisheries. The agreement establishes procedures to facilitate communication and resolve disputes through a Policy Committee composed of the parties. Two technical committees guide management decisions of the Policy Committee. The Production Advisory Committee (PAC) responds to hatchery production issues; the Technical Advisory Committee (TAC) responds to harvest issues.

Since the escapement goals for salmon to the Snake River basin are viewed as hard constraints on harvest by the regulators within the Columbia River basin, the nature of these goals is critical to the sustainable management of all salmon and steelhead. Although the Yankee Fork Chinook is part of an aggregate escapement goal for areas above Lower Granite Dam, the CRFMP has no explicit escapement goal for Yankee Fork.

The Tribes, as a CRFMP signatory, will be responsible for consultation with the other parties to CRFMP to ensure that hatchery management and operations are in compliance with the CRFMP with regard to production issues, harvest in the ocean and mainstem Columbia River and harvest in the Salmon River in Idaho.

### **3.3 RELATIONSHIP TO HARVEST OBJECTIVES.**

To the extent consistent with the conservation and broodstock objectives of the YFCSS program, contribute to the Yankee Fork, Salmon, Snake, and Columbia River fisheries.

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

Harvest opportunities in Yankee Fork will be available to Tribal members and will be governed by the Shoshone-Bannock Tribes' Tribal Resource Management Plan. Hatchery-produced adults will be subjected to potential Commercial Ocean and in-river fisheries with a sport fishing season. Since the inception of the LSRCP, Chinook salmon sport fishing seasons have been limited in the upper Salmon River.

Harvest is estimated to be approximately 1,000 adults, NOR and HOR combined, in the Yankee Fork after the Crystal Springs program has been initiated.

### **3.4 RELATIONSHIP TO HABITAT PROTECTION AND RECOVERY STRATEGIES.**

The decline of anadromous fish in the Yankee Fork can be linked to hydropower developments and mining activities. Mining has resulted in complete re-channeling of lower Yankee Fork and deposition of extensive dredge piles and, thus, has eliminated or destroyed significant amounts of excellent rearing and spawning habitat (Reiser and Ramey 1987). Without habitat enhancement, production of salmon and steelhead will remain below historic levels. In addition to habitat enhancement, significant changes in hydropower operation must be adopted to increase survival of Yankee Fork Chinook salmon.

Currently, the NOAA-Fisheries is developing a recovery plan specific to the Snake River spring/summer Chinook salmon ESU. YFCSS will assist NOAA-Fisheries in achieving recovery objectives for Yankee Fork Chinook.

#### *Ecological interactions*

Possible negative effects on listed salmon from the release of hatchery-produced Chinook smolts may occur through predation, competition, or disease transmission.

#### *Predation*

It may be probable, although highly unlikely, that hatchery-origin juveniles from the YFCSS may prey on natural-origin spring Chinook. Although it is possible for hatchery-origin individuals to ingest natural-origin fry based on size (39.8 mm; Peery and Bjornn 1992), emigration from release sites is expected to occur almost immediately alleviating any pressure to natural-origin fish. In addition, no studies suggest juvenile Chinook salmon are piscivorous as well as it is unlikely hatchery-origin individuals will convert to a natural diet immediately upon release (USFWS 1992, 1993).

### *Competition*

Initial competition in Yankee Fork should be minimal due to the limited population size of natural Chinook salmon and steelhead trout in the system. Competition for food and space should also be minimal because of the location of selected release sites, rapid emigration from those, and the initial non-natural diet of hatchery-produced juveniles. Space and habitat selection should be controlled by the size difference between hatchery and natural-origin juveniles (Everest 1962). Generally, hatchery-produced juveniles are larger and, therefore, more adapted to occupy deeper water and faster velocities compared to smaller, natural juveniles (Hampton 1988).

### *Disease*

There is history of chronic bacterial disease (BKD) in spring Chinook salmon from Sawtooth. Sawtooth has installed adult antibiotic injections, egg disinfection, egg culling based on BKD ELISA values, egg segregation incubation, juvenile segregation rearing, and juvenile antibiotic feedings as disease control measures (SFH HGMP 2002). Sawtooth and the YFCSS will monitor the health status of hatchery-produced Chinook salmon and follow protocols established by the PNFHPC and AFS Health Section.

## **SECTION 4. WATER SOURCE**

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.

### **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.**

#### *Sawtooth Fish Hatchery*

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

### *Yankee Fork Weirs*

The Yankee Fork weirs do not divert any water from Yankee Fork. No fish rearing occurs at this site.

### *East Fork Salmon River Satellite*

The East Fork Salmon River Satellite receives water from the East Fork Salmon River. Approximately 15 cfs is delivered to the facility through a gravity line. Water is delivered to adult holding raceways. A well provides domestic water and pathogen-free supply for spawning (egg water-hardening process). No fish rearing occurs at this site. The intake screens comply with NMFS screen criteria and were designed by the Corp of Engineers.

### *Crystal Springs Fish Hatchery*

The proposed Crystal Springs Hatchery site is on two parcels of land, 19.7 acres total, containing six existing artesian wells. A minimum of two new wells will be required to achieve the anticipated need of 24 cfs. The artesian aquifer that underlies the site provides an excellent source of high quality water for fish rearing, and is the primary reason this site was selected for the project. The design of this facility will be to use gravity flow artesian well water to the greatest degree possible in order to minimize pumping costs. In an average water year, artesian flows will be adequate to meet hatchery demand for both the spring/summer Chinook (Yankee Fork and Panther Creek) and Yellowstone cutthroat trout programs, for at least nine months (approximately May through October). During the peak months (March through April), several (up to three) of the highest producing wells will most likely need to be pumped in order to meet water supply demand. Once pumps are turned on, the amount of artesian flow available to the non-pumped wells will likely decline; however, gravity supplied flow may still be available. A water right of 24.7 cfs was perfected by the former trout hatchery at Crystal Springs and will be used for the new hatchery.

The conceptual design of this facility includes dual elevation degassing head boxes; a lower elevation head box for degassing and oxygenating artesian flows, and a higher elevation head box for degassing and oxygenating pumped flows. There may also be need for a chiller and associated chilled water head box and piping system that would be used to slow the development rate of eggs and fry in order to produce smolts that meet targets for fish size and release dates.

The water requirements for the Yankee Fork Chinook program show a peak flow of 5,689 gpm to the outdoor rearing facilities for a given brood year, and a concurrent demand of 926 gpm for early rearing supply to the successive brood year. The total peak demand, including incubation (123 gpm constant), is expected to be 6,738 gpm for the Yankee Fork program. The peak total flow demand, for both Yankee Fork and Panther Creek program, would be 9,705 gpm in April.

All water used at the Crystal Springs site will be supplied by wells, and no fish screening will be required.

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

Intake screens at all facilities will comply with NOAA-Fisheries screen criteria and were designed by the Corps of Engineers. IDFG monitors and maintains Sawtooth 24 hours a day and is responsible for emergency actions. The YFCSS will be monitored and occupied 24 hours a day. The East Fork Satellite Facility will be monitored by the Tribes and IDFG.

The proposed Crystal Springs Fish Hatchery will have a water right of 24.7 cfs to be supplied from artesian wells. There are no listed fish in the system that may be affected by effluent discharge.

Consistency of project construction and operation will be demonstrated with various regulatory programs under the Federal Water Pollution Control Act (Clean Water Act). The authority to review the programs for consistency with Section 401 is the responsibility of the Idaho Department of Environmental Quality (IDEQ). Section 404 of this act is administered by the Corps of Engineers. Effects of developing the proposed hatchery facilities on wetland habitat will be evaluated by the Corps, an effort that will require delineation of existing wetlands. Another Clean Water Act component is administered by the Environmental Protection Agency (EPA) is the National Pollution Discharge Elimination System (NPDES) permit for hatchery construction (and the associated Stormwater Pollution Prevention Plan). An additional NPDES permit will be required for hatchery operations if production reaches a regulated level.

## **SECTION 5. FACILITIES**

### **5.1 BROODSTOCK COLLECTION FACILITIES (OR METHODS).**

#### *Pole Flat Weir*

Adult collection at the Pole Flat weir is facilitated by a temporary weir that spans the Yankee Fork Salmon River. Weir panels and the trapping device are installed in late June or early July to prevent upstream migration of adult Chinook salmon. Chinook salmon volitionally migrate into the adult trap where they are manually sorted and disposition is determined. The Tribes are proposing to modify Pole Flat facilities to make operations safer and to improve handling and sorting the larger number of fish estimated to be returning to this site.

#### *Yankee Fork Juvenile/Adult Holding Facility*

A new facility is proposed on the Yankee Fork in the vicinity of Jordan Creek at a location yet to be confirmed. Adults collected at Pole Flat Weir will be trucked here and held for spawning. When juveniles reared at Crystal Springs Hatchery are trucked to Yankee Fork, they will be held for a short term in this pond to reduce stress prior to volitional release to the stream.



### *Five Mile Weir*

Adult collection at the Five Flat weir is facilitated by a temporary weir that spans the Yankee Fork Salmon River. Weir panels and the trapping device are installed in late June or early July to prevent upstream migration of adult Chinook salmon. Chinook salmon volitionally migrate into the adult trap where they are manually sorted and disposition is determined.

### *Sawtooth Fish Hatchery*

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

### *East Fork Salmon River Satellite*

The East Fork Salmon River Satellite was constructed with a velocity barrier fitted with radial gates to prevent upstream passage beyond the trap. Adult Chinook salmon move into a fish ladder and then into two adult holding raceways that measure 68 ft long by 10 ft wide by 4.5 ft deep. Each adult pond has the capacity to hold approximately 500 adults.

### *Crystal Springs Fish Hatchery*

The Crystal Springs Facility is a rearing facility. No broodstock would be collected and or held at these facilities. The facilities are designed for production of Chinook salmon from green egg to smolt stage before being transported back to the Yankee Fork Salmon River.

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

A variety of transportation vehicles and equipment are available at the various facilities.

### *Smolt*

Multiple methods are available for smolt transfer: two-ton trucks, helicopters, or tanker trucks. Two-ton trucks would require numerous truck loads and helicopter releases are not viable for large releases. Tanker trucks are considered the favorable approach for smolt transfer to Yankee Fork. Transportation of smolt will be conducted using a 5,000 gallon capacity tanker truck. Five tanks of 1,000 gallons with 6°C water and fish size of 20 FPP can safely hold 26,112 smolts per tank for a total of 130,560 smolts per load. Three trips would safely stock approximately 391,680 smolts. Distance from Sawtooth to the stocking site is approximately 26 miles. Safe travel time would be one hour, dependent on road conditions. Smolt loading will occur at Sawtooth at 8:30 a.m. during winter weather conditions, therefore, estimating completion of one stocking trip (Sawtooth to Sawtooth) by 11:00 a.m.

The transport time from Crystal Springs Hatchery to the Yankee Fork release site is over 200 miles and could take four to five hours. Depending on weather and road conditions this trip could take longer.

### *Adult*

Adults are transported using a 300 gallon tank mounted on a three-quarter ton truck. The tank has one compartment of 300 gallon capacity and was modified to include an oxygen tank, diffuser, and circulating pump. The tank is filled with water pumped directly from Yankee Fork. Normal hauling guidelines were followed for adult fish, which is approximately one pound of fish per gallon of water.

### *Eggs*

Eggs will be placed in individual containers to maintain separation from other female eggs. Containers will be placed in 80 quart sealed, insulated coolers for transportation. Ice is added to each cooler to keep eggs chilled during transport.

## **5.3 BROODSTOCK HOLDING AND SPAWNING FACILITIES.**

Section 5.1 describes the trapping, broodstock holding, and spawning facilities.

## **5.4 INCUBATION FACILITIES.**

Incubation of YFCSS progeny will occur at Sawtooth Fish Hatchery and Crystal Springs Fish Hatchery.

### *Sawtooth Fish Hatchery*

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

### *East Fork Salmon River Satellite*

Spawning of YFCSS broodstock occurs at the East Fork Satellite but no incubation occurs at this facility. Eggs are transferred to the Sawtooth Fish Hatchery for incubation.

### *Crystal Springs Fish Hatchery*

Eggs will be loaded into heath tray incubators. A total of 328 trays stacked 8 high, a total of 47 stacks, will be required for the Yankee Fork and Panther Creek programs.

Both chilled and ambient groundwater will be provided to each incubator. It is anticipated that the supply water will be chilled to approximately 40° F for the duration of the incubation period, slowing fish development in order to achieve the target size by the release date.

A hard-piped chemical feed system will be used to deliver daily argentine or formalin treatments to each incubator stack to prevent fungus growth on the eggs. Overflow water from the incubators will fall through gratings into floor trenches that convey the water into the hatchery drain system. Adequate dilution flow will be maintained through the hatchery drain system avoid exceeding chemical concentration limits in the hatchery outfall.

## 5.5 REARING FACILITIES.

Rearing of YFCSS progeny will occur at Sawtooth Fish Hatchery and Crystal Springs Fish Hatchery.

### *Sawtooth Fish Hatchery*

**Inside Rearing** - Inside rearing is provided to rear newly hatched juveniles to the fry stage. Inside rearing consists of three semi-square tanks with an individual volume of 17 cubic feet and a capacity of 15,000 swim up fry each; four inside rearing tanks with an individual volume of 90 cubic feet and a capacity for 50,000 fry each; and 14 inside rearing vats with an individual volume of 391 cubic feet and a capacity of 100,000 fry each. Inside rearing capacity equals 1,545,000 fry, however there are six additional fry raceways each with 1,500 cubic feet of rearing space.

**Outside Rearing** - Outside rearing is provided to rear fry to smolt, however as mentioned above there are 12 fry raceways. Sawtooth has 14 production raceways each with 5,400 cubic feet of rearing space. Both outside fry and production raceways have the capability of being split. Each production raceway has a capacity to raise 200,000 Chinook fry to the smolt stage for a total design capacity of 2.8 million smolts.

### *Crystal Springs Fish Hatchery*

**Early rearing** - Beginning in March, swim up fry will be transferred into early rearing troughs located in a 60- by 132-foot room adjacent to the incubation area. The troughs will be 40-foot long, 4-foot wide, and 2.75-foot deep fiberglass vessels, configured in pairs, with narrow access aisles between each pair. Pathogen-free groundwater will be supplied to the upstream end of each rearing trough through a valved connection for flow control. Typical flow rates to each trough will be 84 gpm (37 minute turnover), at an average temperature of 10°C. Each trough will have screens for segregating and retaining batches of fish, and stop logs or standpipes for water level control. Fish will be reared in these troughs until late July or early August, when they will be marked and transferred into the outdoor rearing ponds. The target size range for transfer is 150 to 200 fish per pound.

**Outdoor rearing** - The outdoor ponds used for juvenile rearing will be constructed of cast in place concrete, with inlet, outlet and intermediate screens to retain and segregate fish, and stop logs to control water level. A total of 2 ponds are required to meet the production goal of 400,000 smolts at 10 fish per pound. The ponds will be arranged in a row, with a fifteen-foot-wide access aisle between them. The rearing area of each raceway will be 100 feet long, 25 feet wide, with an average water depth of 5 feet, and a volume of 12,500 cubic feet. A 10-foot-long quiescent zone will be provided at the downstream end of each raceway to allow settleable solids to separate from the water column. The floor slab in front of the quiescent zone will have a recessed floor that can be used as a kettle during fish transporting operations.

Up to 1,870 gallons per minute of groundwater will be supplied through a manifold to the upstream end of each pond via a 12-inch valved connection (50 minute turnover). Water level in each pond will be controlled by stop log weirs, positioned across the full width of the pond in order to reduce dead spots and provide good circulation through the entire pond. The overflow water from each pond will be piped into a common drain that discharges into the wetland ponds

to the south. A separate cleaning waste vacuum piping system will be used to collect settled solids for each raceway and convey the concentrated wastes to an off-line settling pond.

## **5.6 ACCLIMATION/RELEASE FACILITIES.**

Acclimation facilities for the YFCSS have not been constructed. Pond Series 1 will be used as an acclimation site, with some modifications. The Tribes plan to release Chinook salmon smolts in the mainstem Yankee Fork near Jordan Creek or in the Pond Series (Table 4). The site below Jordan Creek was used to release BY04 Chinook salmon smolts and significant adults returned, indicating successful imprinting. Pond Series 1 and 4 have been used to release BY01 – 08 summer steelhead smolts and adults have successfully returned from these release points. The Tribes will experiment with direct stream vs. partial acclimation releases to determine whether acclimation is necessary. We plan to release 50% of the smolts in the stream and 50% in Pond Series 1 for a period of four generations or until enough information is acquired to determine the best management strategy.

New juvenile stress relief site(s) on Yankee Fork are in the planning process by the Shoshone-Bannock Tribes. Much of the highest quality spawning habitat in the Yankee Fork is located upstream of the dredged reach (Richards and Cenera 1989), above the Jordan Creek confluence. It is desirable to release the hatchery-origin smolts as high in the watershed as possible since there is evidence that returning adults tend not to migrate above the acclimation site from which they were released (pers. comm., A. Appleby, DJ Warren Associates, 2010).

There are some access and water right challenges to overcome for the preferred acclimation reaches. The various off-channel ponds in the dredged reach suitable for acclimation are privately owned and may not be available unless agreements are reached with the land owner. Vehicle access to upstream sites in the late April out-planting period is variable; the Yankee Fork Road is plowed up to the Town of Custer, at approximately river mile 9.9. This leaves a 1.5-mile reach of Forest Service land between the Jordan Creek confluence and Custer that may be available and appears to be an ideal location for temporary acclimation facilities. Preliminary investigations indicate that it should be feasible for the Tribes to obtain a non-consumptive water right for diversion of Yankee Fork flow through the proposed juvenile stress relief ponds.

The Tribes may also experimentally use portions of Pond Series 1 as juvenile stress relief ponds. The outfall from this pond series is 0.25-mile upstream of the Pole Flat weir site, relatively low in the watershed. The upper ponds of the series are located on private property; only the downstream-most pond is on Forest Service property. If permission can be acquired, the primary improvements to these ponds will be to construct outlet control structures and perhaps some deepening and widening of the lower pond.

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

There has been no significant fish mortality associated with the YFCSS project.

The Crystal Spring Hatchery is in the planning stages and has not experienced any fish mortality.

## **5.8 INDICATE AVAILABLE BACK-UP SYSTEMS, AND RISK AVERSION**

**MEASURES THAT WILL BE APPLIED, THAT MINIMIZE THE  
LIKELIHOOD FOR THE TAKE OF LISTED NATURAL FISH THAT MAY  
RESULT FROM EQUIPMENT FAILURE, WATER LOSS, FLOODING,  
DISEASE TRANSMISSION, OR OTHER EVENTS THAT COULD LEAD  
TO INJURY OR MORTALITY.**

*Sawtooth Fish Hatchery*

Sawtooth Fish Hatchery is staffed around the clock and equipped with an all-purpose alarm system. Generators are in place for emergency water supply. The inside vat room can be switched to gravity flow with river water in the event of a generator failure. Appropriate protocols are in place for emergency situations and methods for disinfection.

*East Fork Salmon River Satellite*

The East Fork Satellite will be staffed with either IDFG or Tribal personnel. The adult holding ponds are fed with direct stream water and the intake will be cleaned on a daily basis to ensure proper function.

*Pole Flat and Five Mile Weirs*

The Tribes will staff employees in Yankee Fork to ensure safe operations for adult Chinook salmon. Adults will be sorted daily as early as 9:00 am when the sun rises above the eastern mountains and daily migration is slowed.

*Crystal Springs Fish Hatchery*

The Crystal Springs Hatchery will have about two to three FTE permanent staff members that live on station and cover shifts for alarm duties and other production checks, and up to three FTE temporary staff for various seasonal fish culture duties. An alarm system will be installed that will alert staff to low water and water temperatures outside of the accepted range. Artesian wells equipped with pumps will each have generator back-up in case of power failure. The water system will be integrated so that any well can provide water to all parts of the facility. Artesian water flow can be supplied to rearing units in the case of complete power/generator failure.

## **SECTION 6. BROODSTOCK ORIGIN AND IDENTITY**

Describe 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.**

The YFCSS project has integrated broodstock from Sawtooth Fish Hatchery with natural-origin Chinook salmon in the Yankee Fork. In BY08-09, broodstock was collected at Sawtooth to

achieve the smolt release target of 400,000 smolts. In BY10 and beyond, broodstock will be collected at either Yankee Fork or Sawtooth, depending upon adult returns. If sufficient numbers of natural-origin adults return to Yankee in 2010, then natural-origin Yankee Fork adults will be collected for broodstock. Beginning in brood year 2012 and then after, broodstock collection with transition to the integrated Yankee Fork source and no adults will be collected for broodstock at Sawtooth.

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

## **6.2 SUPPORTING INFORMATION.**

### **6.2.1 History.**

Yankee Fork Salmon River is located within the boundaries of the Salmon-Challis National Forest in Custer County, Idaho. Yankee Fork is a fourth field HUC watershed and a major tributary of the Salmon River.

Historically, the Yankee Fork drainage was a main supply source of anadromous fish, composed primarily of Chinook salmon and steelhead trout. Runs of these species have been drastically reduced due to a combination of downstream hydroelectric developments and localized mining activities (Reiser and Ramey 1987). Mining has resulted in stream re-channeling, deposition of extensive amounts of dredge piles, and degraded rearing and spawning habitat in lower Yankee Fork.

Generally, spring Chinook would historically enter the Columbia River during March – May and spawn in the Yankee Fork in August and September (Bjornn 1960). Currently, the diminished run of Chinook salmon in the upper Salmon River and Yankee Fork has dramatically reduced an important subsistence and ceremonial fishery for the Shoshone-Bannock Tribes.

Redd counts have consistently declined from a high of 600 for the whole drainage in 1967 (Konopacky et al. 1986). In the mid-1980's, redd counts were zero for upper Yankee Fork (Pollard 1985) and 10 for the entire region (Konopacky et al. 1986). From 2000 – 2004, redd counts averaged 80 per year (Ray unpublished data) resulting in only 200 estimated adults (2.5 spawners/redd) and 48,600 estimated smolts (243 smolts/redd).

### **6.2.2 Annual size.**

Approximately 120 Chinook salmon are needed to meet the current production objective of releasing 200,000 yearling smolts into the Yankee Fork Salmon River. When Crystal Springs Fish Hatchery become operational, the size of the smolt release will be re-visited. It is estimated 358 adults will be required to produce 600,000 smolts.

### **6.2.3 Past and proposed level of natural fish in broodstock.**

There have been no broodstock collected for the YFCSS program in the Yankee Fork to date. In 2008 and 2009, the Tribes and IDFG planned to collect broodstock from the Yankee Fork, however enough hatchery adults were trapped at Sawtooth Fish Hatchery to meet the smolt release targets and adults collected in the Yankee Fork were released for natural spawning. Once we achieve an integrated broodstock in BY12, the Tribes will collect natural-origin adults and manage PNI above 30%.

### **6.2.4 Genetic or ecological differences.**

Annual hatchery-produced populations and source populations are genetically similar. Since YFCSS broodstock will be obtained at the Yankee Fork weir, there should not be any genetic or ecological differences in populations.

### **6.2.5 Reasons for choosing.**

The upper Salmon River endemic spring Chinook stock was selected for the YFCSS program. This population is available and poses the least amount of risk to other upper Salmon River stocks.

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

Artificial selection is difficult to avoid while restoring a diminished natural population. Pending returning run sizes, goals are in place to manage broodstock collection and mainstream spawning populations for 0.3 PNI.

## **SECTION 7. BROODSTOCK COLLECTION**

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

#### *Adults*

General production adults (hatchery x hatchery) will be released for natural spawning as well as collected at Sawtooth Fish Hatchery for smolt production to be released in Yankee Fork in BY 08-11. Beginning in 2012, adult returns to Yankee Fork will be collected (up to 120) to produce the 200,000 smolt component for Sawtooth Hatchery. Once adults return to Yankee Fork in greater numbers and Crystal Springs Hatchery is complete, adult crosses (wild x wild; wild x hatchery, hatchery x hatchery) will be collected at random, held and spawned to produce a 600,000 smolt release into the Yankee Fork Salmon River.

### **7.2 COLLECTION OR SAMPLING DESIGN.**

Adults captured at the weir will be sampled and information will be recorded: time, date, location, length, gender, origin, marks, and tags. Broodstock will be randomly collected throughout the entire run to alleviate artificial selection. Guidelines for sampling are as follows:

1. Weir installed yearly at earliest possible safe flow levels.
2. Adequate personnel will be present at all times for proper weir and trap operation.
3. Broodstock collected over entire run.
4. 358 adults collected dependent upon SAR average.
5. Surplus H x W adults released to spawn naturally.
6. Adults sampled for DNA typing and parentage analysis.

### **7.3 IDENTITY.**

Only one spring Chinook salmon population is recognized in Yankee Fork. Hatchery produced adults will be identified by PIT tags, coded-wire tag, or tissue sampling. Adults without marks will be deemed NOR.

### **7.4 PROPOSED NUMBER TO BE COLLECTED:**

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

Approximately 358 adult spring Chinook salmon are needed annually to achieve a smolt release objective of 600,000 smolts.

#### **7.4.2 Broodstock collection levels for the last twelve years (e.g. 1988-**



## **99), or for most recent years available:**

No broodstock from Yankee Fork has been collected under the YFCSS program. Sawtooth FH broodstock was used to produce 135,934 smolts for release in 2006 into Yankee Fork. Broodyear 2008 and 2009 Sawtooth FH origin adults were outplanted in upper Yankee Fork for natural spawning.

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

Up to 1,500 hatchery-origin fish will be released above the Yankee Fork weir for natural spawning in years 2008 – 2011 (surplus from Sawtooth Hatchery). All collected fish in excess of the number required for broodstock purposes will be immediately released above the Yankee Fork weir for natural spawning.

## **7.6 FISH TRANSPORTATION AND HOLDING METHODS.**

The YFCSS project transports adult spring Chinook salmon from Yankee Fork weir to 1) East Fork Salmon River satellite facility or 2) SFH adult holding facility. Adults are transported using a 300 gallon tank mounted on a three-quarter ton truck. The tank has one compartment of 300 gallon capacity and was modified to include an oxygen tank, diffuser, and circulating pump. The tank is filled with water pumped directly from Yankee Fork. Normal hauling guidelines were followed for adult fish, which is approximately one pound of fish per gallon of water. Adult holding and spawning facilities will be designed for the Yankee Fork, likely at a site near the confluence with Jordan Creek. Smolt transfer from SFH and Crystal Springs Fish Hatchery to Yankee Fork will occur by tanker truck. The adult holding pond will also be used for juvenile fish stress relief.

## **7.7 DESCRIBE FISH HEALTH MAINTENANCE AND SANITATION PROCEDURES APPLIED.**

YFCSS fish health maintenance, monitoring, disease control, and sanitation will conform to the protocols and procedures of the Sawtooth Fish Hatchery under the Idaho Department of Fish and Game.

### *Adults*

Adults will initially be inspected for any external fungi, which is a possible sign of ectoparasitic infestation. Samples for viral, bacterial, and parasitic disease agents will be taken at spawning. Viral assays are conducted on ovarian fluid and kidney samples from a number of spawned females characteristic of the broodstock are analyzed in bacterial assays. Whirling disease will be tested for by obtaining head wedges from a proportion of the spawning broodstock.

### *Eggs*

After fertilization and before being placed in incubation trays, eggs are rinsed in pathogen free water and cleansed with a 100 parts per million (ppm) buffered iodophor solution for one hour.

### *Pre-spawn Mortalities*

Necropsies are conducted based on the guidelines by the Idaho Department of Fish and Game.

## **7.8 DISPOSITION OF CARCASSES.**

Adult holdings will be checked once an hour on a daily basis by trap tenders. Mortalities will be removed and data will be collected on date, time, sex, cause of death (if known), and body condition. Biological samples will be collected and placed in proper containers for later analysis. Mortalities will then be spread across the spawning habitat to help replenish depleted marine nutrients in the system.

## **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.**

Broodstock collection for the YFCSS program will comply with an issued ESA section 10 permit, IDFG, and mitigation and supplementation guidelines and goals. Natural spawning production and escapement will take priority over hatchery broodstock retention. For any returning run size, there will be a minimum number of adults released above the weir for natural spawning. Disease transfer will be controlled by a systematic health monitoring and evaluation program for all age classes used in the YFCSS.

# **SECTION 8. MATING**

*Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.*

## **8.1 SELECTION METHOD.**

Two groups of Chinook salmon will be collected at the YFCSS weir: NOR and HOR. Naturally spawned adults will not be marked. Hatchery origin adults will be PIT tagged and/or coded-wire tagged. Broodstock will be collected at random over the entire time frame of returning adults at approximately a 1:1 ratio (males: females).

## **8.2 MALES.**

Males will only be spawned once. In cases of unequal broodstock collection, male holding mortality exceeds female, or late male maturation, males may be spawned twice.

## **8.3 FERTILIZATION.**

Spawning will occur by single pair mating (1:1 male to female spawning). Backup males will be retained to ensure fertilization. Excess males will be held over for the next spawning date or be segregated for gamete cryopreservation.

## 8.4 CRYOPRESERVED GAMETES.

The Tribes strive to ensure availability of a representative genetic sample of original male population by establishing and maintaining a germplasm repository. Gamete cryopreservation permits the creation of a genetic repository, but is not a cure for decreasing fish stock problems. Gamete samples will be collected and shipped to storage facilities for genetic processing within 24 hours.

Milt will be cryopreserved from transported broodstock NOR males for future spawning. Also, milt will be cryopreserved from adults captured during the second peak (assuming there is a bi-modal distribution) of migration when spawning is occurring.

## 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.

Single pair mating will limit apparent artificial selection by randomly selecting a male to fertilize a “ripe” female. Random backup males will be present to ensure fertilization and also increase genetic diversity through potential use of multiple males. Disease control mechanisms are in place to limit the incidence of BKD and fungus related mortality. In addition, cryopreserved milt will be used to maximize NOR genetic diversity in YFCSS program.

# SECTION 9. INCUBATION AND REARING -

*Specify any management goals (e.g. “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data 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.

YFCSS integrated broodstock has not been collected and, consequently, survival rates between life stages have yet to be determined. The YFCSS program anticipates survival rates to be similar to those at SFH. SFH green-egg to eyed-egg survival for broodyears 1986 – 2003 is reported below in Table 12 (SFH Reports 1986-03).

**Table 12. Sawtooth Fish Hatchery gamete survival for broodyears 1986-2003 (SFH Reports 1986-2003).**

Broodyear	Green Eggs Taken	Eyed-eggs	Survival to Eyed Stage (%)
1986	2,035,535	1,870,306	91.9

Broodyear	Green Eggs Taken	Eyed-eggs	Survival to Eyed Stage (%)
1987	2,721,399	2,533,640	93.1
1988	3,120,669	2,846,235	93.1
1989	733,365	668,373	91.1
1990	1,431,360	1,346,350	94.1
1991	922,000	794,800	86.2
1992	468,300	423,600	90.5
1993	369,340	341,641	92.5
1994	29,933	26,232	87.6
1995	7,377	4,977	68.0
1996	51,743	45,128	87.0
1997	260,480	231,827	89.0
1998	139,469	129,593	93.0
1999	63,642	59,373	93.3
2000	454,355	420,733	92.6
2001	1,529,051	1,371,733	89.7
2002	1,037,558	920,651	88.7
2003	174,575	145,744	83.5

### 9.1.2 Cause for and disposition of surplus egg takes.

The YFCSS does not consider excess amounts of eggs, parr, or smolts as useless/expendable “surplus.” Excess eggs, parr, or smolts will be outplanted in Yankee Fork if survival rates are exceeded between life stages or fecundity is elevated.

### 9.1.3 Loading densities applied during incubation.

#### *Sawtooth Fish Hatchery*

Eight trays will be used per stack of vertical incubation units. Flows to each eight tray stack will be between five to six gallons per minute (gpm). Trays will be loaded with eggs (3,000 – 5,000) from only one female.

#### *Crystal Springs Fish Hatchery*

Eggs will be loaded into heath tray incubators at 4,000 eggs per tray. Pathogen-free groundwater will be provided at a flow rate of 5 gpm to each stack. The total incubator water budget is approximately 235 gpm.

### 9.1.4 Incubation conditions.

Incubation for the YFCSS will occur at both the Sawtooth Fish Hatchery and the Crystal Springs Fish Hatchery. During all incubation periods and processes at Sawtooth, pathogen-free well water is used. Catch basins are in place to eliminate the accumulation of silt and sand within the

trays. After 48 hours, formalin treatments (1667 ppm) are issued three times per week to control fungal contamination and are discontinued when eggs reach eye-up. Eyed egg stage is generally reached at 560 FTUs at which eggs are then shocked to locate and remove dead or unfertilized eggs.

At Crystal Springs, eggs will be delivered between August and September. After fertilization, eggs will be water hardened in iodophor and then loaded into heath tray incubators at approximately 4,000 eggs per tray (each tray containing eggs from individual females). They will be maintained this way until the results of any disease screening are complete. Excess iodophor will be disposed of by land application or stored in a pump-out tank for periodic remote disposal.

Pathogen-free groundwater will be provided at a flow rate of 5 gallons per minute to each stack. A total of 41 stacks (25 for Yankee Fork and 16 for Panther Creek) will be supplied with 205 gallons per minute. A smaller separate quarantine incubation room will be provided for research and experimental egg handling operations. Both chilled and ambient groundwater will be provided to each incubator. It is anticipated that the supply water will be chilled to approximately 40° F for the duration of the incubation period, slowing fish development in order to achieve the target size by the release date.

A hard-piped chemical feed system will be used to deliver daily argentine or formalin treatments to each incubator stack to prevent fungus growth on the eggs. Overflow water from the incubators will fall through gratings into floor trenches that convey the water into the hatchery drain system. Adequate dilution flow will be maintained through the hatchery drain system avoid exceeding chemical concentration limits in the hatchery outfall.

### **9.1.5 Ponding.**

**Sawtooth Fish Hatchery** - Ponding occurs once majority of fish reach swim-up stage at approximately 1,650 FTUs.

**Crystal Springs Fish Hatchery** - Swim up fry will be transferred from incubators to early rearing troughs beginning in March. Troughs are expected to be 40-foot long, 4-foot wide and 2.75-foot deep fiberglass vessels, configured in pairs, with narrow access aisles between each pair. Other styles of troughs will be evaluated during the preliminary design phase. Pathogen-free groundwater will be supplied to the upstream end of each rearing trough through a valved connection for flow control. Typical flow rates to each trough will be 60- 84 gallons per minute (37 minute turnover), at an average temperature of 10° C. Each trough will have screens for segregating and retaining batches of fish, and stop logs or standpipes for water level control. A grated floor trench will run the length of the room at the downstream end of the troughs to collect overflow/drain water and route it into the hatchery drain pipe system. A cleaning waste drain pipe will be routed inside the floor trench to collect and convey vacuumed cleaning wastes to an off-line settling basin.

In late July, juveniles will be transferred from the early rearing troughs to the outdoor rearing ponds. The target size range for transfer is 150 to 200 fish per pound.

The outdoor ponds used for juvenile rearing will be constructed of cast in place concrete, with inlet, outlet and intermediate screens to retain and segregate fish, and stoplogs to control water

level. Five ponds will be required to meet the production goal of one million smolts at 10 fish per pound. The ponds will be arranged in a row, with a 15-foot-wide access aisle between them. The rearing area of each raceway will be 100 feet long, 25 feet wide, with an average water depth of 5 feet, and a volume of 12,500 cubic feet. A 10-foot-long quiescent zone will be provided at the downstream end of each raceway to allow settleable solids to separate from the water column. The floor slab in front of the quiescent zone will have a recessed floor that can be used as a kettle during fish transporting operations.

Up to 1,870 gallons per minute of groundwater will be supplied through a manifold to the upstream end of each outdoor pond via a 12-inch valved connection (50 minute turnover). Water level in each pond will be controlled by stoplog weirs, positioned across the full width of the pond in order to reduce dead spots and provide good circulation. The overflow water from each pond will be piped into a common drain that discharges into the wetland ponds to the south. A separate cleaning waste vacuum piping system will be used to collect settled solids for each raceway and convey the concentrated wastes to an off-line settling pond.

#### **9.1.6 Fish health maintenance and monitoring.**

At Sawtooth, eggs will be treated with a formalin solution (1667 ppm) three times per week to control fungal growth. Formalin treatments will be administered until the eggs reach the eyed-up stage. Shocking will be conducted around 560 FTUs. Dead and undeveloped eggs will be removed by an automatic egg picking machine. Good eggs will be electronically counted and returned to the same tray and stack location. Additional egg picks are conducted to remove any uncollected dead eggs. Tray lids and screens will be cleaned during each egg picking event.

After fertilization at Crystal Springs, eggs will be water hardened in iodophor and loaded into tray incubators. Each tray will contain eggs from an individual female and will be maintained this way until the results of any disease screening are complete. A hard-piped chemical feed system will be used to deliver argentine or formalin treatments to each incubator on a daily basis to prevent fungus growth on the eggs.

#### **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 expected. Density dependent mortality and disease transmission will be countered by placing female eggs in separate trays. Eggs are treated with formalin (1667 ppm) and water hardened in a 100 ppm Iodophor solution for 30 minutes following fertilization. Alarms and sensors are in place for low pressure and water levels.

## 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 (1988-99), or for years dependable data are available.

YFCSS program rearing will occur at the Sawtooth and Crystal Springs Fish Hatcheries. The YFCSS program expects rearing survival data to be similar to those of SFH. Survival data is presented below in Table 13 (SFH Reports 1986 – 03).

**Table 13. Sawtooth Fish Hatchery gamete rearing efficiency for 1986-2003.**

BY	Eyed-Eggs	Ponded Fry	% Survival from Eye	Smolts Released	% Survival from Eyed to Release
1986	1,870,306	1,821,872	97.4	1,705,500	91.2
1987	2,533,640	2,487,500	98.2	2,338,244	92.3
1988	2,846,235	2,818,312	99.0	2,541,500	89.3
1989	668,373	667,900	99.9	652,600	97.6
1990	1,346,350	1,316,048	97.7	1,273,400	94.6
1991	794,800	793,908	99.9	774,583	97.5
1992	423,600	441,812	NA	213,830	50.5
1993	341,641	341,252	99.9	334,313	97.9
1994	26,232	25,632	97.7	25,006	95.3
1995	4,997	4,914	98.3	4,756	95.2
1996	45,128	44,600	98.8	43,161	95.6
1997	231,827	228,997	98.8	223,240	96.3
1998	129,593	127,064	98.0	123,425	95.2
1999	59,373	59,111	99.6	57,134	96.2
2000	420,733	402,777	95.7	385,761	91.7
2001	1,371,133	1,213,215	88.5	1,105,169	80.6
2002	920,651	879,040	95.5	821,415	89.2
2003	145,744	136,830	93.9	134,769	92.5

### 9.2.2 Density and loading criteria (goals and actual levels).

Following the conclusions of Piper et al. (1982) and operations at Sawtooth Fish Hatchery, density and flow indices are monitored to never exceed 0.30 and 1.5, respectively.

Crystal Springs is expected to operate at a density index of 0.23 and a flow index of 1.50-1.52.

### 9.2.3 Fish rearing conditions

**Sawtooth Fish Hatchery** - Swim-up fry are transferred to vats around 1,650 FTUs. Flows range

between 20 and 110 gpm, increasing as fish grow. Water temperature ranges from 4.4 to 7.8°C and is supplied from pathogen-free wells. Outside raceways are supplied with river water ranging from 1.1 to 16.0°C. Spring Chinook are relocated outside at approximately 7.6 mm. Flows and raceway size sections are proportionately increased as fish grow.

**Crystal Springs Fish Hatchery** - Swim-up fry will be transferred from incubation trays to indoor early rearing troughs beginning in March at approximately 0.33 grams. Initial flows in the troughs will be typically set at approximately 60 gpm per trough. As fish grow, flows may be increased. All water to the troughs will be pumped well water. Water temperature during rearing is expected to be a constant 40°F.

Juveniles will be transferred to the outdoor rearing ponds when they reach approximately 150 to 200 fish per pound (approximately 2.70 grams). The rearing ponds will be supplied by pumped well water. Initial pond flows will be set at approximately 1,870 gallons per minute of groundwater. Water temperatures are expected to be a constant 40°F.

#### **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.**

Average length, mass, fish/pound, and condition factor for Chinook salmon at ponding, vat to raceway, and release is presented in Table 14. Length, mass, and condition factor are calculated from the fish per pound value.

**Table 14. Average size by period for Chinook salmon reared at SFH.**

Time Period	Length (mm)	Mass (g)	Fish/lb	Condition Factor
Ponding	35	1.27	1,200	3.00
Vat to Raceway	76	14.27	130	3.25
Release	140	96.04	15	3.50

Modeled growth rates of Chinook reared at Crystal Springs can be found in Table 15.

**Table 15. Expected monthly length and mass of Chinook salmon reared at Crystal Springs Hatchery.**

Month	Length (inches)	Weight (grams)
April	1.3	0.3
May	1.77	0.76
June	2.24	1.52
July	2.72	2.72
August	3.19	4.4
September	3.66	6.7
October	4.13	9.6
November	4.61	13.3
December	5.08	17.8
January	5.55	23



February	6.02	29.6
March	6.50	37.5
April	6.97	45

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

See Section 9.2.4 above.

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

Crystal Springs Hatchery is expected to operate similarly to Sawtooth Fish Hatchery. Feeding operations at Sawtooth Hatchery are described here: All fry are started on BioProducts Bio-Diet starter feed # 2 and #3. Fish are initially fed by hand. Once a response is seen, feeding commences with an automatic belt feeder or by hand. Feed amounts and sizes will vary depending on the manufacturer recommendations as fish grow (Table 16). BioProducts grower feed is administered once fish are transferred to outside raceways.

**Table 16. Fish/pound, % body weight fed, feed size and term in culture information.**

Fish/pound	% Body weight fed/day	Feed Size	Term in culture
Swim-up to 800 fpp	3.5	#2/#3 starter	Nov. – Jan.
800 – 500	3.3	#3 starter	Jan. – Feb.
500 – 400	2.5	1.0 mm	Feb. – March
400 – 350	2.5	1.0/1.3 mm	March – April
350 – 300	2.3	1.3 mm	April
300 – 250	2.2	1.3 mm (med) <sup>1</sup>	May – June
250 – 150	2.4	1.5 mm	June
150 – 110	2.4	1.5 mm	June – July
110 – 90	2.5	1.5 mm	July – August
90 – 50	2.2	2.5 mm	August – Sept.
50 – 17	2.0	2.5 mm	Sept – Oct.
17 to release	maintenance	3.0 mm (med) <sup>1</sup>	Oct. – release

<sup>1</sup>Medicated feed

### **9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.**

Hatcheries could potentially introduce diseases into the natural environment. Disposal of wastes

or pathogen-contaminated water elevates the risk for fish to contract diseases. The IDFG fish health staff will conduct scheduled inspections and random ones if necessary. Individuals may be given injections of Erythromycin-200, oxytetracycline, or other prophylactic treatments to counter specific diseases; however consideration to Tribal fisheries will dictate treatments. During rearing, juveniles will be fed two meals of medicated feed. Disinfection protocols for foot baths, equipment, trucks, vats, raceways, and nets are in place for sanitation purposes.

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

Not Applicable.

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

Not Applicable. Currently, the LSRCF is conducting ongoing Hatchery Evaluation Studies on this subject.

### **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.**

Proper disinfection procedures, antibiotic treatments, and egg culling criteria will be used to limit the spread of disease. Fish observation and raceway cleaning will be conducted on a regular basis. Artificial selection should be limited by rearing juveniles consistent with natural conditions.

## **SECTION 10. RELEASE**

*Describe fish release levels, and release practices applied through the hatchery program.*

### **10.1 PROPOSED FISH RELEASE LEVELS.**

**Table 17. Proposed release number and size for the YFCSS.**

Age Class	Maximum Number	Size (fpp)	Release Date	Location	Rearing Hatchery
Eggs					
Unfed Fry					
Fry					
Fingerling					
Yearling	600,000	9-10 FPP	4/1-5/30 Annually	Yankee Fork	Crystal Springs

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

Stream, river, or watercourse: Yankee Fork  
Release point: Eightmile or Jordan Creek Confluence & Pond Series  
1 and/or 4  
Major watershed: Yankee Fork Drainage of the Salmon River  
Basin or Region: Salmon River Basin

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

In 2006, 135,934 smolts were released in Yankee Fork. In 2010, 400,000 smolts were released. Prior releases by the IDFG are also included in the Table 18.

## 10.4 ACTUAL DATES OF RELEASE AND DESCRIPTION OF RELEASE PROTOCOLS.

Yankee Fork has a long history of artificial production (Table 10). With no long-term monitoring and evaluation little information exists on the effects of NOR population as a result of artificial production. Further information is presented below in Table 18 on release year, hatchery, life stage, and date of release for Yankee Fork.

YFCSS salmon will be released in the month of April coinciding with changes in length of day, discharge, temperature and noticeable physiologically and morphological changes of smolt. Generally, in the third week of April there is a noticeable physiological change in the fish. Fish will be allowed to volitionally emigrate. Those fish that choose not to leave will be forced from the truck.

**Table 18. Yankee Fork Chinook salmon artificial propagation history 1977-2010.**

Brood Year	Release Year	Number	Location	Stock	Size	fish/lb	Hatchery
	1977	56,700	WFYK	Rapid River	fry-fingerling		Mackay
	1978	75,036	Yankee Fork	Rapid River	fry-fingerling		Mackay
	1985	61	Yankee Fork	Sawtooth	adult		Sawtooth
	1985	659	Yankee Fork	Rapid River	adult		Pahsimeroi
	1986	61	Yankee Fork	Sawtooth	adult		Sawtooth
	1986	1,505	Yankee Fork	Rapid River	adult		Pahsimeroi
	1986	386,348	Yankee Fork	Rapid River	fry-fingerling		Pahsimeroi
	1987	157,877	Yankee Fork	Rapid River	fry-fingerling		Sawtooth

Brood Year	Release Year	Number	Location	Stock	Size	fish/lb	Hatchery
	1987	600	Yankee Fork	Rapid River	adult		Pahsimeroi
1986	1987	158,000	Yankee Fork Ponds	Salmon R.	pre-smolt	250	Sawtooth
1986	1988	725,500	Yankee Fork Ponds	Pahsimeroi	smolt	20	Sawtooth
1987	1988	50,100	Yankee Fork Ponds	Rapid River	fry-fingerling	120	Sawtooth
1987	1989	198,200	Yankee Fork Ponds	Salmon R.	smolt	24	Sawtooth
1988	1989	125,000	Yankee Fork Ponds	Salmon R.	fry-fingerling	100	Sawtooth
1988	1990	200,800	Yankee Fork Ponds	Salmon R.	smolt	21	Sawtooth
1989	1990	50,000	Yankee Fork Ponds	Rapid River	fry-fingerling	100	Yakima
1989	1990	491,300	Yankee Fork	Salmon R.	smolt	45	Sawtooth
1989	1990	50,000	Yankee Fork Ponds	Salmon R.	fry-fingerling	111	Sawtooth
1990	1991	50,000	Yankee Fork Ponds	Rapid River	fry-fingerling	120	Sawtooth
	1994	25,025	WFYF	Sawtooth	smolt		Sawtooth
2004	2006	135,934	Yankee Fork	Sawtooth	smolt	21.3	Sawtooth
	2008	1,438	Yankee Fork	Sawtooth	adult		Sawtooth
2008	2010	403,939	Yankee Fork	Sawtooth	smolt		Sawtooth
	2009	1,517	Yankee Fork	Sawtooth	adult		Sawtooth
2009	2009	481,717	Yankee Fork	Sawtooth	eyed-eggs		Sawtooth

## 10.5 FISH TRANSPORTATION PROCEDURES, IF APPLICABLE.

See section 5.2.

## 10.6 ACCLIMATION PROCEDURES (METHODS APPLIED AND LENGTH OF TIME).

All spring Chinook salmon juveniles at SFH are reared on river water. Smolts released into Pond Series 1 and/or 4 will be allowed to volitionally emigrate into the main stem after several days of acclimation. Smolts released at Jordan Creek or Eightmile confluence will be direct stream releases.

New acclimation site(s) on Yankee Fork are being developed by the Shoshone-Bannock Tribes for the Crystal Springs Hatchery program. Much of the highest quality spawning habitat in the

Yankee Fork is located upstream of the dredged reach (Richards and Cenera 1989), above the Jordan Creek confluence. It is desirable to release the hatchery-origin smolts as high in the watershed as possible since there is evidence that returning adults tend not to migrate above the acclimation site from which they were released (pers. comm., A. Appleby, DJ Warren Associates, 2010).

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

All smolts released in Yankee Fork will be CWT, without adipose fin clips. With respect to BY 08 and 09 approximately 400,000 smolts were released annually with 50% of these smolts receiving adipose fin clips. Beginning in 2010, the smolt release target was 200,000 smolts, with intact adipose fins. The goal of the YFCSS is to return fish for population recovery and harvest. Generally, fish intended for harvest interception are marked with an adipose fin clip. Adipose fin clipping Yankee Fork juveniles could, and probably will, further decrease smolt to adult return rates due to sport fisheries in other regions.

Passive integrated transponders (PIT tags) will be injected into a proportion of juveniles prior to release to monitor survival and dispersal to Lower Granite Dam by using the SURPH model. PIT tags will also provide ability to predict annual returns and allow the YFCSS to develop annual spawning and harvest plans. Tissue samples will be collected from parent broodstock to generate a genetic parental assignment database.

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

Excess smolt production above the program goal will be released into the Yankee Fork. If hatchery operations are negatively affected due to increased densities, a randomly selected proportion of eggs or parr will be released into Yankee Fork.

## **10.9 FISH HEALTH CERTIFICATION PROCEDURES APPLIED PRE-RELEASE.**

Testing for bacterial kidney disease, whirling disease, and viral replicating agents will be conducted under the Idaho Fish and Game Eagle Fish Health Laboratory between 45 and 30 days prior to release to obtain fish health certification.

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

The YFCSS will follow the emergency release procedures and protocols developed for the Crystal Springs FH.

### *Crystal Springs*

Artesian pressure is sufficient to deliver some of the required flow to hatchery facilities without pumping. Obtaining the peak flow rates that are needed in the March and April (prior to out-

planting smolts) will likely require pumping to deliver most of the supply. Pumps will be supplied with backup generators for use in the event of power failure.

Fish produced at Crystal Springs cannot be released directly from hatchery. This spring-fed hatchery does not discharge to a stream that could support Chinook. Therefore, if a water system failure occurs, it would trigger the transport of some fish to another facility or to an appropriate release site. Sufficient numbers would be transported to allow the gravity water flow to maintain the remaining fish held in the hatchery. As an interim measure, aeration pumps would be installed in the rearing ponds to provide additional oxygen and water flow would be adjusted in the ponds holding fish as others are being exported.

## **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.**

YFCSS actions taken to minimize adverse effects on listed fish include:

1. Follow the health practices, procedures, and guidelines in place at the Sawtooth Fish Hatchery.
2. Select proper release sites to utilize excellent spawning and rearing habitat.
3. Program smolt releases with noticeable physiological changes in fish and natural rising water levels.
4. Maintain rearing condition as equivalent as possible to those in the natural environment.
5. Annual collection of broodstock with characteristics similar to historically evolved populations.
6. Help Idaho Fish and Game and Sawtooth Fish Hatchery conduct continuing Hatchery Evaluation Studies.

## **SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**

### **11.1 MONITORING AND EVALUATION OF “PERFORMANCE INDICATORS” PRESENTED IN SECTION 1.10.**

#### **11.1.1 Describe plans and methods proposed to collect data necessary to respond to each “Performance Indicator” identified**

**for the program.**

See section 1.10.1, 1.10.2 and 1.10.3.

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

The Shoshone-Bannock Tribes monitor and evaluation program will need to be fully funded and appropriately staffed to achieve the goals and objectives of the YFCSS.

**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.**

The YFCSS weir will be constantly monitored to limit the holding period and minimize adverse impacts to ESA-listed spring Chinook salmon and other listed species. Handling and tagging activities will be conducted to minimize injuries, stress, and mortality. Monitor and evaluation procedures include redd counts, creel surveys, carcass recoveries, tissue sampling, and density and abundance analyses to determine effects to listed fish.

## **SECTION 12. RESEARCH**

### **12.1 OBJECTIVE OR PURPOSE.**

The Tribes will manage Yankee Fork in a manner that promotes recovery of the ESU and allows management flexibility. Our expectation for Yankee Fork is to manage this population under “maintained” criteria having less than a 25% risk threshold of extinction in 100 years. Since Yankee Fork Chinook are currently listed at a high risk of extinction for both A/P (> 25% risk of extinction in the next 100 years) and S/D (high risk of extinction in the next 100 years), we plan to initiate a supplementation program that will immediately increase abundance, spatial structure, and potentially diversity, all of which will assist in recovery of population.

Success will be based on improving viability at the distinct population level; changes in abundance, productivity, diversity and distribution of steelhead and Chinook salmon will be measured. The M&E plan is designed to identify successes as well as problems so that improvements can be made through adaptive management.

### **12.2 COOPERATING AND FUNDING AGENCIES.**

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

## **12.3 PRINCIPLE INVESTIGATOR OR PROJECT SUPERVISOR AND STAFF.**

**Name (and title):** Lytle P. Denny, Anadromous Fish Manager.  
**Agency or Tribe:** Shoshone-Bannock Tribes.  
**Address:** 3rd and B Avenue, P.O. Box 306, Fort Hall, ID 83203.  
**Telephone:** (208) 239-4560 or cell 221-9058.  
**Fax:** (208) 478-3986.  
**Email:** ldenny@shoshonebannocktribes.com

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

Not Applicable.

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

Research techniques for the monitor and evaluation of the YFCSS include: hatchery operations, tissue and scale sampling, abundance and density, harvest monitoring, and juvenile out-migration and adult returns.

### *Hatchery Operations*

IDFG, LSRCP, and SFH staff monitors hatchery conditions (diet, ration, vat or raceway environmental conditions, growth, survival rates, mortalities, disease) and evaluate hatchery-related research.

### *Tissue and Scale Sampling*

Broodstock males and females sampled for genetic analysis and parental assignment. Samples obtained through an operculum punch. Scale samples obtained for age and life history determination as a contingency to tissue samples. Proportion of natural-origin juveniles are tissue sampled prior to out-migration to determine proportion of w x w, w x h, h x h produced offspring. Un-marked adults sampled at the Yankee Fork weir will also be tissue sampled to determine origin. All samples stored in 95% ethanol for later analysis. A DNA parentage analysis will reveal relative productivity of wild and hatchery F1 and F2 juveniles and adults.

### *Abundance and Density*

Operation of a rotary screw trap to document and determine abundance of migrating juvenile Chinook salmon. If electroshocking, use in accordance with NMFS ESA permits. Fork length and mass of each individual recorded. Fin tissue and scale samples taken from juveniles to link to adult parents and brood year.



### *Harvest Monitoring*

Conduct creel surveys and estimate total Chinook catch. Obtain tissue sample, fork length, gender, CWT, or PIT information from harvested Chinook. Provide Shoshone-Bannock tribal fisherman with scale envelopes to preserve scales from harvested fish not surveyed and sampled. Total fish harvested, pressure, and CPUE estimated yearly.

### *Juvenile Out-migration and Adult Returns*

Proportions (15%) of hatchery smolts released are PIT tagged to monitor dispersal, emigration, and arrival at Lower Granite Dam by using the SURPH model. In addition, natural produced smolts will be PIT tagged to detect survival differences between life stages for hatchery and naturally produced offspring. Adult returns are monitored through dam and weir counts, creel surveys, CWT information, redd surveys, spawning surveys, and carcass recoveries.

## **12.6 DATES OR TIME PERIOD IN WHICH RESEARCH ACTIVITY OCCURS.**

Hatchery conditions and research are monitored daily and throughout the year by IDFG, LSRCP, and SFH staff and personnel.

Tissue and scale sampling is conducted yearly for broodstock, smolt release, harvest monitoring, screw trap operation, and electrosampling.

Harvest information through creel surveys is collected during the time of tribal fisheries. Mail surveys sent out after closure of season and compared to harvest information collected during fishing period.

Adult escapement is monitored at dams, traps, mark/recapture studies, and through surveys throughout most of the year. Smolt emigration monitored from March through November. PIT tag and coded-wire tag queried from informational systems throughout the year.

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

See section 9.

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

See Table 19. Generally, take for research activities are defined as: “observe/harass”, “capture/handle/release” and “capture, handle, mark, tissue sample, release.”

**12.9 LEVEL OF TAKE OF LISTED FISH: NUMBER OR RANGE OF FISH HANDLED, INJURED, OR KILLED BY SEX, AGE, OR SIZE, IF NOT ALREADY INDICATED IN SECTION 2 AND THE ATTACHED “TAKE TABLE.”**

See Table 19.

**12.10 ALTERNATIVE METHODS TO ACHIEVE PROJECT OBJECTIVES.**

No alternative methods to achieve research objectives were/have been developed or initiated.

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

Not Applicable.

**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.**

See Section 11.2.

## **SECTION 13. ATTACHMENTS AND CITATIONS**

### **LITERATURE CITED:**

- Achord, S.A., M.B. Eppard, E.E. Hockersmith, B.P. Sanford, G.A. Axel, and G.M. Mathews. 2000. Monitoring the migrations of wild Snake River spring/summer Chinook salmon smolts, 1998. Prepared for the Bonneville Power Administration. Project 9102800, Contract DE-AI79-91BP18800. Portland, OR.
- Berggren, T.J. and L.R. Basham. 2000. Comparative survival rate study (CSS) of hatchery PIT tagged Chinook. Status Report for migration years 1996 – 1998 mark/recapture activities. Prepared for the Bonneville Power Administration. Contract No. 8712702. Portland, OR.
- Bjornn, T.C. 1960. The Salmon and Steelhead Stocks of Idaho. Idaho Department of Fish and Game.

- Bjornn, T.C., D.W. Ortmann, D. Corley, and W. Platts. 1964. Salmon and Steelhead Investigations. Idaho Department of Fish and Game. Federal Aid in Fish Restoration, Annual Progress Report, Project F-49-2-2.
- Ecovista.2004. Draft Salmon Subbasin Management Plan. NPCC, Portland, Oregon.
- Everest, F.E. 1969. Habitat selection and spatial interaction of juvenile Chinook salmon and steelhead trout in two Idaho streams. Ph.D. Dissertation. University of Idaho, Moscow, ID.
- Hall-Griswold, J.A. and C.E. Petrosky. 1997. Idaho habitat/natural production monitoring, part 1. Annual Report 1996. Prepared for the Bonneville Power Administration. Project No. 91-73, Contract DE-BI79-91BP21182. Idaho Department of Fish and Game. Boise, ID.
- Hampton, M. 1988. Development of habitat preference criteria for anadromous salmonids of the Trinity River. U.S. Fish and Wildlife Service. Sacramento, CA.
- Hansen, J.M. and J. Lockhart. 2001. Salmon supplementation studies in Idaho rivers. Annual Report 1997 (brood years 1995 and 1996). Prepared for the Bonneville Power Administration. Project 8909802. Portland, OR.
- Healey, M.C. 1991. Life history of Chinook salmon. Pages 311-393 In Croot, C. and L. Margolis, ed: Pacific Salmon Life Histories. University of British Columbia Press, Vancouver, B.C. Canada.
- Heiberg, E.R. 1975. Lower Snake River Fish and Wildlife Compensation Plan, Washington and Idaho: Special Report. Department of the Army.
- HSRG. 2009. System-wide Report. Available online at: [www.hatcheryreform.us/](http://www.hatcheryreform.us/).
- Interior Columbia Basin Technical Recovery Team (ICTRT). 2005. Draft. ICBTRT: Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs.
- Interior Columbia Basin Technical Recovery Team (ICTRT). 2007. Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs. Review Draft march 2007.
- Idaho Department of Fish and Game (IDFG), Nez Perce Tribe, Shoshone-Bannock Tribes. 1990. Salmon River Subbasin salmon and steelhead production plan. Columbia Basin System Planning.
- Kiefer, S.W. 1987. An annotated bibliography on recent information concerning Chinook salmon in Idaho. The Idaho Chapter of the American Fisheries Society.
- Kiefer, R.B., J. Johnson, and D. Anderson. 2001. Natural production monitoring and evaluation: monitoring age composition of wild adult spring and summer Chinook salmon returning to the Snake River Basin. Prepared for the Bonneville Power Administration. Project No. 91-73, Contract No. BP-94402-5. Idaho Department of Fish and Game. Boise, ID.
- Konopacky, R. C., P. J. Cerner, and E. C. Bowles. 1986. Salmon River Habitat Enhancement.

Annual Report FY 1985, Part 1 or 4, Subproject III: Yankee Fork Salmon River.  
Shoshone-Bannock Tribes Report to Bonneville Power Administration.

- Kucera, P.A. and M.L. Blenden. 1999. Chinook salmon spawning ground survey in Big Creek, and tributary streams of the South Fork Salmon River, Idaho 1992-1995. Assessment of the status of salmon spawning aggregates in the Middle Fork Salmon River and South Fork Salmon river. Technical Report 99-7. Nez Perce Tribe Department of Fisheries Resources Management. Lapwai, ID.
- Matthews, G.M. and R.S. Waples. 1991. Status review for Snake River spring and summer Chinook salmon. NOAA tech. Memo. NMFS F/NWC-200, 75p. National Marine Fisheries Service, Northwest Fisheries Science Center, Montlake, WA.
- National Marine Fisheries Service (NMFS). 2000. Endangered Species Act Section 7 Consultation. Biological Opinion. Reinitiation of consultation on the operation of the federal Columbia River power system, including the juvenile fish transportation program, and 19 Bureau of Reclamation projects in the Columbia Basin.
- Nelson, D.D. and J.L. Vogel. 2001. Monitoring and evaluation activities of juvenile and adult fishes in Johnson Creek. Annual Progress Report. Period Covered: January 1, 1998 to December 31, 1998. Nez Perce Tribe Department of Fisheries Resource Management. Lapwai, ID.
- Northwest Power Planning Council (NPPC). 2001. Draft Subbasin Summary for the Salmon Subbasin of the Mountain Snake Province.
- Oosterhout, G.R. and P.R. Mundy. 2001. The doomsday clock 2001: an update on the status and projected time to extinction for Snake River wild spring/summer Chinook stocks. Prepared for Trout Unlimited. Portland, OR.
- Peery, C.A. and T.C. Bjornn. 1992. Examination of the extent and factors affecting downstream emigration of Chinook salmon fry from spawning grounds in the upper Salmon River. Unpublished report, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow, ID.
- Piper, G.R., I.B. McElwain, L.E. Orme, J.P. McCraren, L.G. Gowler, and J.R. Leonard. 1982. Fish Hatchery Management. U.S. Fish and Wildlife Service, Washington D.C.
- Pollard, H.A. 1985. Salmon and Spawning Ground Surveys. Federal Aid in Fish Restoration, Job Performance Report. Idaho Department of Fish and Game, Project F-73-R-7.
- Reiser, D. W. and M. P. Ramey. 1987. Feasibility plan for the enhancement of the Yankee Fork of the Salmon River, Idaho. Prepared for the Shoshone-Bannock Tribes, Fort Hall, Idaho. BPA contract No. 83-359.
- Richards, C. and P.J. Cenera. 1989. Dispersal and Abundance of Hatchery-reared and Naturally Spawned Juvenile Chinook Salmon in an Idaho Stream. North American Journal of Fisheries Management 9:345-351.

Schaller, H.A., CE Petrosky, and OP Langness. 1999. Contrasting patterns of productivity and survival rates for stream-type Chinook salmon populations of the Snake and Columbia rivers. *Canadian Journal of Fisheries and Aquatic Sciences* 56: 1031-1045.

U.S. Fish and Wildlife Service (USFWS). 1992. Biological assessment of proposed 1992 LSRCP steelhead and rainbow trout releases. Unpublished report, Lower Snake River Compensation Plan Office. Boise, ID.

U.S. Fish and Wildlife Service (USFWS). 1993. Programmatic biological assessment of the proposed 1993 LSRCP program. Unpublished report, Lower Snake River Compensation Plan Office. Boise, ID.

Walters, J., J. Hansen, J. Lockhart, C. Reighn, R. Keith, and J. Olson. 2001. Idaho supplementation studies five year report 1992 – 1996. Project Report, Idaho Department of Fish and Game. Prepared for the Bonneville Power Administration. Report No. 99-14, Contract DE-BI19-89BP01466. Portland, OR.

### Sawtooth Fish Hatchery Reports

Alsager, R.D. 1993. 1988 Spring Chinook salmon brood year report. Idaho Department of Fish and Game: 13-01.

Alsager, R.D. 1993. 1989 Spring Chinook salmon brood year report. Idaho Department of Fish and Game: 13-02.

Chapman, J. and P. Coonts. 1993. 1990 Chinook brood year report. Idaho Department of Fish and Game: 13-03.

Chapman, J. and P. Coonts. 1994. 1991 Spring Chinook brood year report. Idaho Department of Fish and Game: 94-25.

Rogers, T. L. 1969. 1986 Spring Chinook brood year report. Idaho Department of Fish and Game.

Rogers, T.L. 1990. 1987 Spring Chinook salmon brood year report. Idaho Department of Fish and Game.

Snider, B.R. and P. Coonts. 1998. 1992 Spring Chinook brood year report. Idaho Department of Fish and Game: 98-4.

Snider, B.R. and K. Schilling. 1998. 1993 Spring Chinook brood year report. Idaho Department of Fish and Game: 98-18.

Snider, B.R. and K. Schilling. 1998. 1994 Spring Chinook brood year report. Idaho Department of Fish and Game: 98-21.

Snider, B.R. and K. Schilling. 1998. 1995 Spring Chinook brood year report. Idaho Department of Fish and Game: 98-22.

Snider, B.R. and K. Schilling. 1999. 1996 Spring Chinook brood year report. Idaho

- Department of Fish and Game: 99-15.
- Snider, B.R., K. Schilling, and S. Macy. 1999. 1997 Spring Chinook brood year report. Idaho Department of Fish and Game: 99-31.
- Snider, B.R., K. Schilling, and C. Rohrbacher. 2000. 1998 Spring Chinook brood year report. Idaho Department of Fish and Game: 00-43.
- Snider, B.R. and K. Schilling. 2001. 1999 Spring Chinook brood year report. Idaho Department of Fish and Game: 01-30.
- Snider, B.R. and J.A. Heindel. 2003. 2000 Spring Chinook brood year report. Idaho Department of Fish and Game: 03-02.
- Snider, B.R., J. Heindel, M. Hughes, J.D. Seggerman, and D. Munson. 2003. 2001 Spring Chinook brood year report. Idaho Department of Fish and Game: 03-45.
- Snider, B.R., R. Elmore, M. Hughes, H. Lehman, and D. Munson. 2004. 2002 Spring Chinook brood year report. Idaho Department of Fish and Game: 04-34.
- Snider, B.R., R. Elmore, M. Hughes, H. Smith, and D. Munson. 2005. 2003 Spring Chinook brood year report. Idaho Department of Fish and Game: 05-53.

## **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:\_\_\_\_\_

**Table19. Estimated listed salmonid take levels of by hatchery activity.**

Listed species affected: Spring/Summer Chinook Salmon ESU/Population: Yankee Fork/Upper Salmon Mainstem Activity: YFCSS				
Location of hatchery activity: Yankee Fork and Sawtooth Fish Hatchery Dates of activity: Annually Hatchery program operator: Shoshone-Bannock Tribes				
Type of Take	Annual Take of Listed Fish By Life Stage (Number of Fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			1,500	
Collect for transport b)		Up to 600,000 <sup>4</sup>	Up to 358 <sup>1</sup>	
Capture, handle, and release c)			100% <sup>2</sup>	
Capture, handle, tag/mark/tissue sample, and release d)		15% <sup>5</sup> ; 50% <sup>6</sup> ; 50% <sup>7</sup>		
Removal (e.g. broodstock) e)			Up to 358	
Intentional lethal take f)			Up to 358 <sup>3</sup>	
Unintentional lethal take g)	36,5008		Pre-spawn mortality varies and may be as high as 8%.	
Other Take (specify) h) Carcass sampling				

1. Maximum number of adults retained for broodstock.

2. All adults handled at weir.

3. Maximum take numbers annually, dependent on total adult return

4. Smolts transported from SFH to Yankee Fork for release.

5. 15% smolts PIT tagged prior to release.

6. 85% smolts CWT prior to release.

7. 50% smolts Adipose fin-clipped prior to release.

8. 15% mortality from green egg to smolt stage.



## **Appendix B**

---

### *Draft Hatchery and Genetic Management Plan: Panther Creek Spring Chinook Salmon Program*

This page is intentionally blank.

# HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

---

**Hatchery Program:**

Panther Creek Spring Chinook Salmon

**Species or  
Hatchery Stock:**

Spring Chinook salmon  
*Oncorhynchus tshawytscha*

**Agency/Operator:**

Shoshone-Bannock Tribes

**Watershed and Region:**

Panther Creek, Salmon River, Idaho

**Date Submitted:**

**Date Last Updated:**

February 11, 2011

This page is intentionally blank.

## EXECUTIVE SUMMARY

Historically, the Shoshone and Bannock peoples harvested salmon throughout the Columbia River Basin for subsistence. Annual salmon and steelhead runs in what are now Oregon, Washington, Idaho and Nevada provided harvest opportunities throughout the year. The Shoshone-Bannock Tribes continue to harvest anadromous fish under rights reserved by the Fort Bridger Treaty of 1868.

Fishing opportunities for the Tribes have been severely constrained by depressed runs of salmon caused in large part by the detrimental effects of hydroelectric development and early overfishing in the lower Columbia River. Current salmon abundance in the Upper Salmon River basin is estimated at about 0.5% of historical runs. Recent harvest opportunities for Tribal members have only provided half a pound of salmon per tribal member compared to historical use of about 700 pounds per person. The Shoshone/Bannock Tribes therefore, seek to restore fishing opportunities for their peoples through Chinook salmon management programs in the Yankee Fork Salmon River and in Panther Creek. Restoration of these ceremonial and subsistence fisheries would be accomplished in a manner compatible with recovery and long-term sustainability of Chinook salmon in the upper Salmon River basin.

The Chinook programs proposed are designed to focus the Tribes' primary Chinook harvest in Yankee Fork and Panther Creek. These locations and populations have been identified by the Interior Columbia Technical Review Team (ICTRT), the Hatchery Scientific Review Group (HSRG), NOAA-Fisheries and fishery co-managers as a low priority for recovery and sustainability of the Snake River Spring/Summer Chinook ESU. By focusing hatchery and harvest effects within these two watersheds, traditional Tribal fisheries and fishing methods could be restored while at the same time, contributions could be made to recovery by establishing locally adapted hatchery and natural spawning populations of Chinook salmon in watersheds not currently priority targets for species recovery.

In developing these management programs, the Tribes have adopted three objectives:

- **Conservation Objective:** Contribute to recovery of Snake River Spring/Summer Chinook ESU by restoring populations of local spring/summer Chinook in Yankee Fork and Panther Creek.
- **Harvest Objective:** Achieve a tribal harvest of about 800 spring/summer Chinook from Yankee Fork and 500 Chinook from Panther Creek.
- **Cultural Objective:** Ensure that Shoshone - Bannock peoples can harvest salmon in Yankee Fork and Panther Creek by their traditional hunting methods as well as contemporary methods.

The Tribes will continue working to improve habitat conditions in watersheds throughout the upper Salmon River basin and to advocate passage improvements at hydroelectric dams to improve productivity of Chinook populations in the headwaters. In the long term, the proposed tribal and co-manager monitoring programs will allow the Shoshone-Bannock Tribes to adapt

their management plans to provide greater conservation benefits should other populations in the MPG fail to achieve their recovery goals, and ecosystem and biological conditions allow.

## **Yankee Fork Program Component**

Yankee Fork spring/summer Chinook are at an extremely high risk of extinction, prompting the Shoshone-Bannock Tribes to undertake a multi-phase program to restore the population. The Tribes' have three primary objectives for this program identified in Section 2.1. A three-phase program is proposed to meet these objectives, integral to which is construction of the Crystal Springs Hatchery to provide the needed production capacity. In the first phase, colonization, surplus adults and 200,000 smolts from Sawtooth Hatchery will be released annually. When these Chinook return as adults, a percent will be collected as broodstock for rearing at the Crystal Springs. Phase 2, local adaptation, will be triggered when approximately 1,000 Chinook return to the Yankee Fork, the estimated population level needed to meet broodstock and natural escapement goals. Use of Sawtooth fish will be eliminated in Phase 2. Tribal harvest in the Yankee Fork will be 1 to 8 percent when runs are less than 500 adults; harvest in excess of that may occur when both broodstock and natural escapement goals are met. If natural productivity rates reach sufficient levels, Phase 3, integrated harvest program, may be implemented if established triggers are met. The program will be transitioned into an integrated harvest program following the guidelines of the HSRG (2004).

## **Panther Creek Program Component**

The spring/summer Chinook program proposed for Panther Creek will recolonize habitat that was severely compromised by mining activities in the subbasin. Over the last decade, significant habitat restoration activities have resulted in documented observations of stray Chinook and various other aquatic species in Panther Creek, signaling the timeliness of the Tribes' proposed program. Three objectives have been identified by the Tribes for Panther Creek that are described in Section 2.1 above. Achieving these objectives will be two-phased and will require new facilities. The proposed Crystal Springs Hatchery will produce from 200,000 to 400,000 Chinook smolts for reintroduction into Panther Creek. Broodstock for this program will be collected at a new weir and holding pond (site yet to be defined), held and spawned, and the eggs transported to Crystal Springs. Phase 1 of the program, recolonization, will begin by releasing 1,500 surplus hatchery adults to spawn in Panther Creek. As their progeny return and become adapted to this watershed, a portion of the adults will be collected, spawned, reared at Crystal Springs (Phase 2), and then released back into Panther Creek to resume a natural life cycle. All other adult and juvenile releases from non-local stocks will cease. When sufficient numbers of Chinook return to achieve broodstock and natural escapement goals, a Tribal harvest will be permitted.

The success of the Yankee Fork and Panther Creek Chinook programs in achieving conservation, harvest and cultural objectives will be quantified by implementing a monitoring and evaluation program which is described in concept in the Crystal Springs Master Plan.

# SECTION 1. GENERAL PROGRAM DESCRIPTION

## 1.1 NAME OF HATCHERY OR PROGRAM.

Hatchery: Crystal Springs Fish Hatchery (egg incubation and juvenile rearing)  
Panther Creek Weir (adult trapping)  
Panther Creek Adult Holding/ Spawning and Juvenile Stress Relief Pond

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

Chinook salmon (*Oncorhynchus tshawytscha*) native to Panther Creek are part of the Upper Salmon River Chinook MPG in the Snake River Spring/Summer Chinook ESU (Figure 1). The Snake River Spring/Summer ESU was listed as threatened under the Endangered Species Act on April 22, 1992. The listing includes hatchery-origin offspring derived from natural-origin parents. The Panther Creek population was extirpated from the drainage in the 1960s primarily due to local mining activities. Currently, some adults return to and spawn in Panther Creek. Their origin is unknown, but has been assumed to be the result of previous reintroduction efforts.

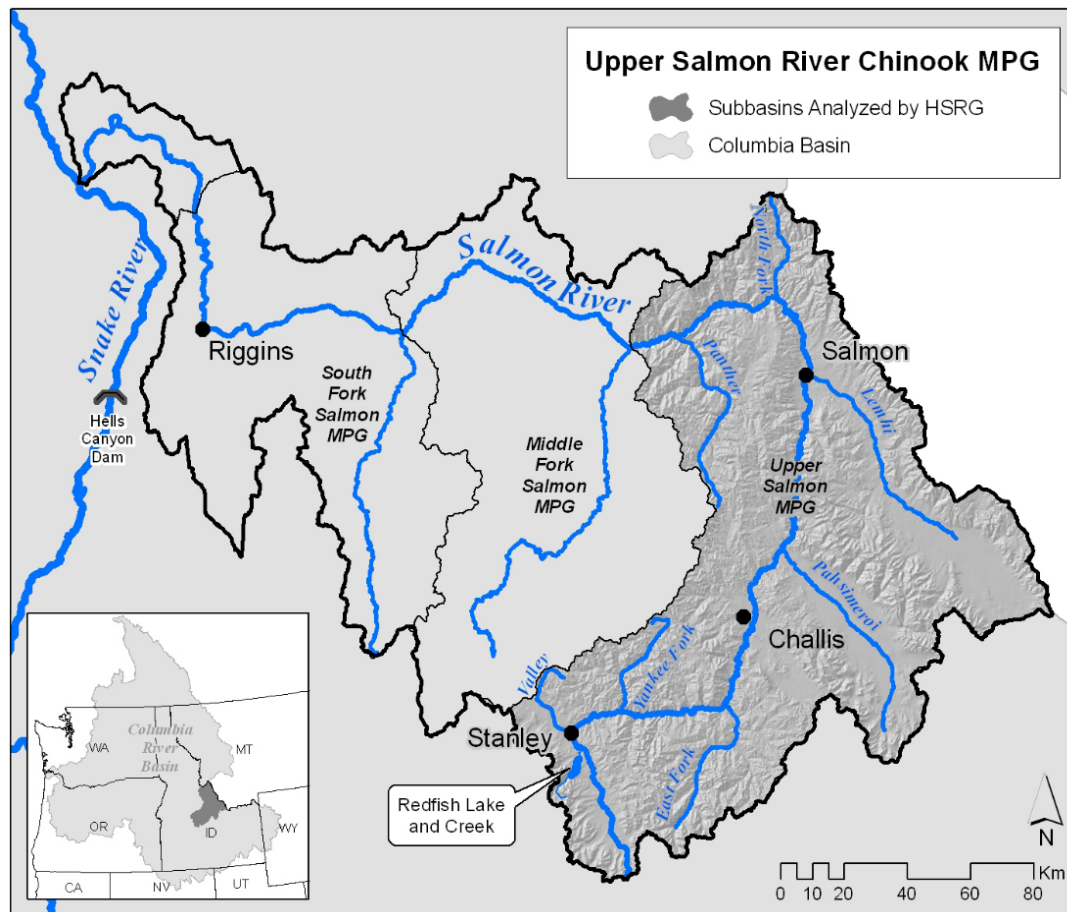
## 1.3 RESPONSIBLE ORGANIZATION AND INDIVIDUALS

### *Lead Contact*

**Name (and title):** Lytle P. Denny, Anadromous Fish Manager  
**Agency or Tribe:** Shoshone-Bannock Tribes  
**Address:** 3<sup>rd</sup> and B Avenue, P.O. Box 306, Fort Hall, ID 83203  
**Telephone:** (208) 239-4560 or cell (208) 221-9058  
**Fax:** (208) 478-3986  
**Email:** ldenny@sbtribes.com

### *Crystal Springs Fish Hatchery*

**Name (and title):** Chad Colter, Fish and Wildlife Director  
**Agency or Tribe:** Shoshone-Bannock Tribes  
**Address:** 3rd and B Avenue, P.O. Box 306, Fort Hall, ID 83203  
**Telephone:** (208) 478-3761  
**Fax:** (208) 478-3986  
**Email:** ccolter@shoshonebannocktribes.com



**Figure 1. Upper Salmon River Chinook MPG**

Source: HSRG 2009.

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

U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan (LSRCP) Office: Administers the LSRCP as authorized by the Water Resources Development Act of 1976. The LSRCP will fund the Tribes Panther Creek Project.

The Idaho Department of Fish and Game (IDFG) is involved in Panther Creek through the Idaho Supplementation Study.

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

The Shoshone-Bannock Tribes (Tribes) are the lead fisheries management agency for the Panther Creek project. The Tribes are funded by the LSRCP and Bonneville Power Administration (BPA).



For the portion of the Crystal Springs allocated to Chinook production for both Yankee Fork and Panther Creek, it is estimated that planning and design of the Crystal Springs complex will be approximately \$1.15 million and construction will cost approximately \$13.1 million. These estimated costs are for both production facilities at Crystal Springs production and the adult capture and holding facilities at both Yankee Fork and Panther Creek.

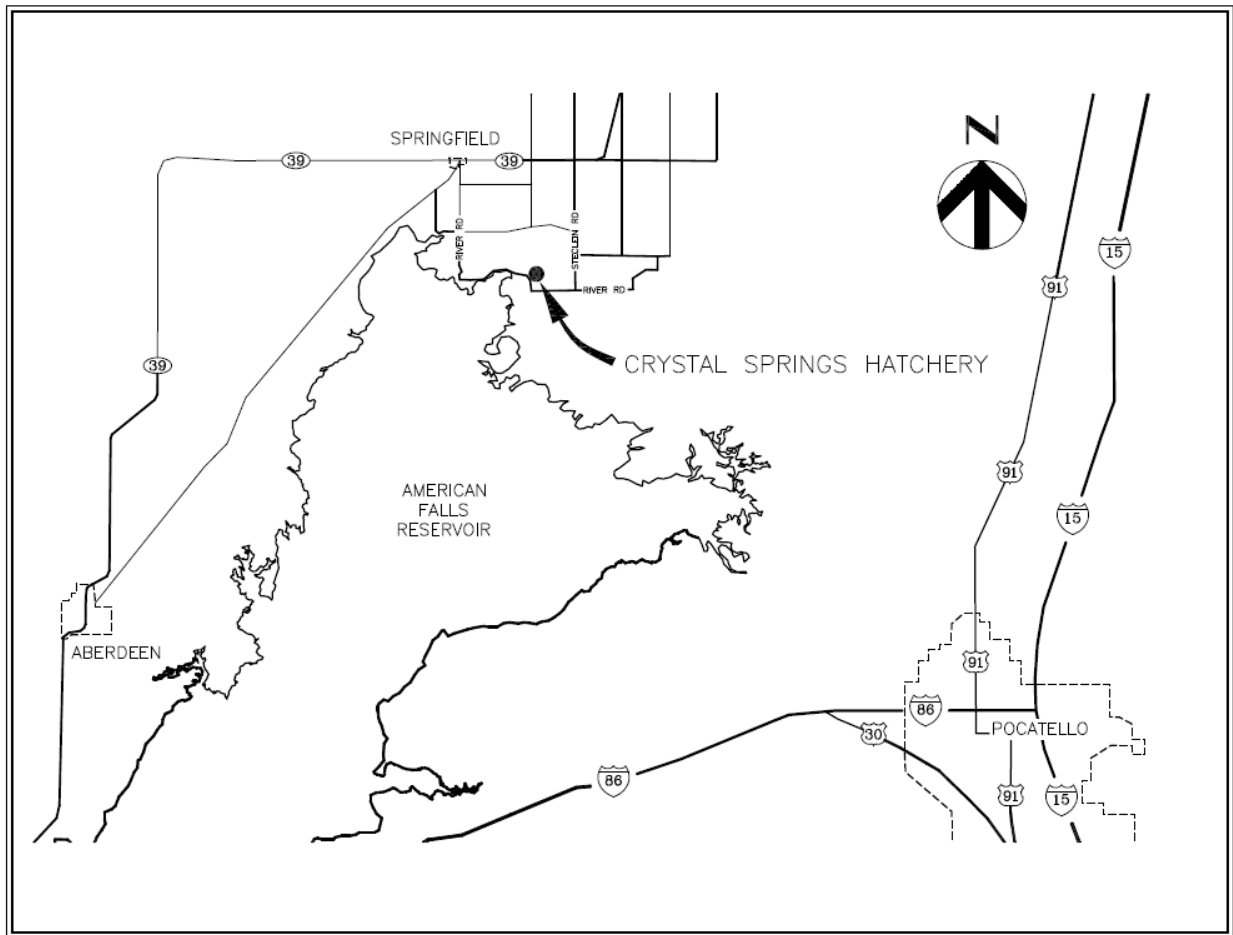
Operating and maintenance costs include such items as payroll, utilities, vehicle leases, supplies, maintenance, some specific tagging expenses and potential subcontracted support services. This planning cost estimate includes the Yankee Fork, Panther Creek and Crystal Springs operations and maintenance costs. The Tribe estimates that the annual budget for operation and maintenance will be \$665,000. If this estimate is escalated from 2010 to 2013 dollars (the year that expenses begin to be incurred), operational costs would be about \$705,000 annually.

Costs associated with monitoring and evaluation are estimated at about \$345,000 annually. If escalated from 2010 to 2014 dollars (when costs would start to be incurred), expenses would be \$374,000 annually. It should be noted that over \$175,000 of the probable costs in 2014 are associated with coded wire-tagging and adipose clipping one million smolts.

Labor is estimated at a total of about 3 full time equivalents (FTE) that are considered permanent staff and an estimated 3 temporary FTE to address specific seasonal fish culture work.

## **1.5 LOCATION(S) OF HATCHERY AND ASSOCIATED FACILITIES.**

Crystal Springs Fish Hatchery – Crystal Springs Hatchery will be located 4.7 km southeast of Springfield, Idaho (Figure 2). The Tribes acquired funding from BPA through the Columbia Basin Fish Accord to reconstruct Crystal Springs Fish Hatchery and build the Panther Creek weir/pond. It is anticipated the Crystal Springs and the weir will be completed in 2013. Crystal Springs will provide egg incubation and juvenile rearing; a proposed pond is expected to provide adult holding, spawning, and juvenile stress relief. Appropriate weir locations will be explored during the preliminary design phase. The hydrologic unit code for the facility is 17040206.



**Figure 2. Location of proposed Crystal Springs Fish Hatchery.**

Surplus spring Chinook will be released into Panther Creek to achieve the objective of producing a minimum spawning population of 1,000 adults. The Pahsimeroi Fish Hatchery is being considered as a source for adults, although this has yet to be determined. The source of the broodstock is still in question; however, genetic samples have been taken from both juvenile and adult Chinook currently found in Panther Creek. These are being analyzed and the results may provide direction about appropriate broodstock. At this time, the alternatives for broodstock in Panther Creek are existing returning Chinook, Pahsimeroi stock, and South Fork Salmon River stock.

#### Pahsimeroi Fish Hatchery –

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

both facilities is 17060202. This facility may or may not supply Chinook for the Panther Creek program.

## **1.6 TYPE OF PROGRAM.**

*Define as either: Integrated Recovery; Integrated Harvest; Isolated Recovery; or Isolated Harvest (see Attachment 1 - Definitions" section for guidance).*

The Crystal Springs program will be an Integrated Recovery/Harvest program. The goal of the project is to restore Chinook salmon in Panther Creek to a level that can provide sustainable fishing opportunities. This will be accomplished when 1,000 adults return to meet the conservation (500 adults) and harvest (500 adults) objectives. To meet the conservation and harvest objectives, the Tribes propose to outplant from 200,000 to 400,000 yearling Chinook salmon smolts, up to 1,500 adult outplants, and various levels of eyed-eggs.

## **1.7 PURPOSE (GOAL) OF PROGRAM.**

**Restoration** – The goal of the Panther Creek project is to contribute to the recovery of Snake River Spring/Summer Chinook ESU by reintroducing and restoring a Maintained (Stabilizing) population of local spring/summer Chinook in Panther Creek to a level that can provide sustainable fishing opportunities.

## **1.8 JUSTIFICATION FOR THE PROGRAM.**

*Indicate how the hatchery program will enhance or benefit the survival of the listed natural population (integrated or isolated recovery programs), or how the program will be operated to provide fish for harvest while minimizing adverse effects on listed fish (integrated or isolated harvest programs).*

Panther Creek Chinook salmon are currently classified by the Interior Columbia Technical Recovery Team (ICTRT) as extirpated. The Panther Creek drainage downstream of and including Blackbird Creek has been impacted by chemical contamination due to operation of the Blackbird Mine. By the 1970s, the endemic Chinook were extirpated due to acid and heavy metal pollution from cobalt mining operations. Panther Creek has since been stocked several times with hatchery fish from a variety of stocks. South Fork Salmon River stock has been used in the past in an effort to reintroduce fish to the Creek, however South Fork stock are from outside the Upper Salmon River spring/summer MPG.

Water quality has reportedly improved in recent years. This is likely due in part to actions taken at the Blackbird Mine site to reduce the amounts of metals released into Blackbird Creek, and poor water quality may no longer be the limiting factor in this system. Current spawning surveys show some adults returning to and spawning in Panther Creek. Their origin is unknown, but has been assumed to be the result of previous reintroduction efforts using South Fork stock from McCall Fish Hatchery.

Under the proposed program, colonization and localization will be achieved through two phases. In Phase I, up to 1,500 surplus hatchery adult Chinook salmon (source to be determined) will be

planted in Panther Creek to achieve a minimum spawning escapement of 1,000 fish. When Crystal Springs Hatchery is complete, an additional 400,000 smolts will be transported to Panther Creek, held for stress relief, and released volitionally in the spring. These smolts may be of Pahsimeroi origin, reared at Crystal Springs. After a decision trigger of a five year average escapement of 1,000 adult returns, Phase II will be implemented and all broodstock will be collected in Panther Creek at a new picket weir. At this time, no surplus hatchery adults from outside the subbasin will be stocked into the system unless average run size drops below 250 adults.

## 1.9 LIST OF PROGRAM “PERFORMANCE STANDARDS”.

**Table 1. Spring/summer Chinook hatchery program performance standards, indicators and monitoring and evaluation methods.**

Performance Standard	Indicator	Monitoring and Evaluation Methods
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in the applicable agreements such as under U.S. v. Oregon and U.S. v. Washington.	<ul style="list-style-type: none"> <li>- Total number of fish harvested in Tribal fisheries targeting this program</li> <li>- Total fisher days or proportion of harvestable return taken in Tribal resident fisheries, by fishery</li> <li>- Tribal acknowledgement regarding fulfillment of treaty rights</li> </ul>	<ul style="list-style-type: none"> <li>- The Tribe will conduct harvest surveys in the Yankee Fork and Panther Creek. This information will be combined with work undertaken by the IDFG and others to determine total harvest rate.</li> </ul>
Fish produced 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.	<ul style="list-style-type: none"> <li>- Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery</li> <li>- Annual numbers of each non-target species caught (including fish retained and fish released/discarded) in fisheries targeting this population</li> <li>- Recreational angler days, by fishery</li> </ul>	<ul style="list-style-type: none"> <li>- The Tribe will conduct harvest surveys in the Yankee Fork and Panther Creek. This information will be combined with work undertaken by the IDFG and others to determine total harvest rate.</li> </ul>
Program addresses ESA responsibilities	<ul style="list-style-type: none"> <li>- ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable</li> </ul>	<ul style="list-style-type: none"> <li>- HGMP and Section 7 permits will be submitted to NMFS for approval</li> </ul>
Release groups sufficiently marked/tagged in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries	<ul style="list-style-type: none"> <li>- Marking rate by type in each release group documented</li> <li>- Document the number of marks identified in juvenile and adult groups</li> </ul>	<ul style="list-style-type: none"> <li>- 100% of the hatchery fish will be coded-wire tagged</li> <li>- 15% will be marked with PIT-tags</li> </ul>

Performance Standard	Indicator	Monitoring and Evaluation Methods
Fish collected for broodstock are taken throughout the return in proportions approximating the timing and age structure of the population	<ul style="list-style-type: none"> <li>- Manage temporal distribution of collected broodstock</li> <li>- Manage age composition of collected broodstock</li> <li>- Composition of broodstock (HOR and NOR)</li> </ul>	<ul style="list-style-type: none"> <li>- Fish for broodstock will be collected at random from the run at large (NOR and HOR).</li> <li>- Broodstock collection will occur at the weir</li> </ul>
Weirs do not impact access to spawning and rearing areas	<ul style="list-style-type: none"> <li>- Fish migrate rapidly past the structure</li> <li>- Large numbers of spawners are not observed downstream of weir</li> </ul>	<ul style="list-style-type: none"> <li>- Weir operators will observe fish behavior daily and report indications of delay to managers.</li> <li>- Spawning surveys will be conducted above and below the weir each week</li> </ul>
Weir/trap operations do not result in significant stress, injury, or mortality in natural populations	<ul style="list-style-type: none"> <li>- Mortality rates in trap documented</li> <li>- Document pre-spawning mortality rates of trapped fish in hatchery or after release</li> </ul>	<ul style="list-style-type: none"> <li>- Weirs and Adult Holding facilities will continue to be operated in a manner that reduces mortality.</li> </ul>
Life history characteristics of the natural and hatchery populations remain similar to the extent possible	<ul style="list-style-type: none"> <li>- Life history characteristics of natural and hatchery-produced populations are measured (e.g., juvenile dispersal timing, juvenile size at outmigration, adult return timing, adult age and sex ratio, spawn timing, rearing densities, growth, diet, physical characteristics, fecundity, egg size)</li> </ul>	<ul style="list-style-type: none"> <li>- Tribal staff will continue to monitor juvenile and adult natural populations in the Yankee Fork and Panther Creek. These same data will be collected at Crystal Springs for HOR fish.</li> </ul>
Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production	<ul style="list-style-type: none"> <li>- Develop genetic profiles of naturally-produced and hatchery-produced adults</li> </ul>	<ul style="list-style-type: none"> <li>- Genetic data will be collected on adults arriving at the weir and on the spawning grounds (i.e., carcasses).</li> </ul>
Juveniles are released in natural acclimation areas to maximize homing ability to intended return locations	<ul style="list-style-type: none"> <li>- Location of juvenile releases</li> <li>- Length of acclimation period</li> <li>- Release type, whether forced, volitional, or direct stream release</li> </ul>	<ul style="list-style-type: none"> <li>- Juvenile acclimation sites are being developed for the program. The parameters listed will be collected and reported yearly.</li> </ul>
Juveniles are released at fully smolted stage of development	<ul style="list-style-type: none"> <li>- Level of smoltification at release is documented</li> </ul>	<ul style="list-style-type: none"> <li>- Fish will be examined for signs of smoltification (transparent fins, silvery appearance, lose of parr marks) prior to release</li> </ul>
Juvenile fish migrate quickly out of the basin after release	<ul style="list-style-type: none"> <li>- Migration timing and survival to traps and Lower Granite Dam</li> </ul>	<ul style="list-style-type: none"> <li>- 15% of the juvenile HOR and NOR (variable rate) fish will be PIT-tagged and released</li> </ul>

Performance Standard	Indicator	Monitoring and Evaluation Methods
The artificial production program uses standard scientific procedures to evaluate various aspects of artificial production	- Hatchery culture practices follow best management practices	<ul style="list-style-type: none"> <li>- Life stage survival rates, flow, rearing densities, mortality and disease will be monitored using standard hatchery practices.</li> <li>- Pathologist will sample fish for disease as needed throughout the culture period</li> </ul>
Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols.	- Annual reports indicating level of compliance with applicable standards and criteria	
Releases do not introduce pathogens not already present in the local populations and do not significantly increase the levels of existing pathogens	- Certification of juvenile fish health documented prior to release	
Hatchery-origin adults do not stray and spawn with other populations	- Stray rate is less than target value	- Carcass and spawning surveys will be used to estimate HOR stray rates to other streams and populations
Smolt to adult (SAR) survival rates of natural-origin and hatchery-origin smolts are known.	- SAR of HOR ; SAR NOR fish	- HOR and NOR fish will be coded-wire tagged and PIT-tagged to quantify smolt-to-adult return rates and total production Data will be made available to regional data centers for analysis and storage.
Reproductive success of NOR and HOR spawning naturally (NOS and HOS) are known	- Adult recruits per spawner (R/S) of HOR and R/S of NOR fish	- Genetic analysis of returning adults from natural spawners will be used to quantify R/S values for both HOR and NOR
Increasing NOR abundance over time	Counts of NOR fish	NOR abundance will be tracked at weirs and on the spawning grounds through carcass surveys

## 1.10 LIST OF PROGRAM “PERFORMANCE INDICATORS”, DESIGNATED BY "BENEFITS" AND "RISKS."

**Table 2. Benefits and risks to natural fish associated with each monitoring and evaluation indicator.**

Indicator	Benefits and Risks
Broodstock composition, timing, structure similar to wild fish	<p><b>Benefit:</b> Achievement ensures that the hatchery population reflects the characteristics of the natural population to the extent possible by including natural- origin fish as broodstock, collecting fish randomly throughout the entire portion of the run, and including jacks in broodstock.</p> <p><b>Risk:</b> As these indicators less represent the natural population, the more divergent the two populations become, thereby reducing natural population productivity and diversity.</p>
Adult holding and spawning survival rate, and egg-to-fry-to-parr-to smolt survival rates for both HOR and NOR fish	<p><b>Benefit:</b> Hatchery culture practices that maximize life-stage survival make the most efficient use of the resource and reduce the need to include additional NOR adults for use as broodstock (due to an increase of total brood).</p> <p><b>Risk:</b> Low survival rates indicate poor hatchery culture practices. Because of this, the hatchery may be artificially selecting for genes/traits that are more conducive for survival in the hatchery rather than the natural environment.</p>
Mating protocols (percent jacks, percent males, pNOB)	<p><b>Benefit:</b> Proper mating protocols ensure high fertilization rates (increase survival) and maximize genetic diversity of the broodstock. The use of jacks maintains genetic continuity between generations.</p> <p><b>Risk:</b> Poor mating protocols may reduce genetic diversity and thereby reduce overall population productivity and reproductive success in the natural environment.</p>
Number and severity of disease outbreaks	<p><b>Benefit:</b> Having fewer and less severe disease outbreaks reduces the disease risks that hatchery populations and operations pose to natural populations. This results in better natural population productivity, diversity and spatial structure as natural populations located close to the hatchery may be more impacted than those further away.</p> <p><b>Risk:</b> Frequent and severe disease outbreaks reduce population productivity and require more natural- and hatchery-origin broodstock to produce a similar number of fish. Using more natural-origin fish in the hatchery reduces natural spawning escapement, which may reduce population productivity, spatial structure and diversity.</p>
Hatchery effluent quality	<p><b>Benefit:</b> Achieving high quality hatchery effluent maintains water quality in the receiving stream. Good water quality is essential for the production of all fish species.</p> <p><b>Risk:</b> Hatchery effluent that degrades water quality may decrease the survival and overall productivity of the natural population.</p>
Release timing, fish health, size and condition of released fish	<p><b>Benefit:</b> Releasing healthy fish at the correct size and time increases overall survival and reduces the release numbers needed to achieve conservation and harvest objectives.</p> <p><b>Risk:</b> Releasing fish that are too large/too small may result in increased predation/competition on natural fish populations or reduced survival of hatchery origin smolts. A mismatch between release timing and environmental conditions required for good survival may reduce overall hatchery performance.</p>

Indicator	Benefits and Risks
Smoltification level	<p><b>Benefit:</b> Achieving proper physiological condition creates a fish that rapidly migrates to the ocean and is able to make the physical changes needed to enter the marine environment; resulting in increased survival.</p> <p><b>Risk:</b> Releasing fish that are not ready to migrate results in these fish residing in the receiving streams where they compete with wild fish for food and space, reducing natural population productivity. If the hatchery fish are larger than wild fish, they may predate on these wild juveniles, decreasing their abundance.</p>
Smolt-to-adult return rate (SAR)	<p><b>Benefit:</b> High SAR is an indicator that the hatchery is producing a high quality smolt able to survive in the natural environment from point of release to return as an adult. The higher the survival rates, the fewer hatchery fish that need to be produced to achieve conservation and harvest objectives. Decreased hatchery production reduces competition with the natural population, which may result in increased natural fish production.</p> <p><b>Risk:</b> Low survival rates indicate that rearing practices are producing a fish of lesser quality. Hatchery production levels required to achieve conservation and harvest objectives may be higher than optimal and represent a risk to natural populations.</p>
Natural adult abundance	<p><b>Benefit:</b> High natural adult abundance levels indicate that the population is healthy and has low risk of extinction. Abundance is an indicator of the need for a hatchery program. As natural production levels increase, conservation and harvest objectives can be met with less reliance on hatchery programs.</p> <p><b>Risk:</b> Low natural abundance is indication that environmental conditions may be insufficient to maintain the population over time (high extinction risk). Hatchery production, with all of its inherent risks to natural populations, is needed to achieve conservation and harvest objectives.</p>
Adult run-timing (HOR and NOR)	<p><b>Benefit:</b> For integrated programs, the run-timing of hatchery and natural runs should match, as this is an indicator that the two populations are expressing similar life histories, and that both are being exposed and adapting to the full range of environmental conditions present in the basin.</p> <p><b>Risk:</b> A mismatch in run-timing between the two populations (HOR and NOR) indicate that hatchery practices are selecting for life histories dissimilar to those being expressed by the natural population. The two populations may become more divergent over time, resulting in greater genetic impacts to natural populations from hatchery fish spawning in the natural environment. This could include a loss in productivity, diversity and spatial structure.</p>
pHOS	<p><b>Benefit:</b> Limiting the proportion of hatchery fish on the spawning grounds (pHOS) reduces possible genetic impacts to the natural population.</p> <p><b>Risk:</b> The more dissimilar the two populations, the larger the risk hatchery strays pose. In a well integrated program, the proportion of natural-origin fish in the hatchery brood (pNOB) must exceed the proportion of hatchery fish on the spawning grounds (pHOS). This is to ensure that the populations possess similar genetic and phenotypic traits.</p>



Indicator	Benefits and Risks
HOR straying	<p><b>Benefit:</b> Good homing fidelity of HOR fish to the release site is important for eliminating the genetic risks hatchery fish pose to wild fish from interbreeding. The higher the homing fidelity, the lower the risk. High homing rates also ensure that broodstock are available for culture so that wild populations do not need to be excessively used to achieve production targets.</p> <p><b>Risk:</b> High HOR straying rates may result in the population becoming more and more adapted to the hatchery rather than the natural environment. This makes the population less resistant or adaptable to environmental change and reduces population diversity.</p>
Reproductive success of NOR and HOR spawning naturally (NOS and HOS)	<p><b>Benefit:</b> The reproductive success of both NOR and HOR fish in nature is an indicator of the ability of each to maintain themselves in a natural environment. The ideal conservation hatchery program should produce a fish with the reproductive success of a natural fish. This indicates that the two components of the population are virtually identical in their ability to reproduce themselves in the wild and that hatchery culture practices have been successful.</p> <p><b>Risk:</b> Low reproductive success of hatchery fish, or decreasing productivity of natural-origin fish spawning with hatchery fish, may be indicative that the hatchery is having negative impacts on population productivity.</p>

## 1.11 EXPECTED SIZE OF PROGRAM.

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

To achieve the full smolt release target of 400,000 smolts, approximately 214 Chinook salmon broodstock are necessary to meet the long-term program management objectives.

### 1.11.2 Proposed annual fish release levels (maximum number) by life stage and location. (Use standardized life stage definitions by species presented in Attachment 2).

Proposed annual fish release levels (maximum numbers) and release locations are summarized in Table 3.

**Table 3. Proposed releases of Crystal Springs Chinook salmon in Panther Creek.**

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	Panther Creek stress relief site	400,000 smolts

## 1.12 CURRENT PROGRAM PERFORMANCE, INCLUDING ESTIMATED

## **SMOLT-TO-ADULT SURVIVAL RATES, ADULT PRODUCTION LEVELS, AND ESCAPEMENT LEVELS. INDICATE THE SOURCE OF THESE DATA.**

*Provide estimated smolt-to-adult survival rate, total adult production number, and escapement number (to the hatchery and natural areas) data available for the most recent twelve years (roughly three fish generations), or for the number of years of available and dependable information. Indicate program goals for these parameters.*

The Crystal Springs Panther Creek program is expected to start after construction of the facility is completed in 2013. The first releases of Chinook salmon reared at Crystal Springs Fish Hatchery would be in 2014. Adult outplants may begin as soon as an appropriate source of fish is identified.

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

The Crystal Springs Panther Creek program is expected to start after construction of the facility is completed in 2013.

### **1.14 EXPECTED DURATION OF PROGRAM.**

The Panther Creek Chinook program will have two phases. Phase I is colonization and will include outplanting up to 1,500 surplus hatchery adults on the Panther Creek spawning grounds. After completion of the Crystal Springs Hatchery, up to 400,000 smolts reared at Crystal Springs will be released in Panther Creek, in addition to outplanting surplus adults. After 4 of 5 years with anadromous escapement more than 1,000 adults, the program will transition to Phase II. Phase II will establish a localized population. Outplanting of hatchery surplus adults will be discontinued and all broodstock will be collected at the Panther Creek weir.

### **1.15 WATERSHEDS TARGETED BY PROGRAM.**

Panther Creek Salmon River: 17060203

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

Panther Creek has undergone intensive habitat restoration activities under the Damage Assessment, Remediation, and Restoration Program (DARRP). These actions are being implemented, in part, as a result of the \$60 million Blackbird Mine Settlement Agreement between the Environmental Protection Agency (EPA). Over the past several years, remediation actions have included an upgraded water treatment plant, removal of mine tailings, installation of water diversions, removal of contaminated sediments from streams, and construction of sediment retention dams. Under current conditions, habitat may no longer be the limiting factor for this

population.

Chinook salmon productivity must be greater than 1.0 recruits per spawner to produce a sustainable population. The current productivity estimate for Panther Creek is 0.1 and there is virtually no replacement. Supplementation is considered our only alternative to make this extinct strain a stabilizing population.

Three hatchery options were considered in developing the Panther Creek Chinook program:

- Option 1: Adult outplant and smolt program transitioning to a local smolt program to achieve a Maintained population status
- Option 2: Adult outplant and smolt program transitioning to a local smolt program to initially achieve Maintained population status; transitioning to a Contributing status if natural productivity warrants
- Option 3: No hatchery program

Based on the AHA analysis, Option 1 was selected as the preferred alternative as it best meets the conservation and harvest goals identified by the Tribes for Panther Creek Chinook. The results of AHA modeling for all options are presented in the Crystal Springs Fish Hatchery and Programs for Snake River Chinook Salmon and Yellowstone Cutthroat Trout (Section 4.2.2).

## **SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-LISTED SALMONID SPECIES AND NON-SALMONID SPECIES ARE ADDRESSED IN ADDENDUM A)**

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

The proposed Panther Creek program has yet to be initiated so the Tribes hold no ESA permits or authorizations for its operation. Approvals will be sought prior to program initiation.

### **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.**

*Include information describing: adult age class structure, sex ratio, size range, migrational timing, spawning range, and spawn timing; and juvenile life history strategy, including smolt emigration timing. Emphasize spatial and temporal distribution relative to hatchery fish release locations and weir sites.*

The following excerpts describing the current ESA-listed Snake River spring/summer Chinook salmon population were taken from the Draft Salmon Subbasin Summary prepared for the Northwest Power Planning Council (NPPC 2001).

### *Salmon Subbasin*

The Salmon Subbasin lies within the northern Rocky Mountains of central Idaho and encompasses 10 major watersheds. The Salmon River flows 410 miles north and west through central Idaho to join the Snake River in lower Hells Canyon. The Salmon is one of the largest sub-basins in the Columbia River Basin and encompasses some of the most pristine terrestrial and aquatic temperate ecosystems.

The Salmon River subbasin covers approximately 14 thousand square miles, 16.7 percent of the land area of Idaho. Ten major hydrologic units (watersheds) occur within the sub-basin: the Upper Salmon, Pahsimeroi, Middle Salmon-Panther, Lemhi, Upper Middle Fork Salmon, Lower Middle Fork Salmon, South Fork Salmon, Lower Salmon, and Little Salmon watersheds.

Idaho's stream-type Chinook salmon are truly unique. Smolts leaving their natal rearing areas migrate 700 to 950 miles downstream every spring to reach the Pacific Ocean.

Mature adults migrate the same distance upstream, after entering freshwater, to reach their place of birth and spawn. The life history characteristics of spring/summer Chinook are well documented by IDFG et al. 1990; Healey 1991; NMFS: 57 FR 14653 and 58FR68543). Kiefer's (1987) An Annotated Bibliography on Recent Information Concerning Chinook salmon in Idaho, prepared for the Idaho Chapter of the American Fisheries Society provides a reference of information available through the mid-1980s on life history, limiting factors, mitigation efforts, harvest, agency planning, and legal issues. Snake River Spring/Summer Chinook salmon, of which spawning populations in the Salmon River subbasin are a part, were listed as Threatened under the Endangered Species Act in 1992 (57 FR 14653); critical habitat was designated in 1993 (58 FR 68543).

Recent and ongoing research has provided managers with more specific knowledge of the Salmon River subbasin stocks. Intensive monitoring of summer parr and juvenile emigrants from nursery streams has provided insights into freshwater rearing and migration behavior (Walters et al. 2001; Achord et al. 2000; Hansen and Lockhart 2001; Nelson and Vogel 2001). Recovered tags and marks on returning adults at hatchery weirs and on spawning grounds have indirectly provided stock specific measures of recruitment and fidelity (Walters et al. 2001; Berggren and Basham 2000). Since 1992, hatchery produced Chinook has been marked to distinguish them from naturally produced fish.

Age-length frequency and age composition of individual stocks are currently being refined for specific stocks (Kiefer et al. 2001). Distribution and abundance of spawning is being monitored with intensity in specific watersheds (Walters et al. 2001; Nelson and Vogel 2001). Ongoing since the mid-1980s, annual standard surveys continue to provide trends in abundance and distribution of summer parr (Hall-Griswold and Petrosky 1997). Resultant data show an erratic trend toward lower abundance of juvenile Chinook salmon in their preferred habitat (Rosgen C type channels), both in hatchery influenced streams and in areas serving as wild fish sanctuaries.

Analysis of recent stock-recruitment data (Kiefer et al. 2001) indicates that much of the freshwater spawning/rearing habitat of Snake River Spring/Summer Chinook salmon is still productive. The average production for brood years 1990-1998 was 243 smolts/female. Stock-recruitment data show modestly density-dependent survival for the escapement levels observed in recent years and have been used to estimate smolt-to-adult survival necessary to maintain or rebuild the Chinook populations. A survival rate of 4.0% (this is less than historic levels) would result in an escapement at Lower Granite Dam of approximately 40,000 wild adult spring/summer Chinook salmon.

In the mid-1900s, the Salmon Subbasin produced an estimated 39% of the spring and 45% of the summer Chinook salmon that returned as adults to the mouth of the Columbia River. Natural escapements approached 100,000 spring and summer Chinook from 1955 to 1960; with total escapements declining to an average of about 49,300 (annual average of 29,300 spring Chinook salmon and 20,000 summer Chinook salmon) during the 1960s. Smolt production within the Salmon Subbasin is estimated to have ranged from about 1.5 million to 3.4 million fish between 1964 and 1970.

Populations of stream-type (spring and summer) Chinook in the sub-basin have declined drastically and steadily since about 1960. This holds true despite substantial capacities of watersheds within the subbasin to produce natural smolts and significant hatchery augmentation of many populations. For example, counts of spring and summer Chinook redds in IDFG standard survey areas within the sub-basin declined markedly from 1957 to 1999. The total number of spring and summer Chinook redds counted in these areas surveys ranged from 11,704 in 1957 to 166 in 1995 (Elms-Cockrum in press). Stream-type Chinook redds counted in all of the sub-basins monitored spawning areas have averaged only 1,044 since 1980, compared to an average 6,524 before 1970. Land management activities have affected habitat quality for the species in many areas of the subbasin, but spawner abundance declines have been common to populations in both high-quality and degraded spawning and rearing habitats.

Kucera and Blenden (1999) have reported that all five “index populations” (spawning aggregations) of stream-type Chinook in the Salmon Subbasin, fish that spawn in specific areas of the Middle Fork and South Fork Salmon watersheds, exhibited highly significant ( $p < 0.01$ ) declines in abundance during the period 1957-95. NMFS (2000) estimated that the population growth rates ( $\lambda$ ) for these populations during the 1990s were all substantially less than needed for the fish to replace themselves: Poverty Flats ( $\lambda = 0.757$ ), Johnson Creek (0.815), Bear Valley/Elk Creek (0.812), Marsh Creek (0.675), and Sulphur Creek (0.681). Many wild populations of stream-type Chinook in the sub-basin are now at a remnant status and it is likely that there will be complete losses of some spawning populations. Annual redd counts for the index populations have dropped to zero three times in Sulphur Creek and twice in Marsh Creek, and zero counts have been observed in spawning areas elsewhere within the Salmon Sub-

basin. All of these Chinook populations are in significant decline, are at low levels of abundance, and at high risk of localized extinction (Oosterhout and Mundy 2001).

Large reductions in historic fisheries on Chinook from the Salmon Sub-basin occurred as populations declined. Historic tribal and recent non-tribal sport fisheries targeted naturally produced salmon. Current fisheries are focused on the harvest of mitigation hatchery-produced fish while attempting to minimize impacts to fish produced in the wild. Sport harvest is now limited to only hatchery produced salmon with an acceptable incidental harvest of naturally produced salmon. Tribal fisheries are still focused in natural-origin origin populations; however harvest is minimal at best.

- 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 population directly affected by the Crystal Springs program is the Panther Creek Salmon River Chinook population in the Upper Salmon River MPG.

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

*(Includes ESA-listed fish in target hatchery fish release, adult return, and broodstock collection areas).*

All juvenile and adult Chinook salmon releases from the Crystal Springs program will occur within Panther Creek. However, populations that could be affected by adult strays include six extant Chinook populations within the Upper Salmon River MPG. To a lesser extent, Chinook salmon MPGs downstream of the Upper Salmon River MPG potentially could be affected by the Crystal Springs program.

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

## **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”)*.

The ICTRT classified the Panther Creek Salmon River population as an “intermediate” population based on historical habitat potential (ICTRT 2007). A Chinook population classified as intermediate has a mean minimum abundance threshold criteria of 750 naturally produced spawners with a sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe. Under these conditions, the Panther Creek population is classified as “critical.”

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

In 2002, reconnaissance level electrofishing indicated that juvenile Chinook salmon distribution extended approximately to Musgrove Creek (about Mile 29.5), with beaver dams upstream of the Musgrove Creek confluence apparently preventing Chinook salmon use of reaches further upstream (BEAK and Golder 2002). Historically, the Chinook salmon distribution extended further upstream and in 2006, 2007, and 2009, Chinook salmon juveniles were collected upstream of Porphyry Creek. No juveniles were collected at this location in 2008. Panther Creek has been broken into three sections for analysis of juvenile abundance (Table 4).

**Table 4. Estimated Annual Density of Juvenile Chinook Salmon in Panther Creek, 2002 to 2009.**

Stream Section	Density/100m <sup>2</sup>							
	2002	2003	2004	2005	2006	2007	2008	2009
Upper (Porphyry Creek to Blackbird Creek) <sup>a</sup>	34.8	10.2	1.1	3.4	12.4	20.6	8.9	7.9
Middle (Blackbird Creek to Big Deer Creek)	42.0	11.4	0.9	5.6	26.8	19.2	9.6	11.1
Lower (Big Deer Creek to Salmon River)	8.8	0.5	0	0.5	1.5	0.6	0.6	0.3
Panther Creek Mean	31.0	8.1	0.7	3.8	16.5	15.4	7.3	7.6

<sup>a</sup> In 2002-2005, the Upper Panther Creek section ended at Musgrove Creek.  
Source: EcoMetrix 2010.

- Provide the most recent 12 year (e.g. 1988-1999) 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).*

The IDFG has conducted a helicopter surveys in September annually to identify salmon redds. Historically, (between 1954 and 1967), the number of redds counted in Panther Creek ranged from 0 (1963 to 1967) to 135 (157) (Corley 1967). In 2005, a total of 18 redds were located in Panther Creek (Table 5) (EcoMetrix Inc 2006). Visibility conditions were not ideal during this condition and the actual number of redds present could have been slightly greater than the 18 identified. IDFG identified 15 redds in 2001, following the summer stocking of Chinook salmon adults in Panther Creek. Independent counts by tribal biologists identified 43 redds in 2001 (EcoMetrix Inc. 2006). Discrepancies in counts between tribal and IDFG surveys could be due to several factors, including timing, techniques, frequency of observations, area surveyed, and crew experience. Discrepancies should not be interpreted to mean that the actual number of redds are likely to be about three times greater than IDFG counts. However, the number of redds present in 2005 may be similar to those observed in 2001. Some of these spawning Chinook

salmon observed in 2005 may have been returns from those produced by stocked adults in 2001.

**Table 5. Number of Chinook salmon redds visually identified by IDFG helicopter surveys.**

Year	Number of Redds
2001	15
2005	18
2006	16
2007	11
2008	5
2009	14

Source: EcoMetrix Inc 2010.

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

No data is available for the natural population. No hatchery currently releases fish in Panther Creek.

**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 (see “Attachment 1” for definition 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.

Broodstock collection will result in the direct take of ESA-listed Snake River spring/summer Chinook salmon. There is the possibility that steelhead or bull trout may be incidentally captured at the proposed weir. Non-target captured individuals will be immediately released either upstream or downstream of the weir with minimal handling.

The Tribes will develop a monitoring and evaluation (M&E) plan to assess the success of hatchery supplementation activities in Panther Creek. Monitoring and evaluation of Chinook salmon will occur by fin clips for genetic analysis, a non-lethal method of data collection. DNA typing will be used to differentiate Chinook salmon of hatchery-origin or natural-origin. Additional M&E activities will include creel surveys, red counts, and carcass recoveries.

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

This program is expected to begin in 2013.

- 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).

*Complete the appended “take table” (Table 1) for this purpose. Provide a range of potential take numbers to account for alternate or “worst case” scenarios.*

All adult Chinook salmon will be trapped and handled at a picket weir after the transition to local broodstock. The number of returning adults is expected to vary annually. To meet juvenile release objectives, the Tribes plan to collect up to 214 broodstock. To collect broodstock from the entire Chinook salmon run, all adult Chinook salmon entering Panther Creek will be trapped at the Blackbird weir or other weir site that has yet to be determined. All adults captured that are not collected for broodstock will be released to spawn naturally.

- 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.

*(e.g. “The number of days that steelhead are trapped at Priest Rapids Dam will be reduced if the total mortality of handled fish is projected inseason to exceed the 1988-99 maximum observed level of 100 fish.”)*

It is unlikely for take levels of natural-origin Chinook salmon to exceed projected take levels presented in Table 1. If adult collection exceeds broodstock take levels, those individuals not required for the Crystal Springs program will be released upstream of the proposed collection weir for natural spawning. However, in the unlikely event that stated levels of take are exceeded, the Tribes will consult with NOAA-Fisheries Sustainable Fisheries Division to agree to an action plan. We assume that any contingency plan will include a provision to discontinue the associated activities.

## **SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES**

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

*(e.g. “The hatchery program will be operated consistent with the ESU-wide plan, with the exception of age class at release. Fish will be released as yearlings rather than as sub-yearlings as specified in the ESU-wide plan, to maximize smolt-to-adult survival rates given extremely low run sizes the past four years.”).*

The Crystal Springs program conforms to the plans and policies of the LSRCP administered by the U.S. Fish and Wildlife Service to mitigate for the loss of Chinook salmon production caused

by the construction and operation of the four dams on the lower Snake River. In addition, the program will also assist in meeting the objectives of the Salmon Subbasin Plan (Ecovista 2004) and the Council's Fish and Wildlife Program funded by BPA.

### **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.**

- Shoshone-Bannock Tribes Salmon River Production Program Master Plan – draft.
- Shoshone-Bannock Tribes Tribal Resource Management Plan for Snake River spring/summer Chinook salmon fisheries in the Salmon River subbasin.
- 2008-2017 Management Agreement pursuant to U.S. v. Oregon, U.S. District Court, District of Oregon.
- Tribes, IDFG, and LSRCP Memorandum of Agreement (2008 and 2009).

### **3.3 RELATIONSHIP TO HARVEST OBJECTIVES.**

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

To the extent consistent with the conservation and broodstock objectives of the Crystal Springs program, this population will contribute to the Panther Creek, Salmon, Snake and Columbia River fisheries.

#### **3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), 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 .**

Harvest opportunities in Panther Creek will be available to Tribal members and will be governed by the Shoshone-Bannock Tribes' Tribal Resource Management Plan. Hatchery-produced adults will be subjected to potential commercial ocean and in-river fisheries with a sport fishing season. Since the inception of the LSRCP, Chinook salmon sport fishing seasons have been limited in the upper Salmon River.

### **3.4 RELATIONSHIP TO HABITAT PROTECTION AND RECOVERY**

## STRATEGIES.

*Describe the major factors affecting natural production (if known). Describe any habitat protection efforts, and expected natural production benefits over the short- and long-term. For Columbia Basin programs, use NPPC document 99-15, section II.C. as guidance in indicating program linkage with assumptions regarding habitat conditions.*

The decline of Chinook salmon in Panther Creek can be linked to both mining activities in the Panther Creek watershed and out of basin hydropower developments. Mining has resulted in chemical contamination, altered riparian habitat, and increased sedimentation. Without contaminant cleanup activities, production of salmon and steelhead will remain close to zero. In addition to habitat cleanup and enhancement, significant changes in hydropower operation must be adopted to increase survival of Panther Creek Chinook Salmon.

Currently, the NOAA-Fisheries is developing a recovery plan specific to Snake River spring/summer Chinook salmon ESU. The Crystal Springs program will assist NOAA-Fisheries in achieving recovery objectives for Panther Creek Chinook.

### **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.]**

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

#### *Ecological interactions.*

Possible negative effects on listed salmon from the release of hatchery-produced Chinook smolts may occur through predation, competition, or disease transmission.

#### *Predation*

It may be probable, although highly unlikely, that hatchery-origin juveniles from the Crystal Springs program may prey on natural-origin spring Chinook. Although it is possible for hatchery-origin individuals to ingest natural-origin fry based on size (39.8 mm; Peery and Bjornn 1992), emigration from release sites is expected to occur almost immediately alleviating any pressure to natural-origin fish. In addition, no studies suggest juvenile Chinook salmon are piscivorous as well as it is unlikely hatchery-origin individuals will convert to a natural diet immediately upon release (USFWS 1992, 1993).

#### *Competition*

Initial competition in Panther Creek should be minimal due to the limited population size of natural Chinook salmon and steelhead trout in the system. Competition for food and space

should also be minimal because of the location of selected release sites, rapid emigration from those sites, and the initial non-natural diet of hatchery-produced juveniles. Space and habitat selection should be controlled by the size difference between hatchery and natural-origin juveniles (Everest 1969). Generally, hatchery-produced juveniles are larger and, therefore, more adapted to occupy deeper water and faster velocities compared to smaller, natural juveniles (Hampton 1988).

#### *Disease*

The Pahsimeroi Hatchery is being considered as a source for surplus spring Chinook adults to be planted in Panther Creek. Whirling disease (*M. cerebralis*) is currently found in the Pahsimeroi drainage. The presence or absence of whirling disease in Panther Creek is unknown. Sampling Chinook in Panther Creek will determine if it is present in the watershed. If whirling disease is present, then transfer of adults from Pahsimeroi could proceed without concern of amplification of the disease. If it is not present in Panther Creek, only gametes would potentially be transferred rather than adults.

## **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.**

*For integrated programs, identify any differences between hatchery water and source, and “natal” water used by the naturally spawning population. Also, describe any methods applied in the hatchery that affect water temperature regimes or quality. Include information on water withdrawal permits, National Pollutant Discharge Elimination System (NPDES) permits, and compliance with NMFS screening criteria.*

#### *Crystal Springs Fish Hatchery*

The proposed Crystal Springs Hatchery site is on two parcels of land, 19.7 acres total, containing six existing artesian wells. A minimum of two new wells will be required to achieve the anticipated need of 24 cfs. The artesian aquifer that underlies the site provides an excellent source of high quality water for fish rearing, and is the primary reason this site was selected for the project. The design of this facility will be to use gravity flow artesian well water to the greatest degree possible in order to minimize pumping costs. In an average water year, artesian flows will be adequate to meet hatchery demand for both the spring/summer Chinook (Panther Creek and Yankee Fork) and Yellowstone cutthroat trout programs, for at least nine months (approximately May through October). During the peak months (March through April), several (up to three) of the highest producing wells will most likely need to be pumped in order to meet water supply demand. Once pumps are turned on, the amount of artesian flow available to the non-pumped wells will likely decline; however, gravity supplied flow may still be available. A

water right of 24.7 cfs was perfected by the former trout hatchery at Crystal Springs and will be used for the new hatchery.

Consistency of project construction and operation will be demonstrated with various regulatory programs under the Federal Water Pollution Control Act (Clean Water Act). The authority to review the programs for consistency with Section 401 is the responsibility of the Idaho Department of Environmental Quality (IDEQ). Section 404 of this act is administered by the Corps of Engineers. Effects of developing the proposed hatchery facilities on wetland habitat will be evaluated by the Corps, an effort that will require delineation of existing wetlands. Another Clean Water Act component is administered by the Environmental Protection Agency (EPA) is the National Pollution Discharge Elimination System (NPDES) permit for hatchery construction (and the associated Stormwater Pollution Prevention Plan). An additional NPDES permit will be required for hatchery operations if production reaches a regulated level.

The conceptual design of this facility includes dual elevation degassing head boxes; a lower elevation head box for degassing and oxygenating artesian flows, and a higher elevation head box for degassing and oxygenating pumped flows. There may also be need for a chiller and associated chilled water head box and piping system that would be used to slow the development rate of eggs and fry in order to produce smolts that meet targets for fish size and release dates.

The water requirements for the Panther Creek Chinook program show a peak flow of 3,740 gpm to the outdoor rearing facilities for a given brood year, and a concurrent demand of 617 gpm for early rearing supply to the successive brood year. The total peak demand, including incubation (82 gpm constant), is expected to be 4,439 gpm for the Panther Creek program. The peak total flow demand, for both Yankee Fork and Panther Creek program, would be 9,705 gpm in April.

All water used at the Crystal Springs site will be supplied by wells, and no fish screening will be required.

## **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.**

*(e.g. "Hatchery intake screens conform with NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.").*

The proposed Crystal Springs Fish Hatchery will have a water right of 24.7 cfs to be supplied from artesian wells. There are no listed fish in the system that may be affected by effluent discharge.

Consistency of project construction and operation will be demonstrated with various regulatory programs under the Federal Water Pollution Control Act (Clean Water Act). The authority to review the programs for consistency with Section 401 is the responsibility of the Idaho Department of Environmental Quality (IDEQ). Section 404 of this act is administered by the Corps of Engineers. Effects of developing the proposed hatchery facilities on wetland habitat will be evaluated by the Corps, an effort that will require delineation of existing wetlands.

Another Clean Water Act component is administered by the Environmental Protection Agency (EPA) is the National Pollution Discharge Elimination System (NPDES) permit for hatchery construction (and the associated Stormwater Pollution Prevention Plan). An additional NPDES permit will be required for hatchery operations if production reaches a regulated level.

## **SECTION 5. FACILITIES**

*Provide descriptions of the hatchery facilities that are to be included in this plan (see “Guidelines for Providing Responses” Item E), including dimensions of trapping, holding incubation, and rearing facilities. Indicate the fish life stage held or reared in each. Also describe any instance where operation of the hatchery facilities, or new construction, results in destruction or adverse modification of critical habitat designated for listed salmonid species.*

### **5.1 BROODSTOCK COLLECTION FACILITIES (OR METHODS).**

#### *Collection Weir*

Adult collection at a new picket weir will be facilitated by a temporary weir that spans Panther Creek at a location yet to be confirmed. Weir panels and the trapping device will be installed in late June or early July to prevent upstream migration of adult Chinook salmon. Chinook salmon volitionally migrate into the adult trap where they will be manually sorted and disposition is determined.

#### *Crystal Springs Fish Hatchery*

This facility would not collect broodstock and would be used to rear Chinook salmon to the smolt life stage before being transported back to Panther Creek.

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

A variety of transportation vehicles and equipment are available at the various facilities.

#### *Smolt*

Multiple methods are available for smolt transfer: two-ton trucks, helicopters, or tanker trucks. Two-ton trucks would require numerous truck loads and helicopter releases are not viable for large releases. Tanker trucks are considered the favorable approach for smolt transfer to Panther Creek. Transportation of smolt will be conducted using a 5,000 gallon capacity tanker truck. Five tanks of 1,000 gallons with 6°C water and fish size of 20 FPP can safely hold 26,112 smolts per tank for a total of 130,560 smolts per load. Three trips would safely stock approximately 391,680 smolts. Safe travel time from Crystal Springs to the stocking site would be about 5.5 hours, dependent on road conditions. Smolt loading will occur at Crystal Springs at 8:00 a.m. during winter weather conditions, therefore, estimating completion of one stocking trip (Crystal Springs to Crystal Springs) by 3:00 p.m.

### *Adult*

Adults are transported using a 300 gallon tank mounted on a three-quarter ton truck. The tank has one compartment of 300 gallon capacity and was modified to include an oxygen tank, diffuser, and circulating pump. The tank is filled with water pumped directly from Panther Creek. Normal hauling guidelines were followed for adult fish, which is approximately one pound of fish per gallon of water.

### *Eggs*

Eggs will be placed in individual containers to maintain separation from other female eggs. Containers will be placed in 80 quart sealed, insulated coolers for transportation. Ice is added to each cooler to keep eggs chilled during transport.

## **5.3 BROODSTOCK HOLDING AND SPAWNING FACILITIES.**

Section 5.1 describes the trapping, broodstock holding, and spawning facilities.

## **5.4 INCUBATION FACILITIES.**

Eggs will be loaded into heath tray incubators. A total of 328 trays stacked 8 high, a total of 47 stacks, will be required for the Yankee Fork and Panther Creek programs. The Panther Creek program will require 131 trays.

Both chilled and ambient groundwater will be provided to each incubator. It is anticipated that the supply water will be chilled to approximately 40° F for the duration of the incubation period, slowing fish development in order to achieve the target size by the release date.

A hard-piped chemical feed system will be used to deliver daily argentine or formalin treatments to each incubator stack to prevent fungus growth on the eggs. Overflow water from the incubators will fall through gratings into floor trenches that convey the water into the hatchery drain system. Adequate dilution flow will be maintained through the hatchery drain system avoid exceeding chemical concentration limits in the hatchery outfall.

## **5.5 REARING FACILITIES.**

### **Early rearing**

Beginning in March, swim up fry will be transferred into early rearing troughs located in a 60-by 132-foot room adjacent to the incubation area. The troughs will be 40-foot long, 4-foot wide, and 2.75-foot deep fiberglass vessels, configured in pairs, with narrow access aisles between each pair. Pathogen-free groundwater will be supplied to the upstream end of each rearing trough through a valved connection for flow control. Typical flow rates to each trough will be 60 gpm (37 minute turnover), at an average temperature of 10°C. Each trough will have screens for segregating and retaining batches of fish, and stop logs or standpipes for water level control. Fish will be reared in these troughs until July or early August, when they will be marked and transferred into the outdoor rearing ponds. The target size range for transfer is 150 to 200 fish per pound.

## Outdoor rearing

The outdoor ponds used for juvenile rearing will be constructed of cast in place concrete, with inlet, outlet and intermediate screens to retain and segregate fish, and stop logs to control water level. A total of 2 ponds are required to meet the production goal of 400,000 smolts at 10 fish per pound. The ponds will be arranged in a row, with a fifteen-foot-wide access aisle between them. The rearing area of each raceway will be 100 feet long, 25 feet wide, with an average water depth of 5 feet, and a volume of 12,500 cubic feet. A 10-foot-long quiescent zone will be provided at the downstream end of each raceway to allow settleable solids to separate from the water column. The floor slab in front of the quiescent zone will have a recessed floor that can be used as a kettle during fish transporting operations.

Up to 3,740 gallons per minute of groundwater will be supplied through a manifold to the upstream end of each pond via a 12-inch valved connection (50 minute turnover). Water level in each pond will be controlled by stop log weirs, positioned across the full width of the pond in order to reduce dead spots and provide good circulation through the entire pond. The overflow water from each pond will be piped into a common drain that discharges into the wetland ponds to the south. A separate cleaning waste vacuum piping system will be used to collect settled solids for each raceway and convey the concentrated wastes to an off-line settling pond.

## **5.6 ACCLIMATION/RELEASE FACILITIES.**

All Chinook salmon smolts produced at Crystal Springs for Panther Creek will be transported to a stress relief pond for temporary holding, after which they would be volitionally released to Panther Creek.

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

This program is expected to start in 2013, therefore there has been no fish mortality.

## **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.**

### *Crystal Springs Fish Hatchery*

The Crystal Springs Hatchery will have about two to three FTE permanent staff members that live on station and cover shifts for alarm duties and other production checks, and up to three FTE temporary staff for various seasonal fish culture duties. An alarm system will be installed that will alert staff to low water and water temperatures outside of the accepted range. Artesian wells equipped with pumps will each have generator back-up in case of power failure. The water system will be integrated so that any well can provide water to all parts of the facility. Artesian



water flow can be supplied to rearing units in the case of complete power/generator failure.

## **SECTION 6. BROODSTOCK ORIGIN AND IDENTITY**

Describe 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.**

*List all historical sources of broodstock for the program. Be specific (e.g., natural spawners from Bear Creek, fish returning to the Loon Creek Hatchery trap, etc.).*

The broodstock source for the Crystal Springs program will initially be from the Pahsimeroi stock. As escapement to Panther Creek increases, broodstock will transition to be locally adapted Chinook returning to Panther Creek.

### **6.2 SUPPORTING INFORMATION.**

#### **6.2.1 History.**

*Provide a brief narrative history of the broodstock sources. For listed natural populations, specify its status relative to critical and viable population thresholds (use section 2.2.2 if appropriate). For existing hatchery stocks, include information on how and when they were founded, sources of broodstock since founding, and any purposeful or inadvertent selection applied that changed characteristics of the founding broodstock.*

The Middle Salmon-Panther watershed is a fourth level hydrologic unit and drains an area of 1,164,588 acres. The watershed is bordered by the Lower Middle Fork Salmon watershed to the east and the Lemhi watershed to the east. The southern boundary of the Middle Salmon-Panther watershed is the Upper Salmon watershed. The headwaters of Panther Creek originate near Morgan Creek Summit at an elevation of approximately 8,000 feet msl. From its headwaters, the creek flows in a north-northwesterly direction for 44 miles, where it enters the Salmon River.

Historically, Chinook salmon, steelhead, and resident trout inhabited Panther Creek. Runs of these species have been drastically reduced or extirpated due to local mining activities and downstream hydroelectric developments. Mining and agricultural practices in the region have resulted in more than 2,250 points of water diversion, 337 stream-alteration permits, and 95 road culverts of U.S. Forest Service lands in the Middle Salmon Panther watershed. Fifty-one of these culverts are known to block adult fish passage while 10 allow passage.

Generally, spring Chinook would historically enter the Columbia River during March – May and spawn in Panther Creek in August and September (Bjornn 1960). Currently, the diminished run of Chinook salmon in the Salmon River and Panther Creek has dramatically reduced an important subsistence and ceremonial fishery for the Shoshone-Bannock Tribes.

Current spawning surveys show some adults returning to and spawning in Panther Creek. Their origin is unknown but has been assumed to be the result of the previous reintroduction efforts using South Fork Salmon River sock from McCall Fish Hatchery. Genetic samples are being analyzed.

Return numbers are currently at a level that will not support collection of sufficient broodstock to initiate the Crystal Springs program. Pahsimeroi stock Chinook may be used to supplement Panther Creek escapement by releasing Pahsimeroi Fish Hatchery surplus adults to spawn naturally in Panther Creek, and using Pahsimeroi Fish Hatchery returns as broodstock to start the Crystal Springs program.

### **6.2.2 Annual size.**

*Provide estimates of the proportion of the natural population that will be collected for broodstock. Specify number of each sex, or total number and sex ratio, if known. For broodstocks originating from natural populations, explain how their use will affect their population status relative to critical and viable thresholds.*

Approximately 214 adult Chinook salmon are needed to meet the current production objective of releasing 400,000 yearling smolts into Panther Creek. The size of the smolt release will be modified annually as space at the hatchery allows.

### **6.2.3 Past and proposed level of natural fish in broodstock.**

*If using an existing hatchery stock, include specific information on how many natural fish were incorporated into the broodstock annually.*

There have been no broodstock collected for the Crystal Springs program. The Tribes plan to collect broodstock from Panther Creek; however, it will be necessary to supplement natural broodstock with hatchery-origin adults from Pahsimeroi stock or some other source. As returns to Panther Creek increase, broodstock will be collected entirely at the new weir and out-of-basin stocks will not be used.

### **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.*

The Panther Creek spring Chinook population was extirpated in the 1960s primarily due to local mining activities. Currently, there are spring Chinook spawning in the Panther Creek watershed that are expected to be strays from outside the watershed. It is unknown if these fish are from in-basin (Upper Salmon River) or out-of-basin (South Fork Salmon River) stock. Tests analyzing the genetics of Panther Creek returns are ongoing.

### **6.2.5 Reasons for choosing.**

*Describe any special traits or characteristics for which broodstock was selected.*

Surplus hatchery adults of South Fork Salmon River or Upper Salmon River stock are expected to be released in Panther Creek to produce a minimum spawning population of 1,000 adults. Pahsimeroi Hatchery is being considered as a source for these adults and as a source for broodstock. Using the Pahsimeroi Hatchery stock will keep the source in-basin and potentially decrease the stray rate of returns.

### **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.**

*(e.g. “The risk of among population genetic diversity loss will be reduced by selecting the indigenous chinook salmon population for use as broodstock in the supplementation program.”).*

The Panther Creek population is considered extirpated. All Chinook salmon released in the system will be of hatchery-origin in Phase 1 of the program. PNI will be analyzed and managed at a later date.

## **SECTION 7. BROODSTOCK COLLECTION**

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

Phase I of the Panther Creek program may use adult returns to Pahsimeroi Fish Hatchery. Returning adults will be collected at a new picket weir on Panther Creek and supplemented with Pahsimeroi broodstock (or other appropriate stock) as needed. Once run size is large enough, returning adults in excess of broodstock needs will be released to spawn naturally.

### **7.2 COLLECTION OR SAMPLING DESIGN.**

*Include information on the location, time, and method of capture (e.g. weir trap, beach seine, etc.) Describe capture efficiency and measures to reduce sources of bias that could lead to a non-representative sample of the desired broodstock source.*

Adults captured at new Panther Creek weir will be sampled and information will be recorded: time, date, location, length, gender, origin, marks, and tags. Broodstock will be randomly collected throughout the entire run to alleviate artificial selection. Guidelines for sampling are as follows:

1. Weir installed yearly at earliest possible safe flow levels.

2. Adequate personnel will be present at all times for proper weir and trap operation.
3. Broodstock collected over entire run.
4. 214 adults collected dependent upon SAR average.
5. Surplus H x W adults released to spawn naturally.
6. Adults sampled for DNA typing and parentage analysis.

### **7.3 IDENTITY.**

*Describe method for identifying (a) target population if more than one population may be present; and (b) hatchery origin fish from naturally spawned fish.*

No spring Chinook salmon population is recognized in Panther Creek, however there are adult spring Chinook spawning in the watershed. These fish are assumed to be strays from populations outside the watershed. Hatchery produced adults will be identified by PIT tags, coded-wire tag, or tissue sampling. Adults without marks will be deemed NOR.

### **7.4 PROPOSED NUMBER TO BE COLLECTED**

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

Approximately 214 broodstock are needed annually to achieve a smolt release objective of 400,000 smolts.

#### **7.4.2 Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:**

No broodstock has been collected from Panther Creek for this program.

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

*Describe procedures for remaining within programmed broodstock collection or allowable upstream hatchery fish escapement levels, including culling.*

Disposition of surplus hatchery-origin adults collected at the Panther Creek weir will vary based on adult return numbers and management objectives. Disposition of surplus fish will include releasing hatchery adults above the weir for natural spawning and increasing the allowable harvest of Chinook in Panther Creek by the Tribes.

### **7.6 FISH TRANSPORTATION AND HOLDING METHODS.**

*Describe procedures for the transportation (if necessary) and holding of fish, especially if captured unripe or as juveniles. Include length of time in transit and care before and during*

*transit and holding, including application of anesthetics, salves, and antibiotics.*

See Section 5.2.

## **7.7 DESCRIBE FISH HEALTH MAINTENANCE AND SANITATION PROCEDURES APPLIED.**

After fertilization, eggs will be water hardened in iodophor and loaded into tray incubators. Each tray will contain eggs from an individual female and will be maintained this way until the results of any disease screening are complete. A hard-piped chemical feed system will be used to deliver argentine or formalin treatments to each incubator on a daily basis to prevent fungus growth on the eggs.

## **7.8 DISPOSITION OF CARCASSES.**

*Include information for spawned and unspawned carcasses, sale or other disposal methods, and use for stream reseeding.*

Adult holdings will be checked once an hour on a daily basis by trap tenders. Mortalities will be removed and data will be collected on date, time, sex, cause of death (if known), and body condition. Biological samples will be collected and placed in proper containers for later analysis. Mortalities will then be spread across the spawning habitat to help replenish depleted marine nutrients in the system.

## **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.**

*(e.g. “The risk of fish disease amplification will be minimized by following Co-manager Fish Health Policy sanitation and fish health maintenance and monitoring guidelines”).*

Artificial production programs and associated RM&E components are developed to minimize genetic and ecological risks to target population. The program complies with NOAA Section 10 permitting language and program oversight is further dictated by the Shoshone-Bannock Tribes.

## SECTION 8. MATING

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

### 8.1 SELECTION METHOD.

*Specify how spawners are chosen (e.g. randomly over whole run, randomly from ripe fish on a certain day, selectively chosen, or prioritized based on hatchery or natural origin).*

Two groups of Chinook salmon will be collected at the Panther Creek weir: NOR and HOR. Naturally spawned adults will not be marked. Hatchery origin adults will be PIT-tagged and/or coded-wire tagged. Broodstock will be collected at random over the entire timeframe of returning adults at an approximate ratio of 1:1 (males: females).

### 8.2 MALES.

Males will only be spawned once. In cases of unequal broodstock collection, male holding mortality exceeds female, or late male maturation, males may be spawned twice.

### 8.3 FERTILIZATION.

*Describe spawning protocols applied, including the fertilization scheme used (such as equal sex ratios and 1:1 individual matings; equal sex ratios and pooled gametes; or factorial matings). Explain any fish health and sanitation procedures used for disease prevention.*

Spawning will occur by single pair mating (1:1 male to female spawning). Backup males will be retained to ensure fertilization. Excess males will be held over for the next spawning date or be segregated for gamete cryopreservation.

### 8.4 CRYOPRESERVED GAMETES.

*If used, describe number of donors, year of collection, number of times donors were used in the past, and expected and observed viability.*

The Tribes strive to ensure availability of a representative genetic sample of original male population by establishing and maintaining a germ plasm repository. Gamete cryopreservation permits the creation of a genetic repository, but is not a cure for decreasing fish stock problems. Gamete samples will be collected and shipped to storage facilities for genetic processing within 24 hours.

Milt will be cryopreserved from transported broodstock NOR males for future spawning. Also, milt will be cryopreserved from adults captured during the second peak (assuming there is a bi-modal distribution) of migration when spawning is occurring.

### 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.**

*(e.g. “A factorial mating scheme will be applied to reduce the risk of loss of within population genetic diversity for the small chum salmon population that is the subject of this supplementation program”).*

Single pair mating will limit apparent artificial selection by randomly selecting a male to fertilize a “ripe” female. Random backup males will be present to ensure fertilization and also increase genetic diversity through potential use of multiple males. Disease control mechanisms are in place to limit the incidence of BKD and fungus related mortality. In addition, cryopreserved milt will be used to maximize genetic diversity in the Crystal Springs Panther Creek program.

## **SECTION 9. INCUBATION AND REARING -**

Specify any management *goals* (e.g. “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data 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.**

*Provide data for the most recent twelve years, or for years dependable data are available.*

Broodstock has not been collected and, consequently, survival rates between life stages have yet to be determined. Survival from green egg to hatch is estimated to be approximately 80%. Survival for the subsequent early rearing and juvenile rearing phases is anticipated to be approximately 95%.

#### **9.1.2 Cause for and disposition of surplus egg takes.**

*Describe circumstances where extra eggs may be taken (e.g. as a safeguard against potential incubation losses), and the disposition of surplus fish safely carried through to the eyed eggs or fry stage to prevent exceeding of programmed levels.*

The Panther Creek program does not consider excess amounts of eggs, parr, or smolts as useless/expendable “surplus.” Excess eggs, parr, or smolts will be outplanted in Panther Creek if survival rates are exceeded between life stages or fecundity is elevated.

### **9.1.3 Loading densities applied during incubation.**

*Provide egg size data, standard incubator flows, standard loading per Heath tray (or other incubation density parameters).*

Eggs will be loaded into heath tray incubators at 3,000 to 5,000 eggs per tray. Pathogen-free groundwater will be provided at a flow rate of 5 gpm to each stack.

### **9.1.4 Incubation conditions.**

*Describe monitoring methods, temperature regimes, minimum dissolved oxygen criteria (influent/effluent), and silt management procedures (if applicable), and any other parameters monitored.*

Eggs will be delivered between August and September. After fertilization, eggs will be water hardened in iodophor and then loaded into heath tray incubators at approximately 4,000 eggs per tray (each tray containing eggs from individual females). They will be maintained this way until the results of any disease screening are complete. Excess iodophor will be disposed of by land application or stored in a pump-out tank for periodic remote disposal.

Pathogen-free groundwater will be provided at a flow rate of 5 gallons per minute to each stack. A total of 41 stacks (25 for Yankee Fork and 16 for Panther Creek) will be supplied with 205 gallons per minute. A smaller separate quarantine incubation room will be provided for research and experimental egg handling operations. Both chilled and ambient groundwater will be provided to each incubator. It is anticipated that the supply water will be approximately 10°C for the duration of the incubation period, slowing fish development in order to achieve the target size by the release date.

A hard-piped chemical feed system will be used to deliver daily argentine or formalin treatments to each incubator stack to prevent fungus growth on the eggs. Overflow water from the incubators will fall through gratings into floor trenches that convey the water into the hatchery drain system. Adequate dilution flow will be maintained through the hatchery drain system avoid exceeding chemical concentration limits in the hatchery outfall.

### **9.1.5 Ponding.**

*Describe degree of button up, cumulative temperature units, and mean length and weight (and distribution around the mean) at ponding. State dates of ponding, and whether swim up and ponding are volitional or forced.*

Swim up fry will be transferred from incubators to early rearing troughs beginning in March. Troughs are expected to be 40-foot long, 4-foot wide and 2.75-foot deep fiberglass vessels, configured in pairs, with narrow access aisles between each pair. Other styles of troughs will be evaluated during the preliminary design phase. Pathogen-free groundwater will be supplied to the upstream end of each rearing trough through a valved connection for flow control. Typical flow rates to each trough will be a 37 minute turnover, at an average temperature of 10° C. Each trough will have screens for segregating and retaining batches of fish, and stop logs or standpipes for water level control. A grated floor trench will run the length of the room at the downstream



end of the troughs to collect overflow/drain water and route it into the hatchery drain pipe system. A cleaning waste drain pipe will be routed inside the floor trench to collect and convey vacuumed cleaning wastes to an off-line settling basin.

In late July, juveniles will be transferred from the early rearing troughs to the outdoor rearing ponds. The target size range for transfer is 150 to 200 fish per pound.

The outdoor ponds used for juvenile rearing will be constructed of cast in place concrete, with inlet, outlet and intermediate screens to retain and segregate fish, and stoplogs to control water level. Five ponds will be required to meet the production goal of one million smolts at 10 fish per pound. The ponds will be arranged in a row, with a 15-foot-wide access aisle between them. The rearing area of each raceway will be 100 feet long, 25 feet wide, with an average water depth of 5 feet, and a volume of 12,500 cubic feet. A 10-foot-long quiescent zone will be provided at the downstream end of each raceway to allow settleable solids to separate from the water column. The floor slab in front of the quiescent zone will have a recessed floor that can be used as a kettle during fish transporting operations.

Up to 1,870 gallons per minute of groundwater will be supplied through a manifold to the upstream end of each outdoor pond via a 12-inch valved connection (50 minute turnover). Water level in each pond will be controlled by stoplog weirs, positioned across the full width of the pond in order to reduce dead spots and provide good circulation. The overflow water from each pond will be piped into a common drain that discharges into the wetland ponds to the south. A separate cleaning waste vacuum piping system will be used to collect settled solids for each raceway and convey the concentrated wastes to an off-line settling pond.

### **9.1.6 Fish health maintenance and monitoring.**

*Describe fungus control methods, disease monitoring and treatment procedures, incidence of yolk-sac malformation, and egg mortality removal methods.*

After fertilization, eggs will be water hardened in iodophor and loaded into tray incubators. Each tray will contain eggs from an individual female and will be maintained this way until the results of any disease screening are complete. A hard-piped chemical feed system will be used to deliver argentine or formalin treatments to each incubator on a daily basis to prevent fungus growth on the eggs. Eggs will be treated with a formalin solution (1667 ppm) three times per week to control fungal growth. Formalin treatments will be administered until the eggs reach the eyed-up stage. Shocking will be conducted around 560 FTUs. Dead and undeveloped eggs will be removed manually or by an automatic egg picking machine. Good eggs will be returned to the same tray and stack location. Additional egg picks are conducted to remove any uncollected dead eggs. Tray lids and screens will be cleaned during each egg picking event.

### **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.**

*(e.g. "Eggs will be incubated using well water only to minimize the risk of catastrophic loss due to siltation.")*

No adverse genetic or ecological effects to listed fish are expected. Density dependent mortality and disease transmission will be countered by placing female eggs in separate trays. Eggs are treated with formalin (1667 ppm) and water hardened in a 100 ppm Iodophor solution for 30 minutes following fertilization. Alarms and sensors are in place for low pressure and water levels.

## **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 (1988-99), or for years dependable data are available.**

The Crystal Springs Fish Hatchery is expected to be operational starting in 2013. Estimated survival rates of juvenile Chinook salmon are provided in Table 6.

### **9.2.2 Density and loading criteria (goals and actual levels).**

Crystal Springs is expected to operate at a density index of 0.23 and a flow index of 1.50-1.52.

**Table 6. Estimated Survival Rates of Chinook Salmon Reared at Crystal Springs Fish Hatchery.**

Life stage	Survival Rate
Green Egg to Hatch	80%
Early Rearing	95%
Juvenile Rearing	95%

Note: Values are approximate averages between several IDFG spring Chinook production hatcheries.

### **9.2.3 Fish rearing conditions**

*(Describe monitoring methods, temperature regimes, minimum dissolved oxygen, carbon dioxide, total gas pressure criteria (influent/effluent if available), and standard pond management procedures applied to rear fish).*

Swim-up fry will be transferred from incubation trays to indoor early rearing troughs beginning in March at approximately 0.33 grams. Initial flows in the troughs will be typically set at approximately 60 gpm per trough. As fish grow, flows may be increased. All water to the troughs will be pumped well water. Water temperature during rearing is expected to be a constant 40°F.

Juveniles will be transferred to the outdoor rearing ponds when they reach approximately 150 to 200 fish per pound (approximately 2.70 grams). The rearing ponds will be supplied by pumped

well water. Initial pond flows will be set at approximately 1,870 gallons per minute of groundwater. Water temperatures are expected to be a constant 40°F.

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

The Panther Creek Chinook program is expected to start in 2013.

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

*Contrast fall and spring growth rates for yearling smolt programs. If available, indicate hepatosomatic index (liver weight/body weight) and body moisture content as an estimate of body fat concentration data collected during rearing.*

The Panther Creek Chinook program is expected to start in 2013.

#### **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*).**

Crystal Springs Hatchery is expected to operate similarly to Sawtooth Fish Hatchery. Feeding operations at Sawtooth Hatchery are described here: All fry are started on BioProducts Bio-Diet starter feed # 2 and #3. Fish are initially fed by hand. Once a response is seen, feeding commences with an automatic belt feeder or by hand. Feed amounts and sizes will vary depending on the manufacturer recommendations as fish grow (Table 16). BioProducts grower feed is administered once fish are transferred to outside raceways.

**Table 16. Fish/pound, % body weight fed, feed size and term in culture information.**

Fish/pound	% Body weight fed/day	Feed Size	Term in culture
Swim-up to 800 fpp	3.5	#2/#3 starter	Nov. – Jan.
800 – 500	3.3	#3 starter	Jan. – Feb.
500 – 400	2.5	1.0 mm	Feb. – March
400 – 350	2.5	1.0/1.3 mm	March – April
350 – 300	2.3	1.3 mm	April
300 – 250	2.2	1.3 mm (med) <sup>1</sup>	May – June
250 – 150	2.4	1.5 mm	June
150 – 110	2.4	1.5 mm	June – July
110 – 90	2.5	1.5 mm	July – August
90 – 50	2.2	2.5 mm	August – Sept.
50 – 17	2.0	2.5 mm	Sept – Oct.

17 to release	2.0	3.0 mm (med) <sup>1</sup>	Oct. – release
---------------	-----	---------------------------	----------------

<sup>1</sup>Medicated feed

### **9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.**

IDFG Eagle Fish Health Laboratory staff will conduct routine fish health inspections on a regular basis. If disease agents are suspected or identified, more frequent inspections will be conducted. Recommendations for treating specific disease agents comes from the Idaho Department of Fish and Game Fish Health Laboratory in Eagle, ID. Therapeutics may be used to treat specific disease agents either via a medicated feed treatment (i.e., Oxytetracycline) or an external bath (i.e., formalin). Juveniles are typically administered one 28-day prophylactic-medicated feed treatments with erythromycin for BKD management as well. Disinfection protocols will be in place for equipment, trucks and nets. The Crystal Springs hatchery building will have foot baths containing disinfectant at each building entrance. All raceways will be thoroughly cleaned and air dried after fish have been transferred outside to the final rearing ponds. Rearing ponds also will be thoroughly cleaned and air dried after smolts are released.

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

No smolt development indices were developed for 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. Predator avoidance behaviors may be strengthened in the hatchery population by the presence of avian and mammalian predators that may occasionally visit the outdoor rearing ponds.

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

Proper disinfection procedures, antibiotic treatments, and egg culling criteria will be used to limit the spread of disease. Fish observation and raceway cleaning will be conducted on a regular basis. Artificial selection should be limited by rearing juveniles consistent with natural conditions.

## **SECTION 10. RELEASE**

Describe fish release levels, and release practices applied through the hatchery program.

*Specify any management goals (e.g. number, size or age at release, population uniformity,*

*residualization controls) that the hatchery is operating under for the hatchery stock in the appropriate sections below.*

## **10.1 PROPOSED FISH RELEASE LEVELS. (USE STANDARDIZED LIFE STAGE DEFINITIONS BY SPECIES PRESENTED IN ATTACHMENT 2. “LOCATION” IS WATERSHED PLANTED (E.G. “ELWHA RIVER”).)**

The Crystal Springs Fish Hatchery is expected to release up to 400,000 smolts for release into Panther Creek after stress relief holding at suitable site (Table 7).

**Table 7. Number of juveniles released in Panther Creek from the Crystal Springs Fish Hatchery.**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	400,000	10-12	4/1-5/30 Annually	Panther Creek Pond

## **10.2 SPECIFIC LOCATION(S) OF PROPOSED RELEASE(S).**

**Stream, river, or watercourse:** Panther Creek Salmon River  
**Release point:** New stress relief pond on Panther Cr (site TBD)  
**Major watershed:** Salmon River  
**Basin or Region:** Snake River Basin in the Columbia River Basin

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

*For existing programs, provide fish release number and size data for the past three fish generations, or approximately the past 12 years, if available. Use standardized life stage definitions by species presented in **Attachment 2**. Cite the data source for this information.*

This program is expected to start in 2013; no fish have been released yet for this program.

## **10.4 ACTUAL DATES OF RELEASE AND DESCRIPTION OF RELEASE PROTOCOLS.**

*Provide the recent five year release date ranges by life stage produced (mo/day/yr).*

*Also indicate the rationale for choosing release dates, how fish are released (volitionally, forced,*

*volitionally then forced) and any culling procedures applied for non-migrants.*

This program is expected to start in 2013; no fish have been released yet for this program.

## **10.5 FISH TRANSPORTATION PROCEDURES, IF APPLICABLE.**

*Describe fish transportation procedures for off-station release. Include length of time in transit, fish loading densities, and temperature control and oxygenation methods.*

See Section 5.2.

## **10.6 ACCLIMATION PROCEDURES (METHODS APPLIED AND LENGTH OF TIME).**

Smolts produced at Crystal Springs will be acclimated for a short time before volitional release into Panther Creek. Location of acclimation site and length of acclimation time have not been determined.

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

All juveniles released will be 100% CWT without adipose fin clips. In addition, sufficient marking/tagging will be in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.

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

No juveniles produced in the Crystal Springs program will be considered surplus. All juveniles will be released into Panther Creek.

## **10.9 FISH HEALTH CERTIFICATION PROCEDURES APPLIED PRE-RELEASE.**

Testing for bacterial kidney disease, whirling disease, and viral replicating agents will be conducted under the Idaho Fish and Game Eagle Fish Health Laboratory between 45 and 30 days prior to release to obtain fish health certification.

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

Artesian pressure is sufficient to deliver some of the required flow to hatchery facilities without pumping. Obtaining the peak flow rates that are needed in March and April (prior to out-planting smolts) will likely require pumping to deliver most of the supply. Pumps will be supplied with backup generators for use in the event of power failure.

Production reared at Crystal Springs cannot be released into the effluent from the facility as this is a spring- and well water- supplied facility. If water system failures occurred it would require the following actions:

- Transport of some fish to another facility or to the release station. Sufficient numbers will be transported to allow the existing gravity water flow to maintain the remaining fish held at the facility.
- In the interim, aeration pumps will be installed in the rearing ponds to provide additional oxygen and water flow will be adjusted to ponds holding fish as others are being transported.

## **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.**

Panther Creek Chinook Program actions taken to minimize adverse effects on listed fish include:

1. Follow the health practices, procedures, and guidelines in place IDFG Fish Hatcheries.
2. Select proper release sites to utilize excellent spawning and rearing habitat.
3. Program smolt releases with noticeable physiological changes in fish and with natural rising water levels.
4. Annual collection of broodstock with characteristics similar to historically evolved populations.

# **SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**

*This section describes how “Performance Indicators” listed in Section 1.10 will be monitored. Results of “Performance Indicator” monitoring will be evaluated annually and used to adaptively manage the hatchery program, as needed, to meet “Performance Standards”.*

## **11.1 MONITORING AND EVALUATION OF “PERFORMANCE INDICATORS” PRESENTED IN SECTION 1.10.**

### **11.1.1 Describe plans and methods proposed to collect data necessary to respond to each “Performance Indicator” identified**

**for the program.**

See Sections 1.10.1 and 1.10.2.

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

The Shoshone-Bannock Tribes monitor and evaluation program will need to be fully funded and appropriately staffed to achieve the goals and objectives of the Panther Creek program.

**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.**

*(e.g. “The Wenatchee River smolt trap will be continuously monitored, and checked every eight hours, to minimize the duration of holding and risk of harm to listed spring chinook and steelhead that may be incidentally captured during the sockeye smolt emigration period.)”*

The Blackbird weir will be constantly monitored to limit the holding period and minimize adverse impacts to ESA-listed spring Chinook salmon and other listed species. Handling and tagging activities will be conducted to minimize injuries, stress, and mortality. Monitor and evaluation procedures include redd counts, creel surveys, carcass recoveries, tissue sampling, and density and abundance analyses to determine effects to listed fish.

## **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.**

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

The Tribes will manage Panther Creek in a manner that promotes recovery of the ESU and allows management flexibility. Our expectation for Panther Creek is to manage this population under “maintained” criteria having less than a 25% risk threshold of extinction in 100 years. Since Panther Creek Chinook are currently listed as extirpated, we plan to initiate a



supplementation program that will immediately increase abundance, spatial structure, and potentially diversity, all of which will assist in recovery of population.

Success will be based on improving viability at the population level; changes in abundance, productivity, diversity and distribution of Chinook salmon will be measured. The M&E plan is designed to identify successes as well as problems so that improvements can be made through adaptive management.

## **12.2 COOPERATING AND FUNDING AGENCIES.**

Monitoring and Evaluation associated with the project will be funded by the LSRCF, BPA, and the Shoshone-Bannock Tribes.

## **12.3 PRINCIPLE INVESTIGATOR OR PROJECT SUPERVISOR AND STAFF.**

**Name (and title):** Lytle P. Denny, Anadromous Fish Manager.  
**Agency or Tribe:** Shoshone-Bannock Tribes.  
**Address:** 3rd and B Avenue, P.O. Box 306, Fort Hall, ID 83203.  
**Telephone:** (208) 239-4560 or cell 221-9058.  
**Fax:** (208) 478-3986.  
**Email:** [ldenny@shoshonebannocktribes.com](mailto:ldenny@shoshonebannocktribes.com)

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

N/A.

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

Research techniques for the monitor and evaluation of the Panther Creek program include: hatchery operations, tissue and scale sampling, abundance and density, harvest monitoring, and juvenile out-migration and adult returns.

### *Hatchery Operations*

Crystal Springs staff will monitor hatchery conditions (diet, ration, vat or raceway environmental conditions, growth, survival rates, mortalities, disease) and evaluate hatchery-related research.

### *Tissue and Scale Sampling*

Broodstock males and females sampled for genetic analysis and parental assignment. Samples obtained through an operculum punch. Scale samples obtained for age and life history

determination as a contingency to tissue samples. Proportion of natural-origin juveniles will be tissue sampled prior to out-migration to determine proportion of w x w, w x h, h x h produced offspring. Un-marked adults sampled at the Blackbird weir will also be tissue sampled to determine origin. All samples stored in 95% ethanol for later analysis. A DNA parentage analysis will reveal relative productivity of wild and hatchery F1 and F2 juveniles and adults.

#### *Abundance and Density*

Operation of a rotary screw trap to document and determine abundance of migrating juvenile Chinook salmon. If electroshocking, use in accordance with NMFS ESA permits. Fork length and mass of each individual recorded. Fin tissue and scale samples taken from juveniles to link to adult parents and broodyear.

#### *Harvest Monitoring*

Conduct creel surveys and estimate total Chinook catch. Obtain tissue sample, fork length, gender, CWT, or PIT information from harvested Chinook. Provide Shoshone-Bannock tribal fisherman with scale envelopes to preserve scales from harvested fish not surveyed and sampled. Total fish harvested, pressure, and CPUE estimated yearly.

#### *Juvenile Out-migration and Adult Returns*

Proportions (15%) of hatchery smolts released are PIT tagged to monitor dispersal, emigration, and arrival at Lower Granite Dam by using the SURPH model. In addition, natural produced smolts will be PIT-tagged to detect survival differences between life stages for hatchery and naturally produced offspring. Adult returns are monitored through dam and weir counts, creel surveys, CWT information, redd surveys, spawning surveys, and carcass recoveries.

## **12.6 DATES OR TIME PERIOD IN WHICH RESEARCH ACTIVITY OCCURS.**

Hatchery conditions and research are monitored daily and throughout the year by Crystal Springs staff and personnel.

Tissue and scale sampling is conducted yearly for broodstock, smolt release, harvest monitoring, screw trap operation, and electrosampling.

Harvest information through creel surveys is collected during the time of tribal fisheries. Mail surveys sent out after closure of season and compared to harvest information collected during fishing period.

Adult escapement is monitored at dams, traps, mark/recapture studies, and through surveys throughout most of the year. Smolt emigration monitored from March through November. PIT-tag and coded-wire tag queried from informational systems throughout the year.

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

See Section 9.

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

See Table 1 in Attachment A. Generally, take for research activities are defined as: “observe/harass”, “capture/handle/release” and “capture, handle, mark, tissue sample, release.”

## **12.9 LEVEL OF TAKE OF LISTED FISH: NUMBER OR RANGE OF FISH HANDLED, INJURED, OR KILLED BY SEX, AGE, OR SIZE, IF NOT ALREADY INDICATED IN SECTION 2 AND THE ATTACHED “TAKE TABLE” (TABLE 1).**

See Table 1 in Attachment A.

## **12.10 ALTERNATIVE METHODS TO ACHIEVE PROJECT OBJECTIVES.**

No alternative methods to achieve research objectives have been developed.

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

Not Applicable.

## **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.**

*(e.g. “Listed coastal cutthroat trout sampled for the predation study will be collected in compliance with NMFS Electrofishing Guidelines to minimize the risk of injury or immediate mortality.”).*

See Section 11.2.

## SECTION 13. ATTACHMENTS AND CITATIONS

- Achord, S.A., M.B. Eppard, E.E. Hockersmith, B.P. Sanford, G.A. Axel, and G.M. Mathews. 2000. Monitoring the migrations of wild Snake River spring/summer Chinook salmon smolts, 1998. Prepared for the Bonneville Power Administration. Project 9102800, Contract DE-AI79-91BP18800. Portland, OR.
- Beak International Incorporated and Golder Associates Inc. (BEAK and Golder). 2002. Assessment of the Presence, Abundance and Condition of Fish in the Panther Creek Drainage. August 2002.
- Berggren, T.J. and L.R. Basham. 2000. Comparative survival rate study (CSS) of hatchery PIT tagged Chinook. Status Report for migration years 1996 – 1998 mark/recapture activities. Prepared for the Bonneville Power Administration. Contract No. 8712702. Portland, OR.
- Bjornn, T.C. 1960. The Salmon and Steelhead Stocks of Idaho. Idaho Department of Fish and Game.
- Corley, D.R. 1967. Biological sampling of Panther Creek above and below the introduction of mining wastes. Idaho Fish and Game Department, Boise. November.
- EcoMetrix, Inc. 2006. Biomonitoring Study: Panther Creek Watershed – September 2005. Prepared for the Blackbird Mine Site Group. Salmon, Idaho. September 2005.
- EcoMetrix. 2010. Biomonitoring Study: Panther Creek Watershed-2009. Prepared for the Blackbird Mine Site Group. Salmon, Idaho. July 2010.
- Ecovista. 2004. Draft Salmon Subbasin Management Plan. NPCC, Portland, Oregon.
- Elms-Cockrum, T. 2001. 1999 Salmon spawning ground surveys. Idaho Department of Fish and Game. Pacific Salmon Treaty Program: Award No. NA77FP0445. IDFG 01-10.
- Everest, F.E. 1969. Habitat selection and spatial interaction of juvenile Chinook salmon and steelhead trout in two Idaho streams. Ph.D. Dissertation. University of Idaho, Moscow, ID.
- Hall-Griswold, J.A. and C.E. Petrosky. 1997. Idaho habitat/natural production monitoring, part 1. Annual Report 1996. Prepared for the Bonneville Power Administration. Project No. 91-73, Contract DE-BI79-91BP21182. Idaho Department of Fish and Game. Boise, ID.
- Hampton, M. 1988. Development of habitat preference criteria for anadromous salmonids of the Trinity River. U.S. Fish and Wildlife Service. Sacramento, CA.
- Hansen, J.M. and J. Lockhart. 2001. Salmon supplementation studies in Idaho rivers. Annual Report 1997 (brood years 1995 and 1996). Prepared for the Bonneville Power Administration. Project 8909802. Portland, OR.

- Interior Columbia Basin Technical Review Team (ICTRT). 2007. Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs. Review Draft march 2007.
- Kiefer, S.W. 1987. An annotated bibliography on recent information concerning Chinook salmon in Idaho. The Idaho Chapter of the American Fisheries Society.
- Kiefer, R.B., J. Johnson, and D. Anderson. 2001. Natural production monitoring and evaluation: monitoring age composition of wild adult spring and summer Chinook salmon returning to the Snake River Basin. Prepared for the Bonneville Power Administration. Project No. 91-73, Contract No. BP-94402-5. Idaho Department of Fish and Game. Boise, ID.
- Kucera, P.A. and M.L. Blenden. 1999. Chinook salmon spawning ground survey in Big Creek, and tributary streams of the South Fork Salmon River, Idaho 1992-1995. Assessment of the status of salmon spawning aggregates in the Middle Fork Salmon River and South Fork Salmon river. Technical Report 99-7. Nez Perce Tribe Department of Fisheries Resources Management. Lapwai, ID.
- National Marine Fisheries Service (NMFS). 2000. Endangered Species Act Section 7 Consultation. Biological Opinion. Reinitiation of consultation on the operation of the federal Columbia River power system, including the juvenile fish transportation program, and 19 Bureau of Reclamation projects in the Columbia Basin.
- Nelson, D.D. and J.L. Vogel. 2001. Monitoring and evaluation activities of juvenile and adult fishes in Johnson Creek. Annual Progress Report. Period Covered: January 1, 1998 to December 31, 1998. Nez Perce Tribe Department of Fisheries Resource Management. Lapwai, ID.
- Northwest Power Planning Council (NPPC). 2001. Draft Subbasin Summary for the Salmon Subbasin of the Mountain Snake Province.
- Oosterhout, G.R. and P.R. Mundy. 2001. The doomsday clock 2001: an update on the status and projected time to extinction for Snake River wild spring/summer Chinook stocks. Prepared for Trout Unlimited. Portland, OR.
- Peery, C.A. and T.C. Bjornn. 1992. Examination of the extent and factors affecting downstream emigration of Chinook salmon fry from spawning grounds in the upper Salmon River. Unpublished report, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow, ID.
- U.S. Fish and Wildlife Service (USFWS). 1992. Biological assessment of proposed 1992 LSRCP steelhead and rainbow trout releases. Unpublished report, Lower Snake River Compensation Plan Office. Boise, ID.
- U.S. Fish and Wildlife Service (USFWS). 1993. Programmatic biological assessment of the proposed 1993 LSRCP program. Unpublished report, Lower Snake River Compensation Plan Office. Boise, ID.
- Walters, J., J. Hansen, J. Lockhart, C. Reighn, R. Keith, and J. Olson. 2001. Idaho

supplementation studies five year report 1992 – 1996. Project Report, Idaho Department of Fish and Game. Prepared for the Bonneville Power Administration. Report No. 99-14, Contract DE-BI19-89BP01466. Portland, OR.

## **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:\_\_\_\_\_

**Table 1. Estimated listed salmonid take levels of by hatchery activity.**

Listed species affected: Spring/Summer Chinook ESU/Population: Snake River Spring/Summer Chinook Activity: Broodstock Collection				
Location of hatchery activity: Panther Creek				
Type of Take	Annual Take of Listed Fish By Life Stage ( <i>Number of Fish</i> )			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)			214	
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category.

### Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.



## ATTACHMENT 1. DEFINITION OF TERMS REFERENCED IN THE HGMP TEMPLATE.

---

**Augmentation** - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as “fishery enhancement”.

**Critical population threshold** - An abundance level for an independent Pacific salmonid population below which: compensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

**Direct take** - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

**Evolutionarily Significant Unit (ESU)** - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

**Harvest project** - Projects designed for the production of fish that are primarily intended to be caught in fisheries.

**Hatchery fish** - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

**Hatchery population** - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

**Hazard** - Hazards are undesirable events that a hatchery program is attempting to avoid.

**Incidental take** - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

**Integrated harvest program** - Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

**Integrated recovery program** - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as “supplementation”.

**Isolated harvest program** - Project in which artificially propagated fish produced primarily for harvest are not intended to spawn in the wild or be genetically integrated with any specific natural population.

**Isolated recovery program** - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

**Mitigation** - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

**Natural fish** - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with *natural origin recruit (NOR)*.

**Natural origin recruit (NOR)** - See *natural fish* .

**Natural population** - A population that is sustained by natural spawning and rearing in the natural habitat.

**Population** - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

**Preservation (Conservation)** - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

**Research** - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

**Restoration** - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

**Stock** - (see “Population”).

**Take** - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

**Viable population threshold** - An abundance level above which an independent Pacific salmonid population has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame.

## ATTACHMENT 2. AGE CLASS DESIGNATIONS BY FISH SIZE AND SPECIES FOR SALMONIDS RELEASED FROM HATCHERY FACILITIES.

(generally from Washington Department of Fish and Wildlife, November, 1999).

Species	Age Class	Number of fish/pound	Size Criteria (grams/fish)
Chinook	Yearling	<=20	>=23
	Fingerling (Zero)	20 to 150	3 to <23
	Fry	>150 to 900	0.5 to <3
	Unfed Fry	>900	<0.5
Coho	Yearling <sup>1</sup>	<20	>=23
	Fingerling	>20 to 200	2.3 to <23
	Fry	>200 to 900	0.5 to <2.3
	Unfed Fry	>900	<0.5
Chum	Fed Fry	<=1000	>=0.45
	Unfed Fry	>1000	<0.45
Sockeye	Yearling <sup>2</sup>	<=20	>=23
	Fingerling	>20 to 800	0.6 to <23
	Fall Releases	<150	>2.9
	Fry	>800 to 1500	0.3 to <0.6
	Unfed Fry	>1500	<0.3
Pink	Fed Fry	<=1000	>=0.45
	Unfed Fry	>1000	<0.45
Steelhead	Smolt	<=10	>=45
	Yearling	<=20	>=23
	Fingerling	>20 to 150	3 to <23
	Fry	>150	<3
Cutthroat Trout	Yearling	<=20	>=23
	Fingerling	>20 to 150	3 to <23
	Fry	>150	<3
Trout	Legals	<=10	>=45
	Fry	>10	<45

<sup>1</sup> Coho yearlings defined as meeting size criteria and 1 year old at release, and released prior to June 1st.

<sup>2</sup> Sockeye yearlings defined as meeting size criteria and 1 year old.

This page is intentionally blank.

## **Appendix C**

---

### *Draft Hatchery and Genetic Management Plan: Upper Snake River Yellowstone Cutthroat Trout Program*

This page is intentionally blank.

# HATCHERY AND GENETIC MANAGEMENT PLAN

## RESIDENT FISH VERSION

---

<b>Hatchery Program:</b>	Upper Snake River Yellowstone Cutthroat Trout
<b>Species or Hatchery Stock:</b>	Yellowstone Cutthroat Trout <i>Oncorhynchus clarki bouvieri</i>
<b>Agency/Operator:</b>	Shoshone Bannock Tribes
<b>Watershed and Region:</b>	Upper Snake Subbasin, Idaho
<b>Date Submitted:</b>	February 10, 2011
<b>Date Last Updated:</b>	

This page is intentionally blank.



## EXECUTIVE SUMMARY

The Shoshone-Bannock Tribes' goal for the Yellowstone cutthroat trout program at Crystal Springs Hatchery is to (1) conserve the Yellowstone cutthroat trout population on tribal lands, (2) increase the abundance and range of pure Yellowstone cutthroat trout, and (3) provide hatchery fish for Tribal and non-tribal harvest, thereby reducing human impacts on this species.

The conservation objective of the program to reintroduce genetically pure Yellowstone cutthroat trout into Spring Creek, a tributary to American Falls Reservoir (located on the Reservation), and in up to nine additional suitable tributaries located both on and off the Reservation (approximately 1,000 fingerlings in each stream annually, totaling 10,000 fish). This annual stocking combined with continued habitat enhancement and annual monitoring will contribute to the success of the program over time.

The harvest objective of the program is to produce 10,000 catchable Yellowstone cutthroat trout for harvest by tribal and non-tribal fishers. These fish would be released to streams designated for harvest.

Production needed to support this Yellowstone cutthroat trout restoration/supplementation program would occur at Crystal Springs Hatchery. Genetically pure Yellowstone cutthroat trout strongholds will be identified from which donor stock will be collected (adults or juveniles). These donors will be reared in the hatchery until they are spawned and produce juvenile fish. The initial production goal is 10,000 fry for stocking in suitable streams both within and near the Fort Hall Reservation (primarily in the Fort Hall bottoms area). Collection of additional Yellowstone cutthroat trout would depend on the minimum number needed to sustain the brood (assumed to be several hundred fish). Captive hatchery brood will be replenished over time, i.e., older brood fish will be released into the wild and younger fish brought in to maintain the hatchery population and its genetic diversity.

Backwater from American Falls Reservoir transports hybrid trout onto Reservation waters. In order to expand the range of the existing population, suitable streams with very few or no Yellowstone cutthroat trout will be evaluated for potential fry/fingerling stocking. Weirs would be placed in locations that currently do not have hybrid populations (cutthroat-rainbow crosses) to prevent rainbow trout or hybrids from entering these areas.

The Tribes have expended considerable effort improving the habitat along the spring-fed streams in the Fort Hall Bottoms area where reintroduction could occur. These efforts include streamside stabilization, grazing practice modifications, livestock fencing, enforcing fishing limitations, and other activities. Tribal staff developed strategies to limit the rainbow population and enhance a genetically pure Yellowstone cutthroat trout for introduction in the Bottoms.

In addition, the Tribes manage a very popular recreational fishery for Yellowstone cutthroat trout in the Fort Hall Bottoms, and issuing trout fishing licenses for non-tribal members is an important revenue source for the Tribe.

# SECTION 1. GENERAL PROGRAM DESCRIPTION

## 1.1 NAME OF HATCHERY OR PROGRAM.

Hatchery: Crystal Springs Hatchery

Program: Yellowstone cutthroat trout

## 1.2 SPECIES AND POPULATION (OR STRAIN) UNDER PROPAGATION, ESA/POPULATION

In 2001, the Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) was petitioned for listing under the Endangered Species Act of 1973. After review of available scientific information, it was found that listing of Yellowstone cutthroat trout was not warranted. The population to be propagated is found in the Upper Snake River Subbasin in Idaho (Figure 1).

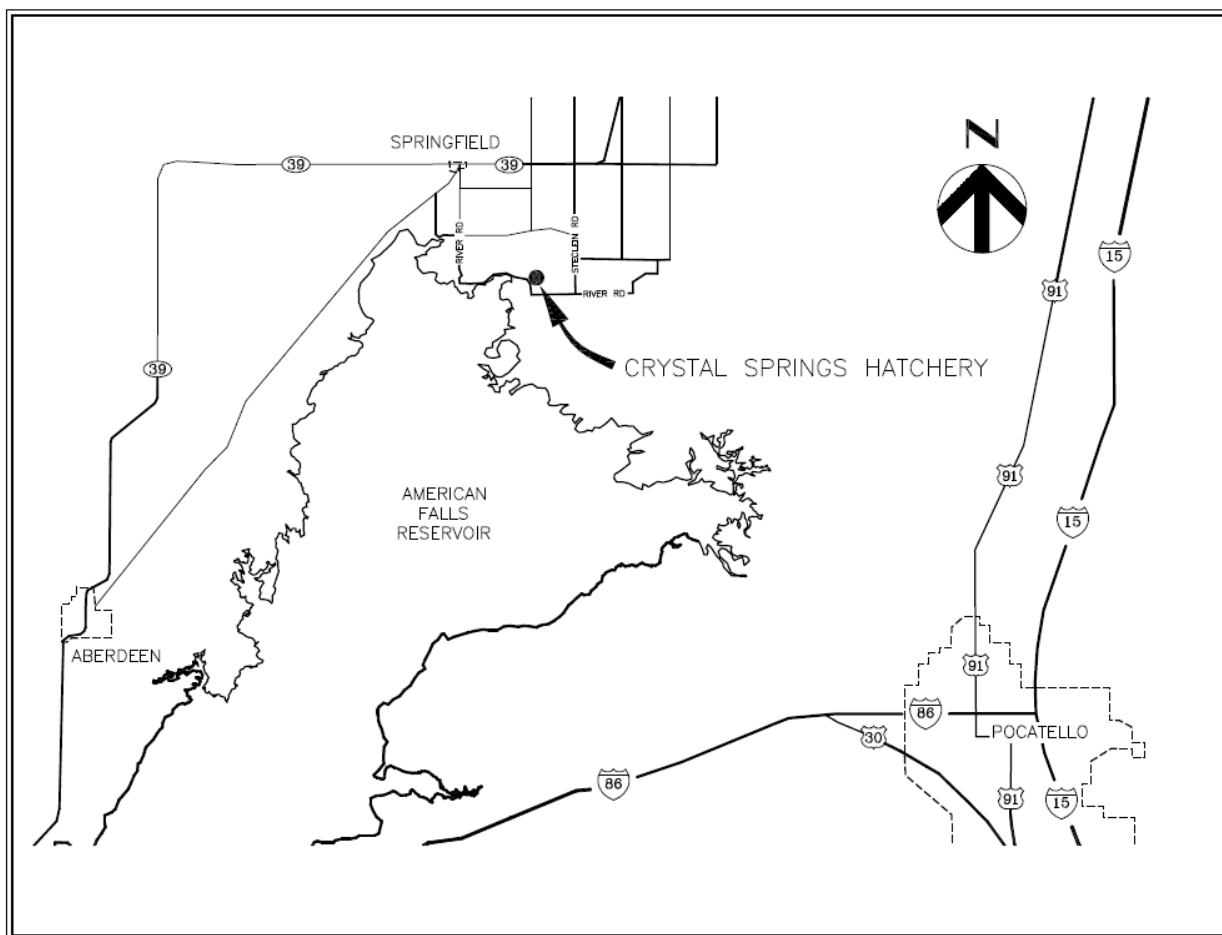


Figure 1. Location of proposed Crystal Springs Fish Hatchery.

**Conservation status/Classification:**

Global Status: G4T2, Imperiled  
Statewide (Idaho): S2, Imperiled  
ESA: Not listed  
USFS, Region 1: Sensitive Species  
BLM: Regional/State: Rangewide/Globally imperiled  
IDFG: Game fish

### 1.3 RESPONSIBLE ORGANIZATION AND INDIVIDUALS

*Indicate lead contact and on-site operations staff lead.*

**Name (and title):** Chad Colter Fish and Wildlife Director  
**Agency or Tribe:** Shoshone-Bannock Tribes  
**Address:** 3rd and B Avenue, P.O. Box 306, Fort Hall, ID 83203  
**Telephone:** (208) 478-3761  
**Fax:** (208) 478-3986  
**Email:** ccolter@shoshonebannocktribes.com

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

The Bonneville Power Administration, under the resident fish portion of the Northwest Power Planning Council's Fish and Wildlife Program, funds hatchery construction, operations, administration, research, and monitoring. Funding from BPA is provided under BPA Project 200890600: Crystal Springs Planning and Operations and Maintenance Project and BPA Project 1992011000: Habitat Improvement Project for Fort Hall.

Staff and other resources will be shared with the Upper Salmon Basin (Yankee Fork/Panther Creek) Chinook salmon program at the Crystal Springs Facility. Staffing and operational costs provided are based on the assumption of these proposed shared resources. For a detailed presentation of potential operational and monitoring and evaluation costs, refer to Chapter 7 in the Crystal Springs Fish Hatchery and Programs for Snake River Chinook Salmon and Yellowstone Cutthroat Trout Master Plan.

#### **Operational Costs and Staffing levels**

Cost estimates associated with operations and maintenance of the proposed Yellowstone cutthroat trout programs at Crystal Springs Hatchery are allocated based on approximate pounds of fish each program will rear at Crystal Springs (Yankee Fork- 58%, Panther Creek - 37%, Yellowstone cutthroat trout- 5%). Operating costs for the proposed Yellowstone cutthroat trout programs include such items as payroll, utilities, vehicle leases, supplies, maintenance, some specific tagging expenses and potential subcontracted support services. This planning estimate includes Crystal Springs operations and maintenance costs. The Tribes estimate that the annual budget for operations and maintenance apportioned to this program component will be about \$35,000 annually. When this estimate is escalated from 2010 to 2013 dollars (the year that these expenses would be incurred), operational expenses are about \$37,000 annually.

For the Crystal Springs operations, labor for all programs (Yankee Fork- 58%, Panther Creek - 37%, Yellowstone cutthroat trout- 5%) is estimated at a total of about 3 full time equivalents (FTE) that are considered permanent staff and an estimated 3 temporary FTE to address specific seasonal fish culture work for planning purposes it can be assumed that the percentages of the overall operational labor can be applied to the Yellowstone cutthroat trout program

Costs associated with monitoring and evaluation for the existing program are currently funded through BPA project number 199201000 at about \$285,000 annually. The Tribes estimate that the annual budget for monitoring and evaluation will increase to about \$418,000 annually when costs associated with Crystal Springs production start to be incurred in 2014.

Overall labor for the existing monitoring and evaluation program is estimated at about 2 FTE and 2.5 temporary FTE.

## **1.5 LOCATION(S) OF HATCHERY AND ASSOCIATED FACILITIES.**

*Include name of stream, river kilometer, location, basin name, and state. Also include watershed code (e.g. WRIA number), or sufficient information for GIS entry. See “Instruction E” for guidance in responding.*

The Crystal Springs Hatchery will be located in southeast Idaho, near the town of Springfield, in the Upper Snake subbasin. Springfield is approximately 12 miles northeast of the town of Aberdeen, Idaho, in the American Falls HUC (17040206) near the inflow of the Snake River into the American Falls Reservoir.

The existing facilities at the Crystal Springs Fish Hatchery site are located at 43 deg, 02', 43.40" N, 112 deg, 39' 12.24" W at an elevation of 4,376 feet.

## **1.6 TYPE OF PROGRAM(S).**

*Define as either: Integrated Recovery; Integrated Harvest; Isolated Recovery; or Isolated Harvest (see Attachment 1 - Definitions” section for guidance).*

The Crystal Springs Hatchery will be an Integrated Recovery/Harvest Program primarily designed to aid in the recovery, conservation or reintroduction of a natural population. Fish produced are intended to spawn in the wild or be genetically integrated with the natural population or provide for additional harvest. This recovery objective for Yellowstone cutthroat trout in the Upper Snake subbasin presupposes that natural spawning conditions for the wild population will be restored by ongoing habitat restoration measures.

## **1.7 PURPOSE (GOAL) OF PROGRAM(S).**

*Define as either: Augmentation, Mitigation, Restoration, Preservation/Conservation, or Research (for Columbia Basin programs, use NPPC document 99-15 for guidance in providing these definitions of “Purpose”). Provide a one sentence statement of the goal of the program, consistent with the term selected and the response to Section 1.6. Example: “The goal of this program is the restoration of white sturgeon in the Kootenai River using the indigenous population.”*

**Restoration** - The Tribes' long-term goals for this program are to (1) conserve the Yellowstone cutthroat trout population on tribal lands, (2) increase the abundance and range of pure Yellowstone cutthroat trout, and (3) provide hatchery fish for Tribal and non-tribal harvest.

## 1.8 JUSTIFICATION FOR THE PROGRAM.

*Indicate why the hatchery program is needed and how it will enhance or benefit the survival of the listed population (integrated or isolated recovery programs), or how the program will be operated to provide fish for harvest while minimizing adverse effects on listed fish (integrated or isolated harvest programs).*

Historically, Yellowstone cutthroat trout inhabited about 17,397 miles of habitat in Montana, Wyoming, Nevada, and Idaho. Over the past century or more, the subspecies has experienced substantial declines in abundance and distribution hybridization with, or displacement by nonnative trout and habitat alterations caused by water storage and diversions, grazing, mineral extraction, timber harvest, and overexploitation by anglers (Meyer 2006). Today, less than 43% (7,528 miles) of that habitat is currently occupied.

In 1998, Yellowstone cutthroat trout were petitioned for listing as “threatened” under the Endangered Species Act. The U.S. Fish and Wildlife Service (USFWS) determined that subspecies listing was “not warranted” in a 90-day finding (USFWS 2001) and a full status review finding (USFWS 2006). YCT are now considered a “Sensitive Species” or “Species of Special Concern” by the U.S. Forest Service, The American Fisheries Society, and in all state that they inhabit.

Yellowstone cutthroat are culturally important to the Shoshone-Bannock Tribes and trout habitat restoration and enhancement actions have been, and are currently being implemented on Fort Hall Reservation lands and on federal, state and private lands. These actions have included the removal of non native species and planting pure Yellowstone cutthroat trout into suitable underutilized or unoccupied habitat. Removal of non-native species is being accomplished using a variety of methods. Some of the methods being employed include direct removal, elimination of access to spawning habitat, removal using sport fishing management actions, and genetic swamping by planting pure Yellowstone cutthroat trout on populations of rainbow trout x Yellowstone cutthroat trout hybrids.

Even though most of the Yellowstone cutthroat trout present in the streams on the “bottoms” area have a high level of hybridization with rainbow trout, some genetically pure Yellowstone cutthroat trout are found there and are thought to be either temporally and /or spatially segregated from the hybrid populations. Specifically, genetically pure strains are present in Ross Fork and Mill Creeks<sup>1</sup> (Moser 1999). The genetically pure Yellowstone cutthroat trout present in these Creeks (and possibly fish from other sources) would serve as brood stock for the proposed SBT program.

There is clearly an identified need for the restoration and enhancement of Yellowstone cutthroat trout populations over its entire historical range. The proposed Crystal Springs Hatchery Yellowstone cutthroat trout program would provide the SBTs with a valuable tool that would aid

---

<sup>1</sup> A total of 22 streams were sampled during the 1999 genetics evaluation.

in their ongoing Yellowstone cutthroat trout restoration and enhancement program.

## **1.9 LIST OF PROGRAM “PERFORMANCE STANDARDS.”**

*“Performance Standards” are designed to achieve the program goal/purpose, and are generally measurable, realistic, and time specific. The 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 a subbasin plan including your hatchery program is available, use the performance standard list already compiled.*

Performance standards and indicators for the Yellowstone cutthroat trout program will be developed in 2011 when genetic data are available.

## **1.10 LIST OF PROGRAM “PERFORMANCE INDICATORS”, DESIGNATED BY "BENEFITS" AND "RISKS."**

*“Performance Indicators” determine the degree that program standards have been achieved, and indicate the specific parameters to be monitored and evaluated. Adequate monitoring and evaluation must exist to detect and evaluate the success of the hatchery program and any risks to or impairment of recovery of affected, listed fish populations.*

*The NPPC “Artificial Production Review” document referenced above presents a list of draft “Performance Indicators” that, when linked with the appropriate performance standard, stand as examples of indicators that could be applied for the hatchery program. If a subbasin plan is available, use the performance indicator list already compiled. Essential “Performance Indicators” that should be included are monitoring and evaluation of overall fishery contribution and survival rates, stray rates, and divergence of hatchery fish morphological and behavioral characteristics from natural populations.*

*The list of “Performance Indicators” should be separated into two categories: “benefits” that the hatchery program will provide to the listed resident fish species, or in meeting harvest objectives while protecting listed resident fish species; and “risks” to listed resident fish species that may be posed by the hatchery program, including indicators that respond to uncertainties regarding program effects associated with a lack of data.*

Performance standards and indicators for the Yellowstone cutthroat trout program will be developed in 2011 when genetic data are available.

### **1.10.1 “Performance Indicators” addressing benefits.**

*(e.g., “Evaluate fingerling-to-adult return rates for program fish to harvest, hatchery broodstock, and natural spawning.”)*

Performance standards and indicators for the Yellowstone cutthroat trout program will be developed in 2011 when genetic data are available.

### **1.10.2 “Performance Indicators” addressing risks.**

*(e.g., “Evaluate predation effects on listed fish resulting from hatchery fish releases.”)*

Performance standards and indicators for the Yellowstone cutthroat trout program will be developed in 2011 when genetic data are available.

## **1.11 EXPECTED SIZE OF PROGRAM.**

*In responding to the two elements below, take into account the potential for increased fish production that may result from increased fish survival rates affected by improvements in hatchery rearing methods, or in the productivity of fish habitat.*

The program will require between 100 and 200 adults to produce the juvenile release numbers identified for the program. The results of genetic analysis will be used to develop a spawning matrix each year to be used by hatchery staff during mating operations. The number of fish used for broodstock may change depending on what is learned about population structure in the targeted streams from on-going genetic and population abundance and life history field work.

### **1.11.1 Proposed annual broodstock need (maximum number of fish).**

*Proposed annual fish release levels (maximum number) by life stage and location. (Use standardized life stage definitions by species presented in Attachment 2.)*

Once additional pure YCT strongholds are identified both on and off the Fort Hall reservation, the program would collect donor stock from those locations (adults or juveniles). This donor stock would then be reared in the hatchery environment until they are spawned and produce juvenile fish. Collection of additional YCT in following years would depend on the minimum number need to start to brood (assuming it will be several hundred fish). Captive hatchery brood required to produce a minimum of 10,000 juvenile (250 fpp) and 10,000 catchable (>10 inches) Yellowstone cutthroat trout each year would be replenished over time, i.e., older brood fish would be released into the wild and younger fish would be brought into the hatchery to maintain the hatchery population.

The primary biological objective of the YCT program is the conservation of the species in suitable streams located both within and near the Fort Hall Reservation. Once populations become established in the targeted streams at levels that approach the habitat’s carrying capacity and become self-sustaining, managers would slowly phase out the captive broodstock program and implement a more conventional hatchery program where broodstock are collected each year, eggs are incubated, and the resulting juveniles are released to the natal areas.

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

An annual production of approximately 10,000 fingerling and 10,000 catchable Yellowstone cutthroat trout for release into suitable streams located both on and off the Fort Hall Reservation

is expected (Table 1). Future release locations and levels will depend on efforts to identify suitable habitat, presence of hybrids, and future habitat modifications.

**Table 1. Estimated release levels of hatchery-reared YCT.**

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	Streams on or near Fort Hall Reservation	10,000
Yearling		
Catchable (> 10-inches)	Streams on or near Fort Hall Reservation	10,000

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

*Provide data (e.g., CPUE, condition factors) available for the most recent twelve years), or for the number of years of available and dependable information. Indicate program goals for these parameters.*

No Yellowstone cutthroat trout program is currently operating in this area.

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

The Crystal Springs hatchery is expected to be operational by 2012. First release of hatchery produced Yellowstone Cutthroat is expected by 2014.

### **1.14 EXPECTED DURATION OF PROGRAM.**

*Duration must be consistent with stated purpose. Refer to Table 1 in the APR for guidance.*

The program is expected to continue until natural production is restored to levels that can maintain a self-sustaining harvestable population.

### **1.15 WATERSHEDS TARGETED BY PROGRAM.**

*Include HUC field for desired watershed.*

The American Falls watershed in the Upper Snake River Basin in Idaho is targeted by this program. The program area is contained within HUC 17040206.

### **1.16 INDICATE ALTERNATIVE ACTIONS CONSIDERED FOR ATTAINING**



## **PROGRAM GOALS, AND REASONS WHY THOSE ACTIONS ARE NOT BEING PROPOSED.**

A range of alternatives for Yellowstone cutthroat trout conservation were considered by the Tribes, including relying upon currently funded habitat improvements and installing and operating weirs to control hybridization.

### *Alternative 1: Status Quo*

Under this alternative, ongoing measures would continue. These include habitat restoration performed by the Shoshone-Bannock Tribes funded by the Bonneville Power Administration (Contract No. 1992-010-00). There would be no hatchery facility for YCT in the watershed under this alternative.

If Alternative 1 were to be adopted, the expected outcome would be continued hybridization of YCT with nonnative rainbow trout and further declines in population abundance. State and Tribal fishery managers have expressed their concern regarding the need to protect this unique genetic legacy, therefore, the no action alternative is not considered a viable option.

### *Alternative 2: Rely on Habitat Improvements*

While habitat improvement measures currently being implemented on the Fort Hall Reservation have proven to be effective, increasing the abundance of the existing Yellowstone cutthroat trout population within its current range does not prevent further hybridization and would expand the population beyond its current range.

### *Alternative 3: Rely on weirs to control hybridization*

The use of weirs to prevent rainbow trout access into existing Yellowstone cutthroat trout spawning areas in lower reaches of streams would be problematic and not very effective due to the periodic flooding of the lower reaches of streams in the area. Weirs would only provide periodic isolation, and therefore, were not considered a viable option.

## **SECTION 2. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES**

### **2.1 DESCRIBE ALIGNMENT OF THE HATCHERY PROGRAM WITH OTHER HATCHERY PLANS AND POLICIES (E.G., THE NPPC ANNUAL PRODUCTION REVIEW REPORT AND RECOMMENDATIONS - NPPC DOCUMENT 99-15). EXPLAIN ANY PROPOSED DEVIATIONS FROM THE PLAN OR POLICIES.**

*(e.g. “The hatchery program will be operated consistent with the subbasin e plan, with the exception of age class at release. Fish will be released as age-1 rather than as fingerlings as*

*specified in the subbasin plan, to maximize survival rates given extremely low recruitment rates the past four years.”)*

The strategy for the proposed Yellowstone cutthroat trout program is consistent with that of the Columbia Basin Fish and Wildlife Plan (NPCC 2009).

## **2.2 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.*

- Shoshone-Bannock Tribes Crystal Springs Fish Hatchery and Programs for Snake River Chinook Salmon and Yellowstone Cutthroat Trout - draft
- IDFG Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho

## **2.3 RELATIONSHIP TO HARVEST OBJECTIVES.**

*Explain whether artificial production and harvest management have been integrated to provide as many benefits and as few biological risks. For example, reference any harvest plan that describes measures applied to integrate the program with harvest management.*

*Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last 12 years (1988-99), 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 Crystal Springs Hatchery will produce up to 10,000 Yellowstone cutthroat trout of catchable size (10 inches) to be released into waters on the Fort Hall Reservation. These fish will meet the Tribes’ long-term goal to provide hatchery fish for Tribal and non-tribal harvest.

Yellowstone cutthroat trout inhabiting the Fort Hall Bottoms area provide a significant fishery for both tribal and sport permit fishers. The permit fishery provides a significant source of revenue for the Tribe due to the success rate and size of the fish caught. Since 1996, permit fishers have caught, on average, 0.2 eighteen-inch trout per hour of fishing (See Crystal Springs Master Plan). The release of up to 10,000 catchable Yellowstone cutthroat trout each year will ensure that this sport fishery will continue in the future.

## 2.4 RELATIONSHIP TO HABITAT PROTECTION AND PURPOSES OF ARTIFICIAL PRODUCTION.

*Describe the major factors affecting natural production (if known). Describe any habitat protection efforts, and expected natural production benefits over the short- and long-term. For Columbia Basin programs, use NPPC document 99-15, section II.C. as guidance in indicating program linkage with assumptions regarding habitat conditions.*

The habitat strategy for the proposed Yellowstone cutthroat trout program is consistent with that of the Columbia Basin Fish and Wildlife Plan (NPCC 2009). Streams habitat within the Fort Hall Reservation has degraded since exploration and settlement of the Province in the mid 19th century. Streams have been negatively affected by a variety of sources, including livestock grazing, American Falls Reservoir construction and operation, and the 1976 Teton Dam collapse. The majority of the streams in the area remain relatively productive and support large number of native and non-native trout.

For these habitats, the program will be operated consistent with the following NPCC strategy:

*“Where the habitat for a target population is absent or severely diminished, but can be restored through conventional techniques and approaches, then the biological objective for that habitat will be to restore the habitat with the degree of restoration depending on the biological potential of the target population. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat. Where the target population has low biological potential – for example, when downstream rearing conditions severely limit the survival of juveniles from a given spawning area – the objective will be to restore the habitat to intact condition and consider sustained but limited supplementation as a possible policy choice.”*

The proposed Yellowstone cutthroat trout program focuses on creating a fry production program to preserve the genetic legacy of Yellowstone strain of cutthroat trout and to enhance the population for Tribal and non-tribal harvest; additional habitat measures are not proposed. Because the population productivity and abundance potential is limited by the high hybridization rate Yellowstone cutthroat trout experience with rainbow trout a, artificial production is an important tool to establish pure strains of Yellowstone cutthroat trout in suitable streams. Eventually, as natural abundance increases and populations approach the habitat’s carrying capacity and become self-sustaining, managers would slowly phase out the captive broodstock program and implement a conventional hatchery program.

Degraded habitat in the Fort Hall area is, in large part, due to streambank failures. The Shoshone-Bannock Tribes have been working on large-scale, low-tech, habitat restoration projects to stabilize the eroding banks since 1992. Restoration efforts are improving Yellowstone cutthroat trout habitat, and these improvements are expected to increase Yellowstone cutthroat trout abundance, survival, migration, and reproduction over time.

The Upper Snake Province Plan states that opportunities for improving habitat conditions to improve Yellowstone cutthroat trout populations exist throughout the Upper Snake Subbasin (CH2MHill 2004). The plan lists three bullets for habitat restoration in regard to Yellowstone cutthroat trout: 1) Populations identified as core or conservation populations at low density are likely candidates for habitat restoration efforts; 2) Future hybridization risk should be evaluated in relation to barrier removal projects; and 3) Efforts to protect and enhance migratory populations of Yellowstone cutthroat trout should be prioritized, as this life history form is the most impacted throughout the subbasin. This depressed population has not been identified as a core or conservation population, but habitat restoration effects are currently ongoing in the region. Hybridization risks for this population will be abated by installing weirs to prevent non-native rainbow trout from returning to the spawning grounds. Both migratory and combination life histories are present in the American Falls subbasin (2006 status assessment); newly installed weirs and habitat restoration efforts should benefit fish from both life histories.

## **2.5 ECOLOGICAL INTERACTIONS.**

*Describe all species that could (1) negatively impact program; (2) be negatively impacted by program; (3) positively impact program; and (4) be positively impacted by program.*

Nonnative introduced rainbow trout have been hybridizing with the resident population Yellowstone cutthroat trout in the drainage. These rainbow trout will continue to negatively impact the Yellowstone cutthroat trout population until numbers are sufficient to genetically block out rainbow trout hybrids, or barriers are maintained to keep populations separate.

## **SECTION 3. WATER SOURCE**

### **3.1 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.**

*For integrated programs, identify any differences between hatchery water and source, and “natal” water used by the naturally spawning population. Also, describe any methods applied in the hatchery that affect water temperature regimes or quality.*

The proposed Crystal Springs Hatchery site is on two parcels of land, 19.7 acres total, containing six existing artesian wells. A minimum of two new wells will be required to achieve the anticipated need of 24 cfs. The artesian aquifer that underlies the site provides an excellent source of high quality water for fish rearing, and is the primary reason this site was selected for the project. The design of this facility will be to use gravity flow artesian well water to the greatest degree possible in order to minimize pumping costs. In an average water year, artesian flows will be adequate to meet hatchery demand (both Chinook and Yellowstone cutthroat trout programs) for at least nine months (approximately May through October). During the peak

months (March through April), several (up to three) of the highest producing wells will most likely need to be pumped in order to meet water supply demand. Once pumps are turned on, the amount of artesian flow available to the non-pumped wells will likely decline; however, gravity supplied flow may still be available. A water right of 24.7 cfs was perfected by the former trout hatchery at Crystal Springs and will be used for the new hatchery.

The conceptual design of this facility includes dual elevation degassing head boxes; a lower elevation head box for degassing and oxygenating artesian flows, and a higher elevation head box for degassing and oxygenating pumped flows. There may also be need for a chiller and associated chilled water head box and piping system that would be used to slow the development rate of eggs and fry in order to produce smolts that meet targets for fish size and release dates.

The water requirements for the Yellowstone cutthroat trout program show a peak flow of 0.54 cfs (240 gpm) to the outdoor rearing facilities for a give brood year, and a concurrent demand of 0.2 cfs (90 gpm) for broodstock holding and early rearing supply to the successive brood year in April of each year. The total peak demand is estimated to be 0.7 cfs.

All water used at the Crystal Springs site will be supplied by wells, and no fish screening will be required.

### **3.2 INDICATE ANY APPROPRIATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR THE TAKE OF LISTED SPECIES AS A RESULT OF HATCHERY WATER WITHDRAWAL, SCREENING, OR EFFLUENT DISCHARGE.**

*Include information on water withdrawal permits, National Pollutant Discharge Elimination System (NPDES) permits, and compliance with NMFS and USFW and screening criteria. Although the USFWS does not have specific screening criteria at this time, research is being conducted at the Abernathy facility that will result in criteria specific for bull trout. In the interim, most USFWS field offices are using NMFS criteria.*

The proposed Crystal Springs Fish Hatchery will have a water right of 24.7 cfs to be supplied from artesian wells. There are no listed fish in the system that may be affected by effluent discharge.

Consistency of project construction and operation will be demonstrated with various regulatory programs under the Federal Water Pollution Control Act (Clean Water Act). The authority to review the programs for consistency with Section 401 is the responsibility of the Idaho Department of Environmental Quality. Section 404 of this act is administered by the Corps of Engineers. Effects of developing the proposed hatchery facilities on wetland habitat will be evaluated by the Corps, an effort that will require delineation of existing wetlands. Another Clean Water Act component is administered by the Environmental Protection Agency is the National Pollution Discharge Elimination System permit for hatchery construction (and the associated Stormwater Pollution Prevention Plan). An additional NPDES permit will be required for hatchery operations if production reaches a regulated level.

## SECTION 4. FACILITIES

*For each item, provide descriptions of the hatchery facilities that are to be included in this plan (see “Guidelines for Providing Responses” Item E), including dimensions of trapping, holding incubation, and rearing facilities. Indicate the fish life stage held or reared in each. Also describe any instance where operation of the hatchery facilities, or new construction, results in adverse effects to habitat for listed species (habitat effects must be considered even if critical habitat is not designated).*

### 4.1 BROODSTOCK COLLECTION, HOLDING, AND SPAWNING FACILITIES.

Broodstock for the Yellowstone cutthroat trout program will come from streams that contain pure strains of Yellowstone cutthroat trout or by genetically sampling individual fish collected in streams with high levels of hybridization. In 1999, genetically pure populations of Yellowstone cutthroat trout were identified in Mill Creek and Ross Fork. Because this information is dated, tribal staff are currently in the process of collecting additional genetic samples in streams throughout the reservation. The results of this work will be used to determine which streams will be used as a broodstock source and candidate streams for re-establishing pure Yellowstone cutthroat trout.

The program will require approximately 100 adults to produce the juvenile release numbers identified for the program. The results of genetic analysis will be used to develop a spawning matrix each year to be used by hatchery staff during mating operations. The number of fish used for broodstock may change depending on what is learned about population structure in the targeted streams from on-going genetic and population abundance and life history field work. If substantial genetic differences are found between streams, then broodstock collection may need to be stream-specific. If this occurs, the actual number of fish used for broodstock may need to increase to prevent founder effects in the hatchery population. Prior to mating or releasing any fish to the environment, a genetic management plan will be developed for the program.

Captive hatchery broodstock will be replenished over time, i.e., older brood fish will be released into the wild (to their native stream) and younger fish will be brought into the hatchery to maintain the hatchery population.

Concurrently, the Tribes will investigate the feasibility of placing weirs in streams to protect existing populations from further hybridization. An active fish removal program will be considered for streams where the population consists of introduced species such as brook trout. Once the introduced species was eliminated, hatchery origin pure Yellowstone cutthroat trout would be released to the stream.

Adult collection will consist of netting or trapping adult fish using portable systems that are not specifically identified or included in the capital funding for this project. Collected adults will be hauled to the proposed Crystal Springs Hatchery where they will be held in four 6 foot-diameter fiberglass holding tanks. Selected fish will be spawned at a spawning table located adjacent to the holding tanks. Adult fish that survive spawning will be held for two to three years and then

released back to the wild and replaced with new adult fish as needed. See Figure 4-12 for a conceptual layout of the proposed holding tank. Early rearing will be accomplished in three 10-foot diameter round tanks. One of the outdoor rearing ponds will be used to rear up to 10,000 fry to a size of 3 fish per pound for release annually.

## **4.2 FISH TRANSPORTATION EQUIPMENT (DESCRIPTION OF PEN, TANK TRUCK, OR CONTAINER USED).**

All transportation equipment will emphasize fish health and safety. Adults and juveniles will be transported in 100-1,000 gallon insulated HDPE or fiberglass transport tanks and temperature will be controlled. The transport containers will be supplied with continuous oxygen that maintains dissolved oxygen at full saturation and will be loaded to no more than 0.5 lb fish/gallon of water. All tanks used for transport on trips of a 4 hour or longer duration will be equipped with air scoops. The oxygen reservoir will contain at least double the quantity of oxygen needed to make the entire trip.

## **4.3 INCUBATION FACILITIES.**

Crystal Springs Fish Hatchery's incubation room will consist of standard Marisource (Heath) trays configured in an 8 tray high stack. At a loading rate of 4,000 eggs per tray, 6 trays are required to support the egg take target. The remaining 2 trays will be available to support any additional experimental programs. The stack of trays will be supplied with 5 gpm of pathogen-free groundwater.

## **4.4 REARING FACILITIES.**

### **Early rearing**

Beginning in late May or June, swim up fry will be transferred into early rearing circular tanks located in a 60- by 132-foot room adjacent to the incubation area. A total of 3 tanks at 10 feet diameter and 2.75 feet average depth are proposed. Pathogen-free groundwater will be supplied to the tanks through a valved connection for flow control. Typical flow rates to each tank will vary from month to month, with a peak flow of 136 gpm, at an average temperature of 10°C. Fish will remain in these tanks until August, when 10,000 are released to streams on the Fort Hall Reservation. The following April, the remaining 10,000 fish will be transferred to one of the outdoor rearing ponds for final grow-out once the pond is vacated by the spring/summer Chinook being out-planted. The target size for fry release is 240 fish per pound. The target size for catchables is 3 fish per pound.

### **Outdoor rearing**

The outdoor ponds used for juvenile rearing will be constructed of cast in place concrete, with inlet, outlet and intermediate screens to retain and segregate fish, and stop logs to control water level. The rearing area of each raceway will be 100 feet long, 25 feet wide, with an average water depth of 5 feet, and a volume of 12,500 cubic feet. A 10-foot-long quiescent zone will be provided at the downstream end of each raceway to allow settleable solids to separate from the water column. The floor slab in front of the quiescent zone will have a recessed floor that can be used as a kettle during fish transporting operations. Outdoor rearing of Yellowstone cutthroat

trout will take place in a partitioned area of one of the 12,500 cubic foot rearing ponds which will be vacated in April of each year when spring Chinook are out-planted.

Up to 240 gpm of groundwater will be supplied to the raceway. The overflow water from each pond will be piped into a common drain that discharges into the wetland ponds to the south. A separate cleaning waste vacuum piping system will be used to collect settled solids for each raceway and convey the concentrated wastes to an off-line settling pond.

## **4.5 ACCLIMATION/RELEASE FACILITIES.**

Specific release sites have not yet been identified for Yellowstone cutthroat trout produced at the Crystal Springs Fish Hatchery, but will most likely be located in the Fort Hall Bottoms, near the Fort Hall Reservation. Fish will be directly released into streams after tempering during transport. No acclimation facilities will be provided.

## **4.6 DESCRIBE OPERATIONAL DIFFICULTIES OR DISASTERS THAT LED TO SIGNIFICANT FISH MORTALITY.**

This program is expected to start in 2012; therefore there has been no fish mortality.

### **4.6.1 Indicate available back-up systems, and risk aversion measures that minimize the likelihood for the take of listed species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.**

*(e.g., “The hatchery will be staffed full-time, and equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure.”)*

*Indicate needed back-up systems and risk aversion measures that minimize the likelihood for the take of listed species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.*

The Crystal Springs Hatchery will have about two to three FTE permanent staff members that live on station and cover shifts for alarm duties and other production checks, and up to three FTE temporary staff for various seasonal fish culture duties. An alarm system will be installed that will alert staff to low water and water temperatures outside of the accepted range. Artesian wells equipped with pumps will each have generator back-up in case of power failure. The water system will be integrated so that any well can provide water to all parts of the facility. Artesian water flow can be supplied to rearing units in the case of complete power/generator failure.



## **SECTION 5. BROODSTOCK ORIGIN AND IDENTITY**

### **5.1 SOURCE.**

The broodstock source for the Crystal Springs Yellowstone cutthroat trout program will initially be wild trout taken from stronghold streams located in the Fort Hall Bottoms. Once Yellowstone cutthroat trout stock have been identified and collected as donor stock, they will then be reared in the hatchery environment until they are spawned and produce juvenile fish. Collection of additional Yellowstone cutthroat trout in following years will depend on the minimum number needed to start the brood. Captive hatchery brood will be replenished over time.

Mill, Ross Fork, and West Fork Bannock have been identified as potential broodstock streams. Genetic analysis, available in 2011, will determine if fish from these streams are an adequate source of broodstock.

### **5.2 SUPPORTING INFORMATION.**

#### **5.2.1 History.**

*Provide a brief narrative history of the broodstock sources. For listed natural populations, specify its status relative to critical and viable population thresholds (use section 10.2.2 if appropriate). For existing hatchery stocks, include information on how and when they were founded, sources of broodstock since founding, and any purposeful or inadvertent selection applied that changed characteristics of the founding broodstock.*

In 1992, the Fort Hall Reservation Resident Fisheries Program, through cost-sharing with the BPA and BIA, began a series of large-scale, low-tech, habitat restoration projects on the Fort Hall Reservation. Restoration was directed at stabilizing eroding banks, deepening and narrowing channels, and restoring diversity to the spring stream environment. Restoration efforts were originally focused on Clear Creek, a heavily impacted stream located on the Reservation. The Resident Fisheries Program has also directed efforts toward other Reservation streams, including: Spring, Diggie, and Big Jimmy creeks. The primary focus of restoration program has changed over the course of the project; in particular there is now less reliance on in-stream structures and more reliance on fencing and the natural channel healing processes (Moser 1999).

In addition to the above restoration projects, the Sho-Bans have recently initiated (in September 2010) a comprehensive survey (and mapping effort) of the 30,000 acre Fort Hall Bottoms area to more thoroughly describe the existing status of Yellowstone cutthroat trout. Specifically, this survey is designed to:

- 1) determine the distribution, relative abundance, and degree of Yellowstone cutthroat trout x rainbow trout hybridization in streams located within the bottoms area (i.e. further identify those areas that support pure strains of Yellowstone cutthroat trout and those that do not),

- 2) describe any remaining Yellowstone cutthroat trout limiting factors in the bottoms area that would need to be addressed prior to supplementation,
- 3) identify those streams that could be isolated with weirs or those that are naturally isolated from areas containing hybrids or other non-endemic species (i.e., brook trout), and
- 4) determine the size and source of the Yellowstone cutthroat trout donor population needed for the planned hatchery supplementation program.

Currently, Spring Creek and other Fort Hall Bottoms streams that connect to American Falls Reservoir are known to contain rainbow trout, Yellowstone cutthroat trout, brown trout, Yellowstone cutthroat trout x rainbow trout hybrids, yellow perch, Utah suckers, mountain whitefish, mottled sculpin, Paiute sculpin, and common carp. Upland streams, including the Blackfoot River and Portneuf River on the Fort Hall Indian Reservation, contain rainbow trout, Yellowstone cutthroat trout, brook trout, mottled sculpin, redbelly dace, speckled dace, longnose dace, mountain sucker, and Utah chub (CH2MHill 2004).

Once additional pure Yellowstone cutthroat trout strongholds are identified both on and off the Reservation, the proposed program would collect donor stock from those locations (adults or juveniles).

## **5.2.2 Annual size.**

*Provide estimates of the proportion of the natural population that will be collected for broodstock. Specify number of each sex, or total number and sex ratio, if known. For broodstocks originating from natural populations, explain how their use will affect their population status relative to critical and viable thresholds.*

Captive hatchery brood would be kept to produce a minimum of 10,000 juveniles and 10,000 catchable size trout each year. These fish would be replenished over time, i.e., older brood fish would be released into the wild and younger fish would be brought into the hatchery to maintain the hatchery population. Up to 210 brood fish are proposed to be held on station to provide eggs. It is anticipated that individual fish may be held for up to two years. The number of fish removed from the wild each year would be variable and is not currently known.

## **5.2.3 Past and proposed level of natural fish in broodstock.**

*If using an existing hatchery stock, include specific information on how many natural fish were incorporated into the broodstock annually.*

The Crystal Springs Fish Hatchery is expected to be operational starting in 2013. It is estimated that up to 210 brood fish will be required to meet the egg take target of 22,880 eggs.

## **5.2.4 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.*

### *Reasons for choosing Broodstock traits*

#### *Describe traits or characteristics for which broodstock was chosen.*

Yellowstone cutthroat trout in the Fort Hall Bottoms area are known to hybridize with rainbow trout. Broodstock for the program will come from streams with pure strains of Yellowstone cutthroat trout or by genetically sampling individual fish collected in streams with high levels of hybridization. Adult fish collected in streams with high hybridization rates would be transported and held at the hatchery. Fin-clips would be taken from each fish and genetically analyzed. Pure Yellowstone cutthroat trout would be used as broodstock, while hybrids would be transported and released back to streams targeted for high levels of harvest.

### **5.2.6 ESA-Listing status.**

In 1998, Yellowstone cutthroat trout were petitioned for listing as “threatened” under the Endangered Species Act. The U.S. Fish and Wildlife Service (USFWS) determined that subspecies listing was “not warranted” in a 90-day finding (USFWS 2001) and a full status review finding (USFWS 2006). Yellowstone cutthroat trout are considered a “Sensitive Species” or “Species of Special Concern” by the U.S. Forest Service, the American Fisheries Society, and in all states (Idaho, Wyoming, Montana, Utah, and Nevada) that they inhabit.

### **5.3 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR ECOLOGICAL EFFECTS THAT MAY OCCUR AS A RESULT OF USING THE BROODSTOCK SOURCE.**

*(e.g., “The risk of among population genetic diversity loss will be reduced by selecting the indigenous white sturgeon population for use as broodstock in the supplementation program.”)*

- Ensure collection of an adequate number of adult and juvenile Yellowstone cutthroat trout to begin a captive broodstock program to minimize risk of founder effect and inbreeding depression.
- Ensure use of genetically pure strains of Yellowstone cutthroat trout to produce approximately 10,000 fingerlings annually for release into suitable streams to achieve conservation objectives to minimize risk of outbreeding depression and loss of genetic diversity.
- Ensure use of genetically pure strains of Yellowstone cutthroat trout to produce approximately 10,000 catchable Yellowstone cutthroat trout annually for release into suitable streams to achieve harvest objectives and to minimize risk of outbreeding depression and loss of genetic diversity.
- Externally mark all released hatchery fish for evaluation of various post-release life stage survival parameters and achievement of harvest objectives.

## **SECTION 6. BROODSTOCK COLLECTION**

### **6.1 LIFE-HISTORY STAGE TO BE COLLECTED ( EGGS, JUVENILES, ADULTS).**

Adults will be collected for broodstock for the Crystal Springs Yellowstone cutthroat trout program. It is anticipated that individual fish may be held for up to two years before being released into the wild (their native stream).

### **6.2 COLLECTION OR SAMPLING DESIGN.**

*Include information on the location, time, and method of capture (e.g. weir trap, beach seine, etc.) Describe measures to reduce sources of bias that could lead to a non-representative sample of the desired broodstock source.*

Tribal staff are currently in the process of collecting genetic samples in streams throughout the reservation. The results of this work will be used to determine which streams will be used as a broodstock source and candidate streams for re-establishing pure Yellowstone cutthroat trout. Three streams, Mill Creek, Ross Fork, and West Fork Bannock, have been identified as potential broodstock sources.

Adult collection will consist of netting or trapping adult fish using portable systems that have not been identified.

### **6.3 IDENTITY.**

*Describe method for identifying (a) target population if more than one population may be present; and (b) hatchery origin fish from naturally spawned fish.*

Only one Yellowstone cutthroat trout population is recognized in the Upper Snake River Basin.

Adult fish collected in streams with high hybridization rates would be transported and held at the hatchery. Fin-clips will be taken from each fish and genetically analyzed. Pure Yellowstone cutthroat trout will be used as broodstock, while hybrids would be transported and released back to streams targeted for high levels of harvest.

### **6.4 PROPOSED NUMBER TO BE COLLECTED:**

Up to 210 brood fish are proposed to be held on station to provide eggs for the Yellowstone cutthroat trout programs.

#### **6.4.1 Program goal (assuming 1:1 sex ratio for adults):**

Fecundity of females varies significantly depending on fish size; 350 eggs from a 10-inch fish, to 1,000 eggs from a 15-inch fish. It is anticipated that individual fish may be held for up to two years, and will grow several inches during captivity. In order to achieve the production goal of

10,000 fingerling and 10,000 catchable trout, the egg take target is 22,880 eggs. This allows for a 90% survival rate for green egg to hatch, 98% survival for the fingerling program, and 96% for the subsequent catchable fish rearing phases.

#### **6.4.2 Broodstock collection levels for the last 12 years (e.g., 1988-99), or for most recent years available:**

This program is not expected to begin until 2013, with initial releases of hatchery fish beginning in 2014.

### **6.5 DISPOSITION OF HATCHERY-ORIGIN FISH COLLECTED IN SURPLUS OF BROODSTOCK NEEDS.**

*Describe procedures for remaining within programmed broodstock collection or allowable upstream hatchery fish escapement levels, including culling.*

Broodstock will be held on station to provide eggs for the next year. It is anticipated that individual fish may be held for up to two years before being released to suitable streams.

### **6.6 FISH TRANSPORTATION AND HOLDING METHODS.**

*Describe procedures for the transportation (if necessary) and holding of fish, especially if captured unripe or as juveniles. Include length of time in transit and care before and during transit and holding, including application of anesthetics, salves, and antibiotics.*

Broodstock will be kept in four 6-foot diameter circular tanks dedicated to broodstock holding. This will allow for sorting fish by size and/or gender.

### **6.7 DESCRIBE FISH HEALTH MAINTENANCE AND SANITATION PROCEDURES APPLIED.**

After fertilization, eggs will be water hardened in iodophor and loaded into tray incubators. A hard-piped chemical feed system will be used to deliver argentine or formalin treatments to each incubator on a daily basis to prevent fungus growth on the eggs.

### **6.8 DISPOSITION OF CARCASSES.**

*Include information for spawned and unspawned carcasses, sale or other disposal methods, and use for stream reseedling.*

All broodstock will be kept for up to two years. After two years in captivity, broodstock will be returned to suitable streams. Mortality during holding or spawning will be disposed of at an approved upland site.

### **6.9 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR**

## **ECOLOGICAL EFFECTS TO LISTED SPECIES RESULTING FROM THE BROODSTOCK COLLECTION PROGRAM.**

*(e.g. “The risk of fish disease amplification will be minimized by following Co-manager Fish Health Policy sanitation and fish health maintenance and monitoring guidelines.”)*

No listed fish species are found in the area broodstock collection will take place.

## **SECTION 7. MATING**

*Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.*

### **7.1 SELECTION METHOD.**

*Specify how spawners are chosen (e.g. randomly over whole run, randomly from ripe fish on a certain day, selectively chosen, or prioritized based on hatchery or natural origin).*

Brood fish will be checked for readiness weekly during the spawning season and ripe males and females will be spawned randomly on each spawning day. All brood will be of natural origin.

### **7.2 FERTILIZATION.**

*Describe spawning protocols applied, including the fertilization scheme used (such as equal sex ratios and 1:1 individual matings; equal sex ratios and pooled gametes; or factorial matings). Explain any fish health and sanitation procedures used for disease prevention.*

Spawning will occur by single pair mating (1:1 male to female spawning). Backup males will be retained to ensure fertilization.

### **7.3 CRYOPRESERVED GAMETES.**

*If used, describe number of donors, year of collection, number of times donors were used in the past, and expected and observed viability.*

Not Applicable.

### **7.4 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.**

*(e.g., “A factorial mating scheme will be applied to reduce the risk of loss of within population*

*genetic diversity for the westslope cutthroat trout population that is the subject of this supplementation program.”)*

Single pair mating will limit apparent artificial selection by randomly selecting a male to fertilize a “ripe” female. Random backup males will be present to ensure fertilization and also increase genetic diversity through potential use of multiple males. Disease control mechanisms are in place to limit the incidence of fungus related mortality.

## **SECTION 8. INCUBATION AND REARING**

### **8.1 INCUBATION:**

#### **8.1.1 Number of eggs taken/received and survival rate at stages of egg development**

*Provide data for the most recent 12 years (1988-99), or for years dependable data are available.*

To meet the goal of 10,000 fingerling and 10,000 catchable Yellowstone cutthroat trout, an estimated total of 22,880 eggs will be incubated. A 90% survival is assumed from green egg to hatch.

#### **8.1.2 Loading densities applied during incubation.**

*Provide egg size data, standard incubator flows, and standard loading per Heath tray (or other incubation density parameters).*

Incubators will be standard Marisource trays configured in an 8 tray high stack. At a loading rate of 4,000 eggs per tray, 6 trays will support the egg take target. The single stack of trays has a water demand of 5 gpm.

#### **8.1.3 Incubation conditions.**

*Describe monitoring methods, temperature regimes, minimum dissolved oxygen criteria (influent/effluent), and silt management procedures (if applicable), and any other parameters monitored.*

Water used for incubation will be from the local groundwater supply that is used for all stages of fish rearing. Water temperature will be relatively constant year round at approximately 10.1 degrees C.

#### **8.1.4 Ponding.**

*Describe procedures (e.g., dates of ponding, volitional, forced).*

In late May or June, hatchlings will be transferred from incubators into indoor rearing tanks.

Near the end of July, at 240 fish per pound, approximately 10,000 fish will be out-planted into the Fort Hall Bottoms. The following April, fish (at approximately 60 grams) will be transferred to one of the large outdoor rearing ponds for final grow-out when the pond is vacated by the spring Chinook begin out-planted.

### **8.1.5 Fish health maintenance and monitoring.**

*Describe fungus control methods, disease monitoring and treatment procedures, incidence of yolk-sac malformation, and egg mortality removal methods.*

After fertilization at Crystal Springs, eggs will be water hardened in iodophor and loaded into tray incubators. A hard-piped chemical feed system will be used to deliver argentine or formalin treatments to each incubator on a daily basis to prevent fungus growth on the eggs.

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

*(e.g., “Eggs will be incubated using well water only to minimize the risk of catastrophic loss due to siltation.”)*

No adverse genetic or ecological effects to Yellowstone cutthroat trout are expected. . Eggs will be treated with chemicals following fertilization. Alarms and sensors will be in place for low pressure and water levels.

## **8.2 REARING**

### **8.2.1 Provide survival rate data (average program performance) by hatchery life stage (fry to fingerling; fingerling to release) for the most recent twelve years (1988-99), or for years dependable data are available.**

This program is expected to begin in 2012. The projected survival rate by life stage is presented in Table 2.

**Table 2. Survival rates by life stage of Yellowstone cutthroat trout at the Crystal Springs Hatchery.**

Life Stage	Survival Rate
Green egg to hatch	90%
Fry	98%
Fry to catchable rearing phase	96%



## 8.2.2 Density and loading criteria (goals and actual levels).

*Include density targets (lbs fish/gpm, lbs fish/ft<sup>3</sup> rearing volume, etc.).*

After incubation, fry will be transferred to indoor circular tanks, located in the hatchery building adjacent to the incubation area. A total of 3 tanks at 10 feet diameter and 2.75 feet average depth are proposed. At the time of transfer of fry, density in the tanks will be 99 pounds of fish divided into three tanks of 216 cubic feet each (0.15 lb fish/cf). At the time fingerlings are transferred to outdoor rearing ponds, density is expected to be approximately 0.3 lb/cf/in.

## 8.2.3 Fish rearing conditions

*(Describe monitoring methods, temperature regimes, minimum dissolved oxygen, carbon dioxide, total gas pressure criteria (influent/effluent if available), and standard pond management procedures applied to rear fish).*

Fry will be transferred from incubation trays to indoor early rearing troughs beginning in late May or June. Initial flows in the circulars may be as low as 6 gpm per circular. As fish grow, flows may be increased up to a peak flow of 136 gpm. All water to the circulars will be pumped well water. Water temperature during rearing is expected to be approximately 10.1 degrees C.

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

This program is expected to begin in 2013. Projected growth rates are listed in Table 3.

**Table 3. Projected fish length and weight at the end of each month for Yellowstone cutthroat trout reared at Crystal Springs Hatchery.**

Month	Expected Fish Length (Inches)	Expected Fish Weight (grams)
May	1.1	11
June	1.70	26
July	2.29	47
August	2.89	77
September	3.49	112
October	4.08	154
November	4.68	196
December	5.28	250
January	5.87	312
February	6.47	381
March	7.06	438
April	7.66	508
May	8.26	617
June	8.85	718

Month	Expected Fish Length (Inches)	Expected Fish Weight (grams)
July	9.45	818
August	10.05	901

Average length, mass and fish/pound for Yellowstone cutthroat trout at transfer to early rearing circulars, fry release, catchable transfer to outdoor rearing ponds and release are presented in Table 4.

**Table 4. Average size by period for Yellowstone cutthroat trout reared at Crystal Springs Hatchery.**

Time Period	Size at transfer (g)	Number at Transfer	Total Pounds at Transfer
To Early Rearing	0.21	22,422	10
Fry Release	2.0	10,000	99
Catchable Transfer to Outdoor Ponds	60.0	10,400	1,374
Catchable Release	150.0	10,000	3,304

#### **8.2.5 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).**

Food type has not yet been determined for the Crystal Springs Hatchery Yellowstone cutthroat trout program. However, this program is expected to make use of other successful trout rearing feeds and feeding protocols found in use at other cutthroat trout rearing programs operated by Federal, State or Tribal agencies.

#### **8.2.6 Fish health monitoring, disease treatment, and sanitation procedures.**

*Provide condition factor indices.*

IDFG Eagle Fish Health Laboratory staff will conduct routine fish health inspections on a regular basis. If disease agents are suspected or identified, more frequent inspections will be conducted. Recommendations for treating specific disease agents comes from the Idaho Department of Fish and Game Fish Health Laboratory in Eagle, ID. Therapeutics may be used to treat specific disease agents either via a medicated feed treatment (i.e., Oxytetracycline) or an external bath (i.e., formalin). Disinfection protocols will be in place for equipment, trucks and nets. The Crystal Springs hatchery building will have foot baths containing disinfectant at each building entrance. All raceways will be thoroughly cleaned and air dried after fish have been transferred outside to the final rearing ponds. Rearing ponds also will be thoroughly cleaned and air dried after smolts are released.

### **8.2.7 Indicate the use of "natural" rearing methods as applied in the program.**

No natural or semi-natural rearing methods are intentionally applied. Predator avoidance behaviors may be strengthened in the hatchery population by the presence of avian and mammalian predators that may occasionally visit the outdoor rearing ponds.

### **8.2.8 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to fish under propagation. (e.g., “Fish will be reared to sub-yearling to minimize the risk of domestication effects that may be imparted through rearing to yearling size.”)**

Fish for reintroduction will be planted at the fry or fingerling stage to reduce the risk of domestication to natural populations. Fish for the harvest program will be planted at times and locations to allow for imitate return to the fishery in streams that have been designated for harvest. Proper disinfection procedures, antibiotic treatments, and egg culling criteria will be used to limit the spread of disease. Fish observation and raceway cleaning will be conducted on a regular basis.

## **SECTION 9. RELEASE**

*Describe fish release levels, and release practices applied through the hatchery program.*

### **9.1 PROPOSED FISH RELEASE LEVELS. (USE STANDARDIZED LIFE STAGE DEFINITIONS BY SPECIES PRESENTED IN ATTACHMENT 2. “LOCATION” IS WATERSHED PLANTED (E.G., “ELWHA RIVER”).**

**Table 5. Proposed size, date, and location of releases from Crystal Springs Hatchery Yellowstone cutthroat trout program.**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry	10,000	240	August	Fort Hall Streams
Fingerling				
Catchable	10,000	3	August	Fort Hall Streams

## **9.2 SPECIFIC LOCATION(S) OF PROPOSED RELEASE(S).**

*Stream, river, or watercourse: (include name and watershed code (e.g. WRIA) number)*

A summary of the classifications and proposed actions for each stream of interest is presented in Table 6. The management approach proposed for each stream is based on Yellowstone cutthroat trout genetic, habitat and population work completed in 1999 (Moser 1999). The data in this table will be updated in 2011 as new genetic and population information analyses are completed.

## **9.3 ACTUAL NUMBERS AND SIZES OF FISH RELEASED BY AGE CLASS THROUGH THE PROGRAM.**

*For existing programs, provide fish release number and size data for the past 12 years, if available. Use standardized life stage definitions by species presented in Attachment 2. Cite the data source for this information.*

This program is expected to begin in 2012; the first releases will be in 2014. No fish have been released through this program.

## **9.4 ACTUAL DATES OF RELEASE AND DESCRIPTION OF RELEASE PROTOCOLS.**

*Provide the recent five year release date ranges by life stage produced (mo/day/yr).*

No releases have been made from this program.

**Table 6. Summary of management actions for the proposed Yellowstone cutthroat trout program by stream.**

Stream	Percent Hybrid	Species	Management Classification	Broodstock Source	Fingerling Stocking	Catchable Cut Stocking	Non-Native Removal	Harvest Allowed (Tribal)	Harvest Allowed (Sport)	Investigate For Weir	Elev. (ft)
30-Day	NA	BRK	Restore		Yes	Yes	Yes	Yes	No		7400
Birch	Analysis Incomplete	HYB	Enhance		Yes	?		?			5200
Cold Creek	NA	NO FISH									5390
Garden Creek	NA	NO FISH									4800
Lower Moonshine	NA	SUC,DAC,RSS	Harvest			Yes		Yes	No		4800
Lower/Mid Jeff Cabin	NA	SUC,DAC,RSS	Harvest			Yes		Yes	No		5660
Portneuf/Chesterfield	NA	RBT,SUC,DAC	Harvest		Yes	Yes		Yes	Yes		5400
Upper Portneuf		CUT,DAC,SUC,RBT,	TBD						No	Yes	
Squaw Creek	NA	NO FISH									5076
Upper Portneuf	NA	DAC	Harvest			Yes		Yes	Yes		5685
Wood Creek	NA	NO FISH									5600
Mill	0%	CUT/BRK	Protect	Yes				Yes			7300
Ross Fork (including Lower Ross Creek)	0%	CUT/BRK	Protect	Yes				Yes		Yes	5700
West Fork Bannock	12%	HYB	Protect	Yes				Yes			5100
South Fork Ross	25%	HYB,BRK,SUC	Enhance		Yes		Yes				5500
Moonshine	29%	HYB	Enhance		Yes					Yes	4700
Little Toponce	38%	HYB	Enhance		Yes					Yes	6800
Big Jimmy (Fort Hall Bottoms)	50%	HYB, SUC	Restore		Yes			Yes	Yes		4300
Midnight	50%	HYB	Restore		Yes			Yes	Yes	Yes	5000
Spring (Ft. Hall Bottoms)	55%	HYB,SUC,RBT	Harvest	Yes		Yes		Yes	Yes	Yes	4380
North Toponce	73%	HYB	Harvest			Yes		Yes	Yes		7700
Rattlesnake	96%	HYB, SUC	Harvest			Yes		Yes	Yes		4300
Kinney Creek		HYB,SUC,RBT								Yes	
Clear (Ft. Hall Bottoms)	100%	HYB	Harvest		Yes	Yes		Yes	Yes	Yes	4300

## **9.5 FISH TRANSPORTATION PROCEDURES, IF APPLICABLE.**

*Describe fish transportation procedures for off-station release. Include length of time in transit, fish loading densities, and temperature control and oxygenation methods.*

All transportation equipment will emphasize fish health and safety. Adults and juveniles will be transported in 100-1,000 gallon insulated HDPE or fiberglass transport tanks and temperature will be controlled. The transport containers will be supplied with continuous oxygen that maintains dissolved oxygen at full saturation and are loaded at no more than 0.5 lb fish/gallon of water. All tanks used for transport on trips of a 4 hour or longer duration will be equipped with air scoops. The oxygen reservoir will contain at least double the quantity of oxygen needed to make the entire trip.

## **9.6 ACCLIMATION PROCEDURES (METHODS APPLIED AND LENGTH OF TIME).**

Releases of Yellowstone cutthroat trout from Crystal Springs Hatchery will be made directly into small streams after tempering during transport. No acclimation facilities will be provided.

## **9.7 MARKS APPLIED, AND PROPORTIONS OF THE TOTAL HATCHERY POPULATION MARKED, TO IDENTIFY HATCHERY COMPONENT.**

All catchable Yellowstone cutthroat trout released will be marked with an adipose fin clip. Marks for juvenile releases may differ according to management classification of each stream.

## **9.8 DISPOSITION PLANS FOR FISH IDENTIFIED AT THE TIME OF RELEASE AS SURPLUS TO PROGRAMMED OR APPROVED LEVELS.**

No fish produced in this program will be considered surplus. All Yellowstone cutthroat trout will be released into streams in the Fort Hall Bottoms area.

## **9.9 FISH HEALTH CERTIFICATION PROCEDURES APPLIED PRE-RELEASE.**

Testing for bacterial kidney disease, whirling disease, and viral replicating agents will be conducted under the Idaho Fish and Game Eagle Fish Health Laboratory between 45 and 30 days prior to release to obtain fish health certification.

## **9.10 EMERGENCY RELEASE PROCEDURES IN RESPONSE TO FLOODING OR WATER SYSTEM FAILURE.**

Artesian pressure is sufficient to deliver some of the required flow to hatchery facilities without pumping. Obtaining the peak flow rates that are needed in the March and April (prior to out-planting smolts) will likely require pumping to deliver most of the supply. Pumps will be supplied with backup generators for use in the event of power failure.

Fish reared at Crystal Springs cannot be released into the facility effluent as this is a spring and well water supplied facility. If a water system failure occurs, it would require the following actions:

- Transport some fish to another facility or to the release location. Sufficient numbers would be transported to allow the existing gravity water flow to maintain the remaining fish being held.
- As an interim measure, aeration pumps would be installed in the rearing ponds to provide additional oxygen and water flow. Adjustments would occur in the ponds as fish as being transported out.

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

There are no listed fish species found in the American Falls watershed.

## **SECTION 10. PROGRAM EFFECTS ON ALL ESA-LISTED, PROPOSED, AND CANDIDATE SPECIES (FISH AND WILDLIFE)**

### **10.1 LIST ALL ESA PERMITS OR AUTHORIZATIONS IN HAND FOR THE HATCHERY PROGRAM.**

The Yellowstone cutthroat trout is not a listed species, therefore no ESA permit is required for the hatchery program.

### **10.2 PROVIDE DESCRIPTIONS, STATUS, AND PROJECTED TAKE ACTIONS AND LEVELS FOR ESA-LISTED NATURAL POPULATIONS IN THE TARGET AREA.**

There are no ESA-listed fish in the target area.

#### **10.2.1 Description of ESA-listed, proposed, and candidate species affected by the program.**

*Include information describing: adult age class structure, sex ratio, size range, migrational timing, spawning range, and spawn timing; and juvenile life history strategy, including smolt emigration timing. Emphasize spatial and temporal distribution relative to hatchery fish release*

*locations and weir sites.*

There are no ESA-listed fish in the target area.

Identify the 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).

There are no ESA-listed fish in the target area.

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

There are no ESA-listed fish in the target area. ESA-listed Snake River spring/summer Chinook salmon will also be reared in the facility.

### **10.2.2 Status of ESA-listed species affected by the program.**

There are no ESA-listed fish in the target area. ESA-listed Snake River spring/summer Chinook salmon will also be reared in the facility. Species will be kept separate to minimize the potential impacts of Yellowstone cutthroat trout on Chinook.

### **10.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed species in the target area, and provide estimated annual levels of take (see “Attachment 1” for definition of “take”). Provide the rationale for deriving the estimate.**

There are no ESA-listed fish species in the area to be affected by monitoring and evaluation or research programs. No take of ESA-listed species is expected to occur as a result of the Yellowstone cutthroat trout program.

## **SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**

*This section describes how “Performance Indicators” listed in Section 1.10 will be monitored. Results of “Performance Indicator” monitoring will be evaluated annually and used to adaptively manage the hatchery program, as needed, to meet “Performance Standards”.*



## **11.1 MONITORING AND EVALUATION OF “PERFORMANCE INDICATORS” PRESENTED IN SECTION 1.10.**

Performance indicators have not been developed for the Yellowstone cutthroat trout program. Monitoring and evaluation activities will be designed to determine that the biological objectives for the hatchery and natural components of the Yellowstone cutthroat trout population are being achieved. A detailed monitoring and evaluation program will be developed in Step 2 of the Northwest Power and Conservation Council’s review process.

Monitoring and evaluation (M&E) activities will be designed to determine that the biological objectives for the hatchery and natural components of the population are being achieved.

### **Hatchery Population**

The biological objectives identified for the hatchery component of the population that will be monitored as follows:

- Ensure collection of an adequate number of adult and juvenile Yellowstone cutthroat trout to begin a captive broodstock program to minimize risk of founder effect and in-breeding depression.
- Ensure use of genetically pure strains of Yellowstone cutthroat trout to produce approximately 10,000 fingerlings annually for release into suitable streams to achieve conservation objectives to minimize risk of outbreeding depression and loss of genetic diversity.
- Ensure use of genetically pure strains of Yellowstone cutthroat trout to produce approximately 10,000 catchable Yellowstone cutthroat trout annually for release into suitable streams to achieve harvest objectives and to minimize risk of outbreeding depression and loss of genetic diversity.
- Externally mark all released hatchery fish for evaluation of various post-release life stage survival parameters and achievement of harvest objectives.

Hatchery staff will be responsible for monitoring all phases of hatchery production. The key attributes to be monitored will be the number of adults collected for broodstock and the number of fingerlings reared and released to each stream. In-hatchery culture practices will be documented each year in an annual report.

### **Natural Population**

Natural production will be monitored and evaluated to determine if the following biological objectives are being met:

- Making annual progress toward removing Yellowstone cutthroat trout x rainbow trout hybrids in streams with the greatest potential to support genetically pure Yellowstone cutthroat trout

- Annually monitoring Yellowstone cutthroat trout spawners in those streams that are targeted for supplementation to (1) determine fry-to-adult survival and overall spawner abundance, and (2) compare abundance with streams that currently support undisturbed populations of pure Yellowstone cutthroat trout in the region
- Annually monitoring the change in the total number of streams supporting pure populations of Yellowstone cutthroat trout
- Developing and monitoring actions that protect high quality Yellowstone cutthroat trout spawning and rearing habitat in natal spawning and rearing areas

## Protocols

The frequency of population sampling will depend on the number of streams classified as needing protection versus enhancement and restoration. M&E activities in streams classified as needing protection will be less frequent than in the others in order to reduce sampling impacts on the population. If available, a couple of the protection streams will be identified as controls and will be sampled at the same frequency (using similar methods) as the treatment streams (i.e., streams classified as enhancement or restoration). Habitat conditions in the streams will be sampled using EPA's Generalized Random Tessellation Stratified (GRTS) method. This method is being used throughout the Northwest to document stream habitat quality and quantity over time (see ([http://www.epa.gov/nheerl/arm/designing/design\\_intro.htm](http://www.epa.gov/nheerl/arm/designing/design_intro.htm))).

Monitoring will be integrated with the IDFG's broader-based conservation efforts to manage Yellowstone cutthroat trout so as to restore and ensure their long-term persistence at levels capable of providing angling opportunities (IDFG 2007).

### **11.1.1 Describe the proposed plans and methods necessary to respond to the appropriate "Performance Indicators" that have been identified for the program.**

N/A

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

N/A

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

The monitoring and evaluation component of this program is not expected to have an effect on any ESA listed species.

## **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. Attach a copy of any formal research proposal addressing activities covered in this section. Include estimated take levels for the research program with take levels provided for the associated hatchery program in Table 1.*

### **12.1 OBJECTIVE OR PURPOSE.**

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

Evaluations are ongoing by the Shoshone-Bannock Tribes to identify critical population strongholds and to collect genetic information on Yellowstone cutthroat trout in all streams of the reservation. This information will be used to determine how each stream will be managed in the future (i.e., protection, enhancement or restoration).

### **12.2 COOPERATING AND FUNDING AGENCIES.**

This resident fish program does not have a research component and will have no effect on ESA-listed fish.

### **12.3 PRINCIPLE INVESTIGATOR OR PROJECT SUPERVISOR AND STAFF.**

NA

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

NA

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

This resident fish program does not have a research component and will not affect listed species.

**12.6 DATES OR TIME PERIOD IN WHICH RESEARCH ACTIVITY OCCURS.**

NA

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

This program does not have a research component and will not affect listed species.

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

Yellowstone cutthroat trout not a listed species.

**12.9 LEVEL OF TAKE OF LISTED SPECIES: NUMBER OR RANGE OF INDIVIDUALS HANDLED, INJURED, OR KILLED BY SEX, AGE, OR SIZE, IF NOT ALREADY INDICATED IN SECTION 2 AND THE ATTACHED "TAKE TABLE" (TABLE 1).**

NA

**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.**

NA

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

## **SPECIES AS A RESULT OF THE PROPOSED RESEARCH ACTIVITIES.**

(e.g., “Listed westslope cutthroat trout sampled for the growth study will be collected in compliance with Federal Guidelines to minimize the risk of injury or immediate mortality.”).

This program will not affect listed fish species.

## **SECTION 13. ATTACHMENTS AND CITATIONS**

CH2M Hill. 2004. Draft Management Plan-Upper Snake Province. Submitted to the Northwest Power and Conservation Council. December 2004.

Idaho Department of Fish and Game (IDFG). 2007. Management plan for conservation of Yellowstone cutthroat trout in Idaho. Idaho Department of Fish and Game, Boise, ID.

Meyer, K.A., D.J. Schill, J A. Lamansky, Jr., M.R. Campbell, and C.C. Kozfkay. 2006. Status of Yellowstone Cutthroat Trout in Idaho. Transactions of the American Fisheries Society. 135: 1329-1347.

Moser, D. 1999. Fort Hall Resident Fish Program. Project No. 1992-01000. BPA Report COD/BP-32743-1. 34 pages.

Northwest Power and Conservation Council (NPCC). 2009. Columbia River Basin Fish and Wildlife Program. Updated October 2009.

United States Fish and Wildlife Service (USFWS). 2001. Endangered and Threatened Wildlife and Plants: 90-day Finding for a Petition To List the Yellowstone Cutthroat Trout as Threatened. 66 FR 11244.

USFWS. 2006. Endangered and Threatened Wildlife and Plants: 12-Month Finding for a Petition To List the Yellowstone Cutthroat Trout as Threatened: Notice of a 12-Month petition finding: not warranted. 71 FR 8818.

## **SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY**

“I hereby certify that the foregoing information 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: \_\_\_\_\_

**Table 1. Estimated listed species take levels by hatchery activity.**

Listed species affected: _____ ESU/Population: _____ Activity: _____				
Location of hatchery activity: _____ Dates of activity: _____ Hatchery program operator: _____				
Type of Take	Annual Take of Listed Fish By Life Stage (Number of Fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category.

**Instructions:**

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.

2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).

If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.

This page is intentionally blank.



## **Appendix D**

---

### *Bioprogramming Reports and Hatchery Operations Schedule*

This page is intentionally blank.

---

## ***Technical Memo***

### ***Biological Criteria for Spring Chinook***

This page is intentionally blank.

# TECHNICAL MEMORANDUM 001

**McMILLEN, LLC**

**DRAFT**

To:	Dan Stone Shoshone Bannock Tribe	Project:	SBT Spring Chinook Hatchery
From:	Mark Reiser, Andy Appleby	Cc:	File
Date:	December 27, 2010	Job No:	Purchase Order No: Vendor No:
Subject:	Biocriteria for Shoshone Bannock Tribe Spring Chinook Programs		

## 1.0 INTRODUCTION

The Shoshone Bannock Tribe in cooperation with Bonneville Power Administration (BPA), proposes to construct new hatchery facilities to incubate and raise up to one million Spring Chinook salmon smolts at the site of a defunct trout hatchery. Though the initial rearing targets may be smaller (depending on brood fish availability), the facility will be designed for eventual production targets of 600,000 smolts for out-planting to Yankee Fork and 400,000 smolts for out-planting to Panther Creek. McMillen has developed a preliminary, detailed operations schedule for each program in order to establish water budgets by month, and to determine space required for incubation, early rearing and juvenile rearing improvements. The preliminary operations schedules (See Tables 1-1 and 1-2), covers a two year period in order to shown the overlapping water demand required for both programs, to support two brood years of fish on station at once. The purpose of this memorandum is to document the bio-programming assumptions and criteria used to formulate the operations schedule.

## 2.0 FISH DEVELOPMENT CYCLE

The colored bars across the top section of the operations schedules shows the timing of incubation, early (indoor) rearing, and juvenile (outdoor) rearing. The adult holding process is an existing function that begins in May of each year at off station facilities and runs continuously through the end of September. Incubation will begin in October and run through December. Early rearing in indoor troughs will begin in late December to early January and run through April. Outdoor juvenile rearing begins in May and runs for twelve months, through the following April.

The beginning fish size shown of 0.3 grams in late December is based on the records for the McCall Hatchery program. The preliminary schedule shows that the SBT facility will be managed so that there are a few days in late April to early May when the outdoor raceways can be dewatered and disinfected after brood year A smolts are transferred out and before brood year B fry are transferred in.

## 3.0 BIOLOGICAL VARIABLES

The primary biological variables used in the preparation of the preliminary operations schedule include water temperature, species specific condition factor, and density and flow indices. The basis of the variable values used in the development of the operations schedules are explained below.

### **3.1 Water Temperature**

Water temperature is a primary determining factor in the development and growth rate of fish. The groundwater supply to be used for all stages of incubation and fish rearing will provide relatively constant year round water temperatures. Thermal data loggers deployed by IDFG in February through June of 2007 at a nearby site using the same aquifer indicate the water temperatures vary between 9.5 and 10.28 degrees Celsius. Temperatures averaging 10.1 degrees C were measured at the proposed site during aquifer testing in November 2010. The average groundwater temperatures and are shown along the top of Table 2-1 in degrees Centigrade. These temperatures are warmer in the winter and colder in the summer than the natural surface water temperatures that the spring Chinook would experience.

A temperature of 10.1 degrees C was used for the incubation and rearing periods.

### **3.2 Expected Growth Rates**

The projected monthly growth rate shown in Tables 1-1 and 1-2 are based on a daily growth rate of 0.04 millimeters per Centigrade temperature units (ctu) per day. This growth rate is a management goal that was established to produce fish at no larger than 9 per pound (50 grams each), by the end of April each year. This goal would be difficult to achieve due to the constant temperature groundwater being used for the fish culture at this site. The use of mechanically chilled water during the incubation period is a proven method of slowing fish growth in a cost effective manner.

### **3.3 Fish Weight and Length**

The next row down on the operations schedules shows cumulative fish length in inches is determined by adding the growth per month to the fish length at the end of the preceding month. The weight of individual fish in grams is shown in the row below the length. The fish weight is taken from Piper's Table I-4.

### **3.4 Density Index**

Density index (DI), is a function of pounds of fish per cubic foot of rearing volume, per inch of fish length: lb. fish/cf volume/length (in.). The density index used for Spring Chinook at facilities that perform ELISA culling is typically in the 0.2 to 0.3 range. The following is a summary of DI used at other Spring Chinook facilities:

McCall Hatchery Criteria: DI=0.3

Sawtooth Hatchery Criteria: DI=0.3

DJ Warren Associates and McMillen staff recommend that a density index of 0.23 be used for the planning stage of this project. The density index is then used to calculate the volume of rearing space required in terms of cubic feet. Tables 1- and 1-2 show the rearing volume required at the end of each month as fish size increase from left to right. The total volume is then divided by the cubic foot volume of individual rearing units in order to show the total number of rearing units required.

### **3.5 Flow Index**

Flow index (FI), is a function of pounds of fish/fish length in inches times flow in gallons per minute (gpm). Flow index is an indication of how much oxygen is available for fish metabolism and is adjusted based on the elevation of the project site and water temperature, both of which affect the amount of oxygen in the water supply at saturation. According to Table 8 in Fish Hatchery Management (Piper 1982), the flow index for the SBT site, at an elevation of 4385 feet and average water temperature of 10 degrees C (50 Degrees F), is recommended to be 1.54. A slightly more conservative flow index value of 1.50 to 1.52 are used in Tables 1-1 and 1-2.

#### **4.0 EGG TAKE AND FISH SURVIVAL**

In order achieve the eventual 1,000,000 smolt production goal, Tables 1-1 and 1-2 show an egg take target of 1,312,500. This allows for 80% viability from green egg to hatch and 95% for the subsequent early rearing and juvenile rearing phases. Rearing records from similar hatcheries indicates that these survival rates are often exceeded in good years, and are reasonable averages to use when sub-optimal years are factored in.

#### **5.0 INCUBATION AND REARING FACILITIES**

This section provides a brief summary of the incubation and rearing flows and unit volumes shown on the operations schedules.

##### **5.1 Incubation**

Incubator sizing is based on the use of standard Marisource (Heath) trays, configured in 8 tray high stacks, (top tray not used). With an initial egg take of 1,312,500, and an incubator loading rate of 4,000 eggs per incubator tray, a total of 328 trays are required, in a total of 47 stacks. At 5 gpm of water supply to each stack, the total incubator water budget is approximately 235 gpm.

##### **5.2 Early Rearing**

Early rearing is proposed to be accomplished in indoor rectangular troughs, located in the hatchery building, adjacent to the incubation area. Based on the flow and density indices discussed above, Tables 1-1 and 1-2 are showing a total rearing trough volume requirement of 7,660 cubic feet. A total of 18 troughs 416 cubic foot troughs at 4 feet wide, 40 feet long, and 2.6 feet average depth are proposed. Both incubation and early rearing will utilize either tempered or ambient groundwater water supplies. The operations schedules show the fish being transferred at out at approximate size of 170 to 200 fish per pound, at which point the fish are large enough to marked during transfer to the outdoor rearing units. This results in a peak early rearing flow of 1,543 gpm in April of each year.

##### **5.3 Juvenile Rearing**

Depending on the early rearing strategy selected, at some point between late March and early May, juvenile fish will be moved from the indoor rearing troughs into outdoor raceways where they will be held for approximately 12 months, to a target release size of 9 to 10 fish per pound. Tables 1-1 and 1-2 show a total rearing volume 56,867 cubic feet based on a density index of 0.23. Five 12,500 cubic foot ponds, with rearing area dimensions of 25 feet wide, 100 feet long and 5 feet average depth, are required, with one additional raceway recommended to provide operational flexibility for marking, tagging or batching fish.

#### **5.4 Peak Water Demand**

With the peak flows from the Yankee Fork and Panther Creek programs added together, a peak flow of 21.6 cfs (9,705 gpm), occurs for a relatively short period of time in April of each production cycle, just before smolts are transferred out. The present water right of 24.7 cfs will accommodate these programs and the 0.6 cfs of flow needed to support the Yellowstone Cutthroat program.



[illegible]

This page is intentionally blank.



This page is intentionally blank.

---

## ***Technical Memo***

### *Biological Criteria for Yellowstone Cutthroat Trout*

This page is intentionally blank.

# TECHNICAL MEMORANDUM 002

**McMILLEN, LLC**

**DRAFT**

To:	Dan Stone, Hunter Osbourne Shoshone Bannock Tribe	Project:	Crystal Springs Hatchery
From:	Mark Reiser, Andy Appleby	Cc:	File
Date:	December 27, 2010	Job No:	Purchase Order No: Vendor No:
Subject:	Biocriteria for Shoshone Bannock Tribe Yellowstone Cutthroat Program		

## 1.0 INTRODUCTION

The Shoshone Bannock Tribe in cooperation with Bonneville Power Administration (BPA), proposes to construct new hatchery facilities to incubate and raise 20,000 Yellowstone cutthroat at the site of a defunct trout hatchery. The new hatchery is also intended to provide production support for the Yankee Fork Spring Chinook Salmon supplementation (YFSCSS) program, and a proposed Panther Creek spring Chinook program as well. McMillen has developed a preliminary, detailed operations schedule for the Yellowstone cutthroat program in order to establish water budgets by month, and to determine space requirements for incubation, and rearing improvements. The preliminary operations schedules (See Table 2-1), covers a two year period and is based on out-planting 10,000 fry at 240 fish per pound and 10,000 catchable sized fish a maximum size of 3 fish per pound. The purpose of this memorandum is to document the bio-programming assumptions and criteria used to formulate the operations schedule.

## 2.0 FISH DEVELOPMENT CYCLE

The colored bars across the top section of the operations schedule displays the timing of incubation, early (indoor) rearing, and juvenile (outdoor) rearing. The brood fish for this program will be collected from the wild, and held on station year-round. Spawning and incubation will begin in April. In late May or June, hatchlings will be transferred from incubators into indoor rearing tanks. The following April, fingerling sized fish will be transferred to one of the large outdoor rearing ponds for final grow-out when the pond is vacated by the spring Chinook being out-planted.

The beginning fish size is shown of 0.21 grams, when fish are ponded in May or June.

## 3.0 BIOLOGICAL VARIABLES

The primary biological variables used in the preparation of the preliminary operations schedule include water temperature, species specific condition factor, and density and flow indices. The basis of the variable values used in the development of the operations schedules are explained below.

### 3.1 Water Temperature

Water temperature is a primary determining factor in the development and growth rate of fish. The groundwater supply to be used for all stages of incubation and fish rearing will provide relatively constant year round water temperatures. Thermal data loggers deployed by IDFG in February through June of 2007 at a nearby site using the same aquifer indicate the water temperatures vary between 9.5 and 10.28 degrees Celsius. Groundwater temperatures averaging 10.1 degrees C were measured at the proposed site during aquifer testing in November 2010. The average groundwater temperatures and are shown along the top of Table 2-1 in degrees Centigrade. These temperatures are warmer in the winter and colder in the summer than the natural surface water temperatures that the Yellowstone cutthroat would experience.

A temperature of 10.1 degrees C was used for predicting development and growth rates the incubation and rearing periods.

### **3.2 Expected Growth Rates**

The projected monthly growth rate shown in Table 2-1 is based on a daily growth rate of 0.05 millimeters per Centigrade temperature units (ctu) per day. The growth rate row in Table 2-1 shows the projected millimeters of fish length increase per month. This growth rate is a management goal that was established to produce fish at approximately 3 per pound (150 grams each), by the end of July each year.

### **3.3 Fish Weight and Length**

The next row down on the operations schedule shows cumulative fish length in inches which is determined by adding the growth per month to the fish length at the end of the preceding month. The weight of individual fish in grams is shown in the row below the length. The fish weight is taken from Piper's Table I-5, for west slope cutthroat.

### **3.4 Density Index**

Density index (DI), is a function of pounds of fish per cubic foot of rearing volume, per inch of fish length:  $\text{lb. fish/cf volume/length (in.)}$ . The maximum density index recommended by Piper is 0.5 lb/cf/in. A conservative density value of 0.3 lb/cf/inch is used for this program.

The density index is then used to calculate the volume of rearing space required in terms of cubic feet. Table 2-1 shows the rearing volume required at the end of each month as fish size increase from left to right. The total volume is then divided by the cubic foot volume of individual rearing units in order to show the total number of rearing units required.

### **3.5 Flow Index**

Flow index (FI), is a function of pounds of fish/fish length in inches times flow in gallons per minute (gpm). Flow index is an indication of how much oxygen is available for fish metabolism and is adjusted based on the elevation of the project site and water temperature, both of which affect the amount of oxygen in the water supply at saturation. According to Table 8 in Fish Hatchery Management (Piper 1982), the flow index for the SBT site, at an elevation of 4385 feet and average water temperature of 10 degrees C (50 Degrees F), is recommended to be 1.54. A slightly more conservative flow value of 1.50 is used in Table 2-1



## **4.0 BROODSTOCK HOLDING, EGG TAKE AND FISH SURVIVAL**

Up to 210 brood fish are proposed to be held on station to provide eggs for the YCT programs. Fecundity of females varies significantly depending on fish size; 350 eggs from a 10-inch fish, to 1,000 eggs from a 15-inch fish. It is anticipated that individual fish may be held for up to two years, and will grow several inches during captivity. Table 2-1 shows four 6 foot diameter circular tanks being dedicated to brood stock holding in order to allow for sorting fish by size and/or gender. The water supply to each tank will be approximately 18 gpm, in order to provide 2 exchanges per hour.

In order achieve the fish production goals shown above, Table 2-1 shows an egg take target of 22,880 eggs. This allows for a 90% survival rates for green egg to hatch, 98% survival for the fry program and and 96% for the subsequent catchable fish rearing phases.

## **5.0 INCUBATION AND REARING FACILITIES**

This section provides a brief summary of the incubation and rearing flows and unit volumes shown on the operations schedules.

### **5.1 Incubation**

Incubator sizing is based on the use of standard Marisource (Heath) trays configured in an 8 tray high stack. At a loading rate of 4,000 eggs per tray, 6 trays are required to support the egg take target. The remaining 2 trays are then available to support any additional experimental programs. The single stack of trays has a water demand of 5 gpm.

### **5.2 Early Rearing**

Early rearing is proposed to be accomplished in indoor circular tanks, located in the hatchery building, adjacent to the incubation area. Based on the flow and density indices discussed above, Table 2-1 shows a total early rearing tank volume requirement of 600 cubic feet. A total of 3 tanks at 10 feet diameter and 2.75 feet average depth are proposed. The operations schedules show the fish for the catchable program being transferred to an outdoor pond at 60 gram size, in early April. This results in a peak early rearing flow of 136 gpm in April of each year.

### **5.3 Outdoor Rearing**

In order to minimize construction costs, outdoor rearing of catchable sized fish will be accomplished in a partitioned area of one of the 12,500 cubic foot rearing ponds which will be vacated in April of each year when spring Chinook are out-planted. Table 2-1 shows a total outdoor rearing tank volume requirement of 1,100 cubic feet at a density index of 0.3, and a peak flow rate of 240 gpm at transfer out at the end of July or early August. In reality, a larger portion of the outdoor pond will probably be used, resulting in lighter rearing densities and higher flow rates than those shown in Table 2-1.

This page is intentionally blank.



This page is intentionally blank.

## **Appendix E**

---

### *Crystal Springs Hatchery Site Water Supply Report*

This page is intentionally blank.

# **WATER SUPPLY ASSESSMENT FOR THE SHOSHONE-BANNOCK TRIBE'S CRYSTAL SPRINGS FISH HATCHERY**

Prepared for

**MCMILLEN LLC**

c/o Mort McMillen, P.E.  
1401 Shoreline Drive, Suite 100  
Boise, ID 83702

Prepared by

**SPF Water Engineering, LLC**

300 East Mallard Drive, Suite 350  
Boise, ID 83706

December 2010



This page is intentionally blank.



## Executive Summary

---

1. The existing hatchery wells will not produce the required peak month hatchery supply of 24 cfs, even if equipped with pumps. A minimum of two new wells will be required to achieve production of 24 cfs. The new wells would be designed to produce up to 4,000 gpm each, and would likely be constructed as follows with 20-inch casing (pump chamber) and 16-inch diameter stainless steel screen and filter pack.
2. At a minimum, pumping from wells will be necessary to produce the required supply during the months of October through April. Operation of three pumping wells (Existing Well 6 and new Wells 7 and 8), with two stand-by wells (Wells 1 and 5), is recommended. Artesian flow (without pumping) may be adequate to supply hatchery requirements in other months. The ability to supply hatchery requirements without pumping will depend on (1) required flow rate, (2) the elevation of degasification facilities, (3) regional aquifer water levels, and (4) the wells selected for supply.
3. Maximum pumping water levels under existing aquifer conditions are estimated to range from 35 to 40 feet (three wells, 24 cfs total). Maximum pumping water levels under future aquifer conditions will likely be greater. For planning purposes, an assumption of a maximum aquifer water level decline of 15 to 20 feet (and corresponding increase in pumping lifts) after 20 years is appropriate.
4. Depending on degasification and aeration facility elevations, and head losses from wells to facilities, pumping (directly from wells or indirectly from a pump station at the degasification and aeration facilities) may be required from late summer through April.
5. Sand production must be mitigated at all existing wells. Operational mitigation should include flushing to waste upon pump start up for up to one hour. Sand traps should be provided to contain sand prior to entry into hatchery facilities. Future wells will be constructed with well screens and filter packs to eliminate or significantly reduce sand production.
6. Water quality appears to be consistent across the hatchery site. Average groundwater temperature (measured in all six hatchery wells) in November 2010 was 10.1 °C (50.2 °F). Specific conductance averaged 552 µS/cm. There were no detectable metals, and total nitrogen was less than 2 mg/L.

## Table of Contents

1. Introduction .....	1
2. Summary of Existing Crystal Springs Hatchery Wells .....	2
3. Surface Water Flow and Groundwater Level trends .....	5
3.1. Surface Water Flow .....	5
3.2. Groundwater Level Trends .....	5
4. Crystal Springs Hatchery Well Testing .....	7
4.1. 2010 Test Pumping .....	7
4.2. Artesian Flow Testing .....	10
4.3. Aquifer Parameters .....	13
4.4. Aquifer Monitoring .....	14
5. Considerations for Groundwater Supply Planning .....	16
6. Water Quality .....	21
6. Discussion and Conclusions .....	23
7. References .....	25

### FIGURES

1. Crystal Springs Hatchery Property Boundary and Well Locations
2. Existing Crystal Springs Hatchery Well Locations
3. Hydrographs of Wells within a 6-Mile Radius of Crystal Springs Hatchery
4. Well 6 Hydrograph, Step-Rate Discharge Test
5. Well 6 Specific Drawdown Versus Pumping Rate, Step-Rate Discharge Test
6. Well 6 Well 6 Predicted Drawdown, Aquifer Loss, and Efficiency Diagram
7. Well 3 Hydrograph During Pump Testing
8. Well 3 Cooper-Jacob Evaluation
9. Well 3 Theis Recovery Evaluation
10. Proposed New Pumping Wells

### APPENDIXES

- Appendix A. Summary of Existing Wells at the Crystal Springs Hatchery
- Appendix B. 2010 Test Pump Cut Sheet
- Appendix C. Orifice Charts

# 1. INTRODUCTION

This report documents the review of existing information, along with the collection of new data, to assess the water supply for the Shoshone-Bannock Tribe's Crystal Springs Fish Hatchery. An analysis of this data is provided to assess (1) the capacity of existing wells to provide the required hatchery water supply, (2) sufficiency of the water supply available by artesian flow to meet hatchery demands during low-demand months, (3) pumping lifts necessary during peak-demand months, and (4) potential future pumping lifts in the event of regional aquifer water-level decline. Recommendations are provided for equipping and operating the wells.

The subject property is currently owned by the United States of America and is located in Section 25, T4S, R32E, and Section 30, T4S, R33E, approximately 2.5 miles south and 1.5 miles east of the town site of Springfield in Bingham County, Idaho. There are at least six artesian wells and multiple springs associated with the property. The water is used in a system of ponds and raceways on the property and then discharges into an unnamed stream that flows southwest into American Falls Reservoir. Figure 1 shows the hatchery property and approximate locations of associated wells.

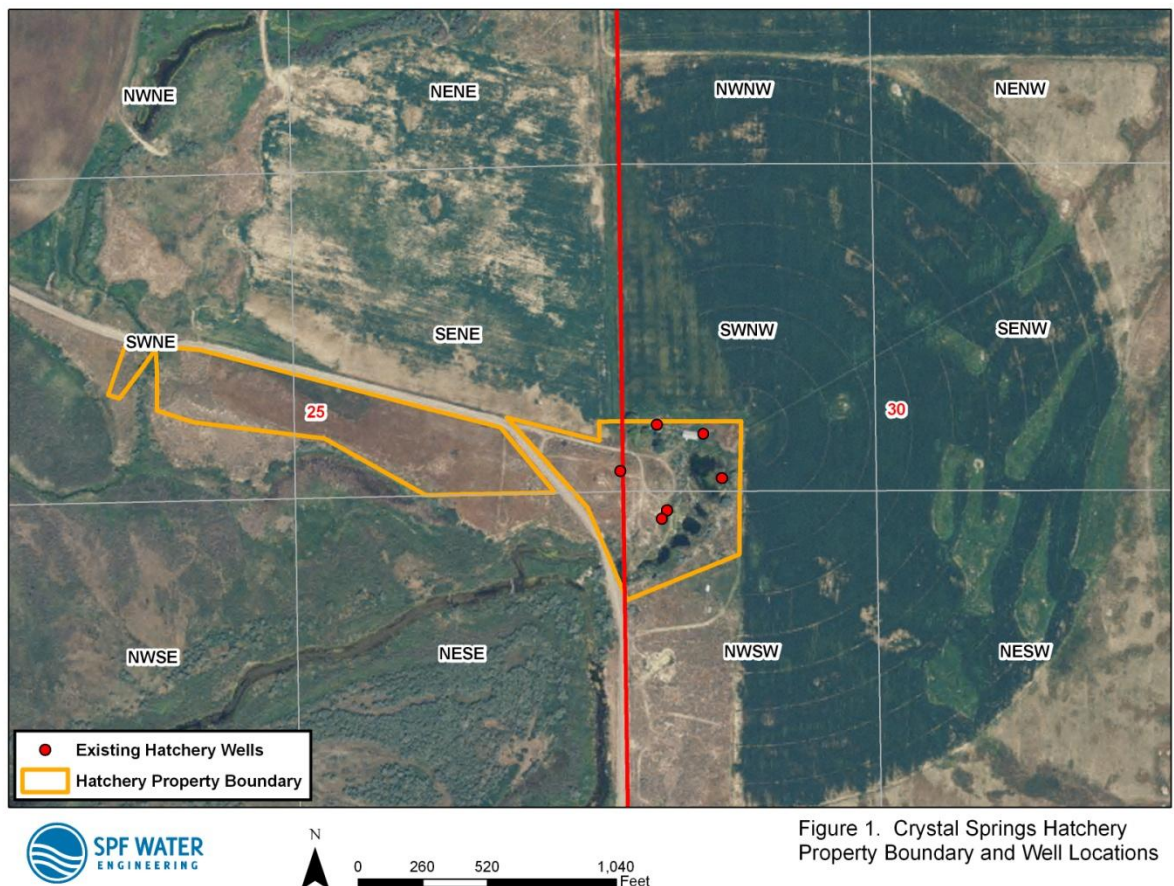


Figure 1. Crystal Springs Hatchery Property Boundary and Well Locations

## 2. SUMMARY OF EXISTING CRYSTAL SPRINGS HATCHERY WELLS

There are six (6) wells onsite that flow under natural conditions by artesian pressure (that is, no pumping). Well locations are shown on Figure 1. SPF reviewed water right files and Idaho Department of Water Resources (IDWR) databases for well information, finding only drillers' reports for two of the six wells. A summary of pertinent existing well information for the wells is provided in Table 1. A brief description of the two wells with well drillers' reports is provided in Appendix A. The completion details of the other four wells are currently unknown.

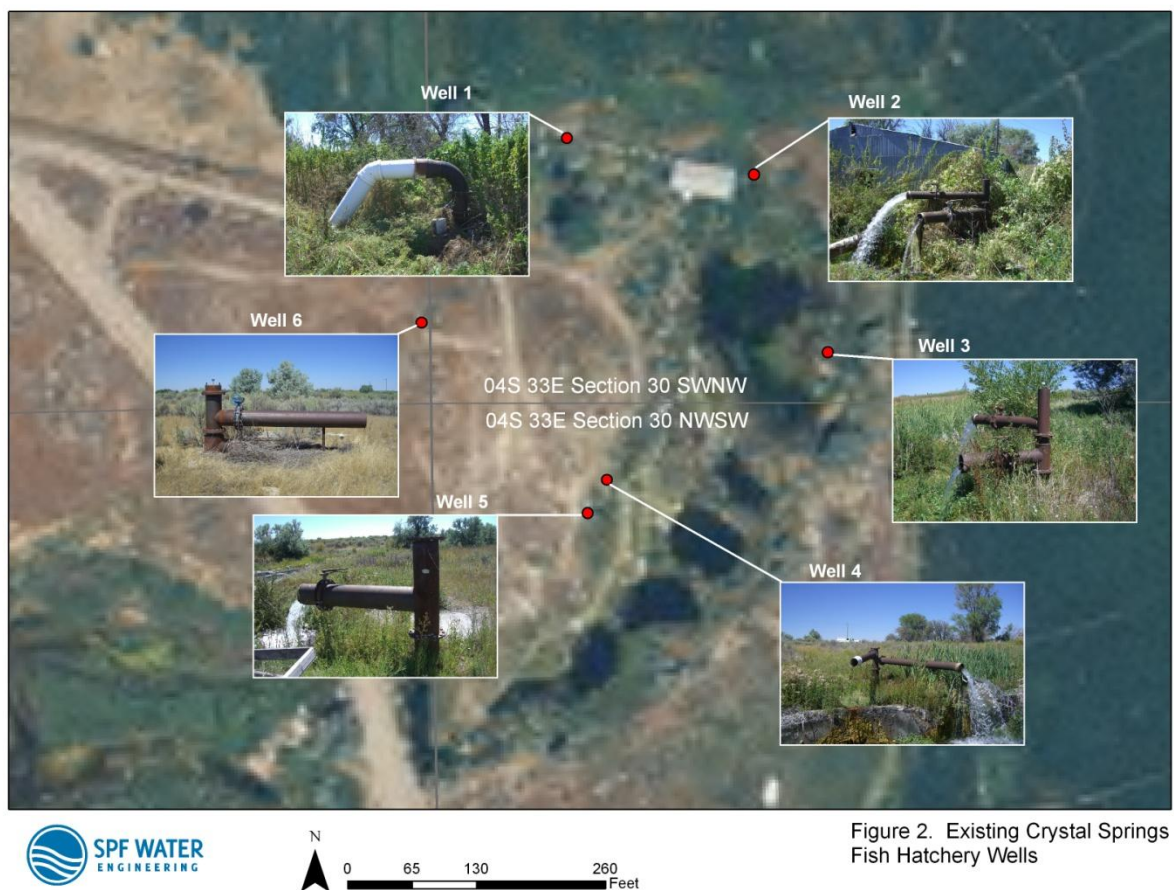


Figure 2. Existing Crystal Springs Fish Hatchery Wells

**Table 1 – Summary Well Information**

Well	Well Completion Date	Altitude of Land Surface (ft asl)	Total Depth (ft bgs)	Casing Diameter (inches)	Open Interval <sup>1</sup> (ft bgs)	Reported Water Temp. at Time of Well Completion (deg F)	Reported Shut-In Pressure at Time of Well Completion (psi)	Reported Natural Flow at time of Well Completion (gpm)
1	-	4375.0	-	12	-	-	-	-
2	-	4372.7	-	8	-	-	-	-
3	-	4367.7	-	8	-	-	-	-
4	-	4366.4	-	8	-	-	-	-
5	5/18/1998	4366.1	180	12	155-178	51	NR	700
6	3/12/1997	4374.3	193	16	165-190	51	8	1,795

Notes: <sup>1</sup> Perforated using Mills knife; “-” indicates information is unknown.

The wells were likely all drilled using the cable-tool method, and appear to have been completed with driven mild-steel casings ranging in diameter from 8 inches to 16 inches. All well casings appear to be 0.250-inch wall thickness. The well heads are equipped with butterfly valves to control flow. Artesian flow is discharged through side discharge pipes to open channels (Wells 2 through 6) or pipe (Well 1).

Water enters Wells 5 and 6 through slots cut with a Mills knife. While an effective well completion technique, the slot sizes are too large to prevent sand from entering. As a result, all wells currently produce sand (only if pumped). Any future wells should be constructed using appropriately-designed well screens and filter packs to minimize water entrance velocities and to control sand production. Completion with well screens will generally result in higher well efficiency, providing more flow for a given amount of drawdown. Existing wells will need to be operated in a manner that minimizes sand production.

Wells 5 and 6 (and likely also wells 1, 2, 3, and 4) draw water from a sand and gravel aquifer zone present between approximately 150 and 200 feet below ground surface. Springs at the site likely discharge water from an overlying aquifer zone found in basalt, sand, and gravel above a depth of approximately 25 feet below ground surface. The degree of hydraulic connection between the wells and springs has not been determined, but is likely limited due to the presence of multiple clay layers between 25 and 150 feet below ground surface.

### **Well Discharge**

Three organizations (IDWR, Brockway Engineering, and SPF Water Engineering) have collected field measurements at the Hatchery; these measurements are summarized below.

**IDWR Field Exam Conducted On 6/21/1977** – It appears that this field exam included flow measurements in Wells 2, 3, and 4. The reported aggregate flow from these flowing artesian wells was 1,177 gpm (2.62 cfs). It is unclear if this aggregate flow included spring discharge (see Section 3), but given the relatively low flow rate it is likely that this measurement consisted only of well water.

**IDWR Field Exam Conducted on 9/02/1977** – Total flow from springs was reported as 11,956 gpm (26.64 cfs). It is not clear if this value included the flow from the three artesian wells on site.

**IDWR Field Exam Conducted on 9/27/1977** – Reported flow was 3,869 gpm (8.62 cfs) from three flowing artesian wells (Wells 2, 3, and 4). It is unclear if flow from the springs was included in this reported flow.

**IDWR Field Exam Conducted on 4/27/1998** – Total flow from springs and wells was 9,700 gpm (21.59 cfs) measured at the lower weir. Artesian flow through the hatchery building from Well 1 was 2,600 gpm (5.78 cfs).

**Brockway Engineering Measurements in 1989, 1990, and 1996** – The total combined spring and well flow was 2,823 gpm (6.29 cfs) on 6/7/89, 5,134 gpm (11.44 cfs) on 6/6/90, and 5,489 gpm (12.23 cfs) on 7/29/96 (Brockway Engineering, 1996). It is not known if valves were open on all of the artesian wells (the effect of partially open valves would be constrained discharge). Wells 5 and 6 were constructed after these flow measurements were taken.

**SPF Measurements in November 2010** – Artesian flow from the three wells that could be measured was 880 gpm (2.0 cfs) at Well 1, 600 gpm (1.3 cfs) at Well 5, and 1,670 gpm (3.7 cfs) at Well 6, for a total flow at the three measured wells of 3,150 gpm (7.02 cfs). These flows were measured while Wells 1, 4, 5, and 6 were flowing (Wells 2 and 3 were shut in). The total combined flow available from all six wells at the time of testing was not measured, but was estimated to have been approximately 4,900 gpm (11 cfs).

Water levels in the Eastern Snake Plain Aquifer have declined over the past 30 years, and artesian flow from individual wells has likely declined due to loss of artesian pressure.



### **3. SURFACE WATER FLOW AND GROUNDWATER LEVEL TRENDS**

---

#### **3.1. Surface Water Flow**

The hatchery site has one or more springs that flow into ponds and an unnamed stream. The spring flow intermingles with the artesian flow from the wells on site. Before wells were constructed on site, hatchery operations relied solely on the springs for water. The amount of flow the springs currently produce or has produced in the past is unknown. The total flow from the site, including flow from both the spring and wells, has been measured in the past (see section above detailing flow measurements).

#### **3.2. Groundwater Level Trends**

There are two groundwater-level trends evident in Crystal Springs Hatchery wells: a long-term, downward water-level trend and seasonal fluctuations (Figure 3). These patterns are similar to other ESPA areas.

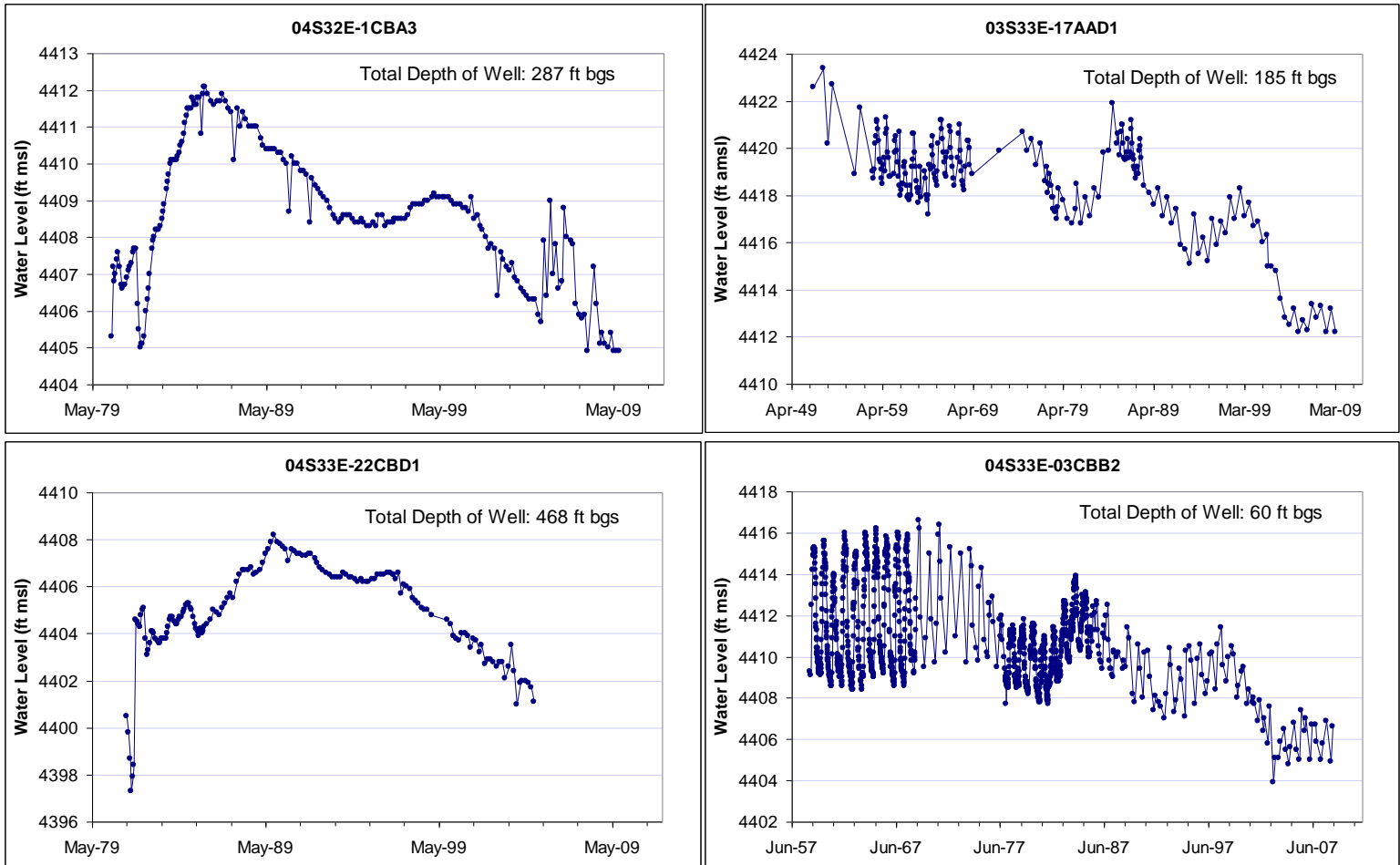
Regional groundwater declines have resulted from the combination of decreased incidental recharge as a result of improved irrigation efficiency, increases in groundwater pumping (mostly prior to the early 1990s), and the recent drought conditions. Prior to about 1885, recharge to the ESPA occurred from stream seepage, subsurface inflow from tributary basins, and infiltration from direct precipitation. Pre-development discharge appears to have been relatively constant. As the area was colonized in the late 19<sup>th</sup> century and early 20<sup>th</sup> century, recharge to and consequently discharge from the aquifer steadily increased, primarily as a result of incidental recharge from new gravity irrigation. During this time, irrigation water was withdrawn from streams, delivered in earthen canals, and applied directly to crops via flooding, furrows, or sub-irrigation. In the middle of the 20th century, irrigation technology improved, enabling farmers to increase irrigation with sprinkler systems. Although most conveyance still occurs in the earthen canals, conversion to sprinkler irrigation has led to a reduction in incidental recharge, as has been observed in other areas in the West. Increased irrigation efficiency, coupled with the advancement of pumping technology and subsequent use of ground water for irrigation, led to changes in the nature and extent of recharge to the ESPA, resulting in a long-term decline in groundwater levels beginning after about 1960. The decline is influenced by climatic conditions, with apparent stabilization during periods of above-average precipitation (and associated increased recharge) and declines during periods of below-average precipitation (and decreased recharge). This stair-step pattern of decline has continued to present day, although some areas are experiencing recent water-level stabilization.

Future water-level changes in the ESPA are difficult to predict due to changes in aquifer and surface-water management in the ESPA. New appropriations from the aquifer for non-domestic consumptive purposes have not been authorized since the early 1990s, yet declines are still apparent over the past decade. These declines may be related to multi-year drought conditions, continued improvements in irrigation efficiency, and/or lag times required to achieve water-level equilibrium in response to past pumping increases. There are arguments to suggest that long-term aquifer water-levels should stabilize in the ESRPA due to conjunctive management of surface and groundwater, along with managed aquifer recharge efforts. However, it is just as likely that water-levels will continue to decline into the

future in response to ever higher irrigation efficiencies and decreased total recharge. There is little likelihood that aquifer water levels will significantly increase in the future.

There is no obvious effect of the American Falls reservoir stage on groundwater trends in the area. The full pool elevation of the reservoir (USGS, 1984) is 4354 ft above mean sea level (msl). Hydraulic head in the aquifer supplying water to the site is about 50 feet higher than the elevation of the reservoir.

In the vicinity of the site, groundwater flows toward the American Falls Reservoir, which is a hydraulic low point in the area (USGS, 1984). Regional groundwater flows toward the west-southwest (Brockway, 1996).



**Figure 3. Hydrographs of Wells within a 6-Mile Radius of Crystal Springs Hatchery**



## 4. CRYSTAL SPRINGS HATCHERY WELL TESTING

---

### 4.1. 2010 Test Pumping

SPF and Riverside, Inc. (pumping contractor) test-pumped two wells during the week of November 1, 2010. Testing consisted of a step-rate pumping test to assess well productivity, well efficiency, and sand production. In addition, several short-term artesian-flow tests were conducted to assess well interference and aquifer properties.

A temporary, end-suction centrifugal test pump was installed in each tested well (i.e., Wells 5 and 6). The pump model was a DV200C (see cut sheet in Appendix B). The pump was capable of producing approximately 3,000 gpm at 25 feet of suction head.

Drawdown was measured using an electric-line well probe. The discharge rate was measured using a 16-inch x 10-inch circular orifice weir and manometer at Well 6 and a 12-inch x 10-inch circular orifice weir and manometer at Well 5. Sand content was measured using an Imhoff cone. Details of each test are provided below.

#### Well 5 Pumping Test (November 3, 2010)

Test-pumping at Well 5 consisted of a 1-hour constant-rate discharge test. The well would not sustain pumping rates beyond the idle throttle position (approximately 990 gpm or 2.2 cfs). The static water level in Well 5 prior to test pumping was 7.9 feet above ground surface (ags). Drawdown at the 990 gpm discharge rate was 31.90 feet; the pumping water level was 24.00 feet below ground surface. The specific capacity estimated for Well 5 at 990 gpm was 36.8 gpm/ft.

The discharge water from Well 5 contained 0.06% sand during the first 15 minutes of pumping at 990 gpm and decreased over time. Water samples collected during the last 15 minutes of pumping at 990 gpm indicated 100 ppm sand content (0.01%). The water was initially cloudy with a tan/brown color (from sand), but was visually clear by the end of the test.

During testing at Well 5, all other wells were shut in except for Well 4 (which had a broken valve). Prior to the test, Well 5 and the other wells were shut in overnight with only Well 4 flowing (because of the broken valve). The pressures in other wells before and during Well 5 pumping are shown in Table 2. Wells 3 and 6 experienced a pressure decline during the Well 5 pumping test. A pressure change in Well 2 could not be determined because of initial frozen conditions.

**Table 2 – Shut-in Pressures Prior to and During Well 5 Pump Testing**

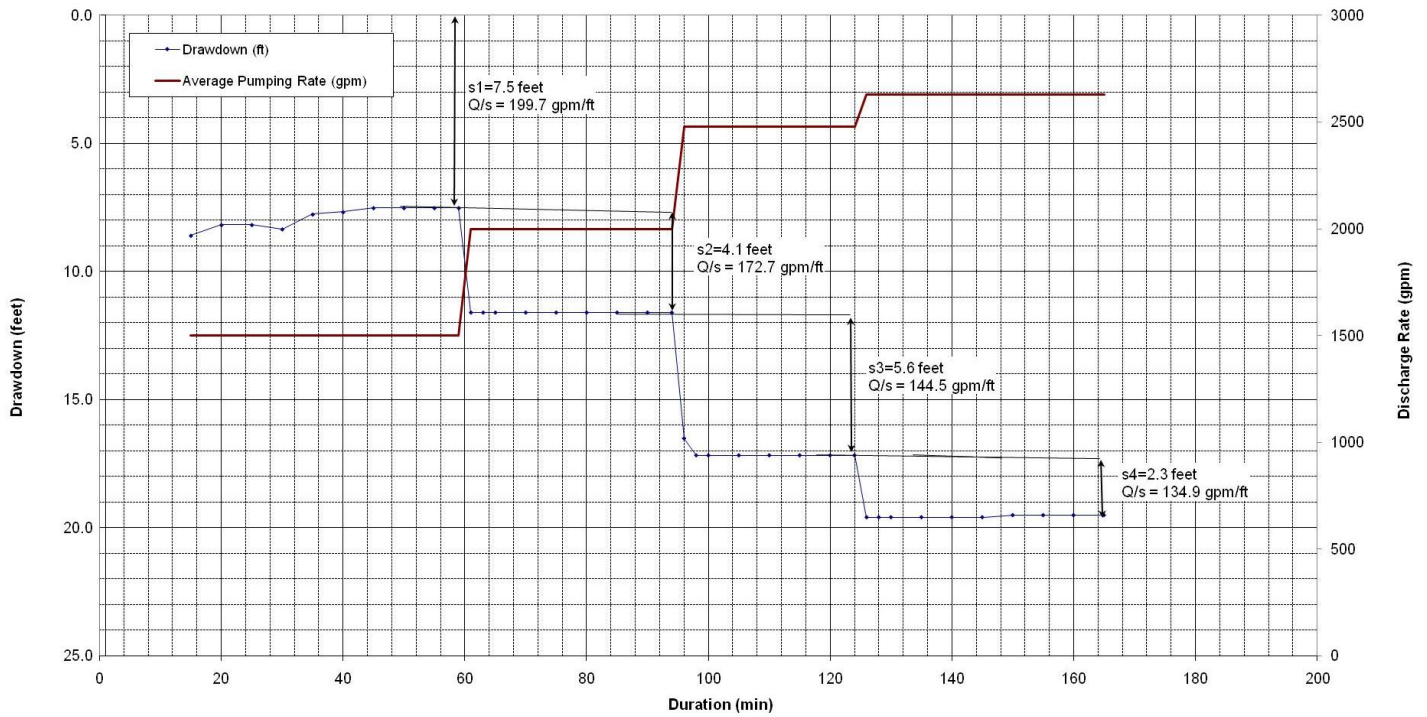
Well No.	Pressure prior to Well 5 pumping (08:30 AM, 11/03/2010)	Pressure after 15 minutes of pumping Well 5 at 990 gpm
1	7.2 psi (16.6 feet)	7.2 psi (16.6 feet)
2	Not measured (frozen)	7.4 psi (17.1 feet)
3	10.6 psi (24.5 feet)	9.4 psi (21.7 feet)
6	6.2 psi (14.3 feet)	5.5 psi (12.7 feet)

Well 4 has two discharge pipes. Water stopped flowing from one discharge pipe immediately upon the initiation of pumping in Well 5. The other discharge pipe stopped flowing after 4 minutes of pumping at Well 5. The water level in Well 4 was 0.43 feet ags after 20 minutes of pumping at Well 5. Well 4 was never shut in during field testing due to the broken valve, and therefore shut-in pressure at Well 4 is unknown. Thus, we conclude that Well 4 experienced a pressure decline as a result of pumping in Well 5, but the amount of pressure decline could not be adequately quantified.

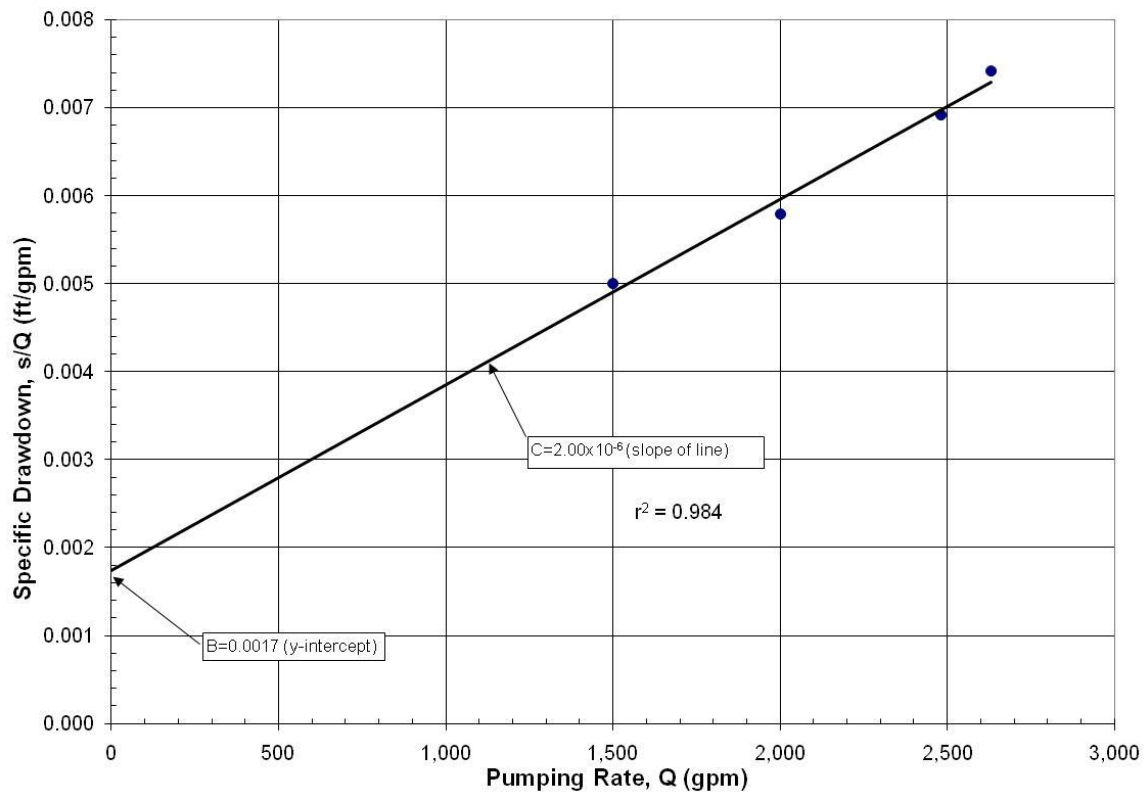
### **Well 6 (November 2, 2010)**

Test pumping at Well 6 consisted of a 2.5-hour, step-rate discharge test. During testing at Well 6, all other wells were shut in except for Well 4, which flowed (at a rate of approximately 400 gpm) throughout the Well 6 step-rate test. SPF measured water levels in the pumping well (Well 6) and shut-in pressure in the other wells on site except for Well 4, which could not be shut in.

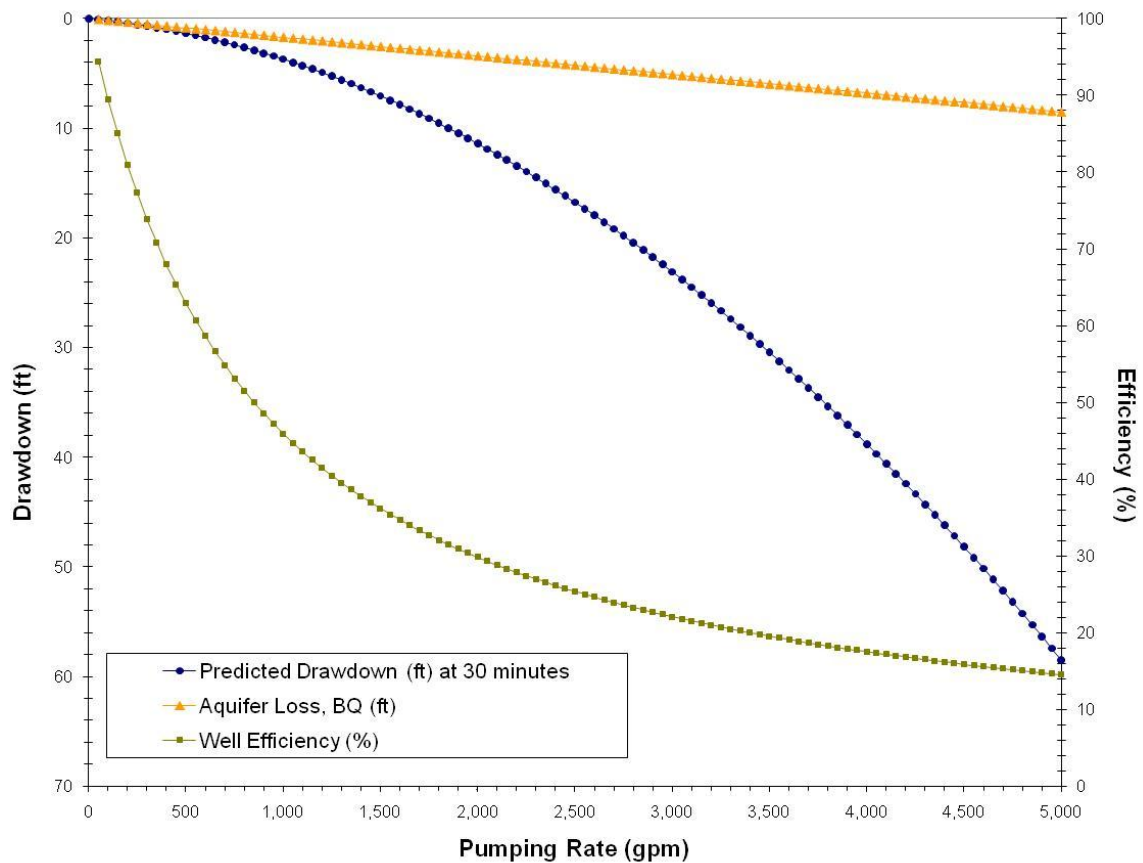
The discharge rate from Well 6 was sequentially increased over four different rates: 1,500 gpm for 50 minutes; 2,000 gpm for 35 minutes; 2,480 gpm for 30 minutes; and 2,630 gpm for 40 minutes. These rates represent average rates based on manometer readings taken throughout each step. The static water level in Well 6 prior to test pumping was 8.09 feet ags, measured upon arriving at the site when all wells had been flowing for an extended (unknown) period of time except for Well 6 (which had been shut in). Drawdown at the 2,630 gpm rate was 19.51 feet and the pumping water level was 11.42 feet below ground surface. The pumping rate and water level drawdown are illustrated in Figure 4. Specific drawdown versus discharge is provided in Figure 5. Well efficiency and predicted drawdown at various flow rates is provided in Figure 6. The specific capacity ranged from 200 gpm/ft at 1,500 gpm to 135 gpm/ft at 2,630 gpm.



**Figure 4. Well 6 Hydrograph, Step-Rate Discharge Test**



**Figure 5. Well 6 Specific Drawdown Versus Pumping Rate, Step-Rate Discharge Test**

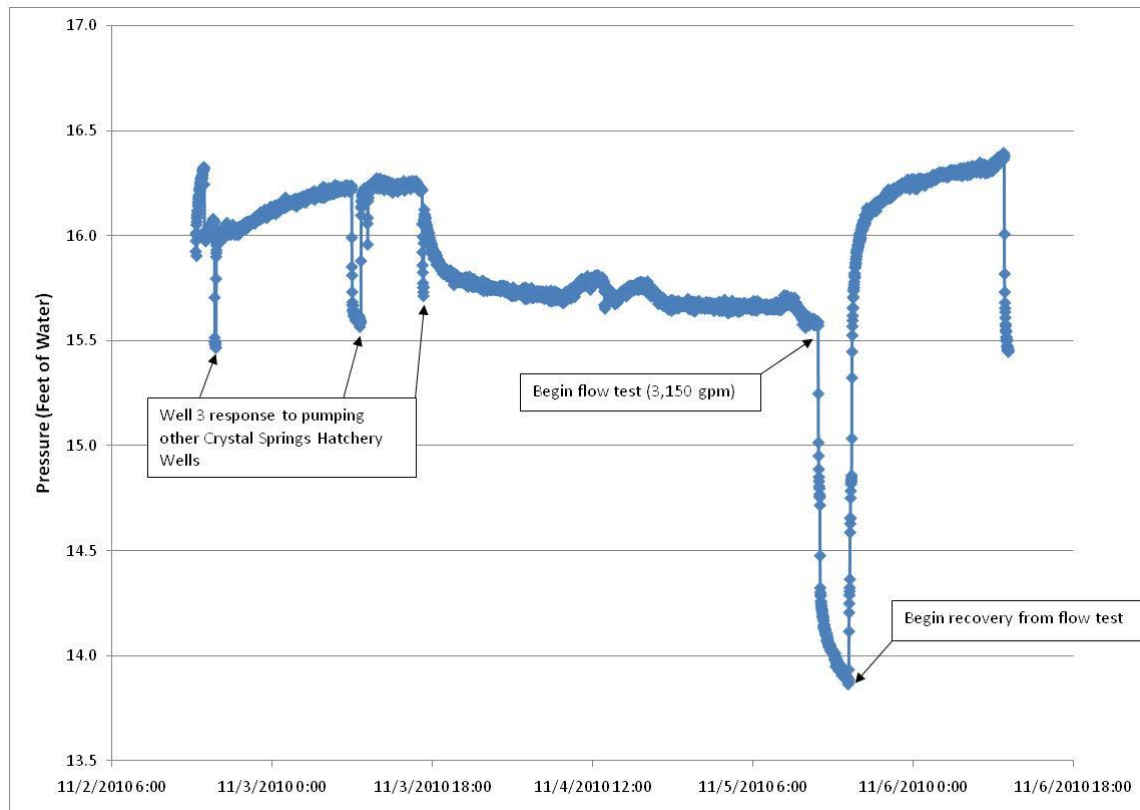


**Figure 6. Well 6 Predicted Drawdown, Aquifer Loss, and Efficiency Diagram**

Discharge water from Well 6 contained 0.15% sand during the first 15 minutes of Steps 1 and 2, which slowly decreased over the last 15 minutes of each pumping step down to 0.01% (100 ppm). The sand content increased to 0.21% during Steps 3 and 4, again slowly decreasing over the last 15 minutes of each step down to 0.05% (500 ppm). The water was visually cloudy with a (tan/brown color) with suspended sediment at the beginning of each pumping step, but the water appeared visually clear at the end of the last step.

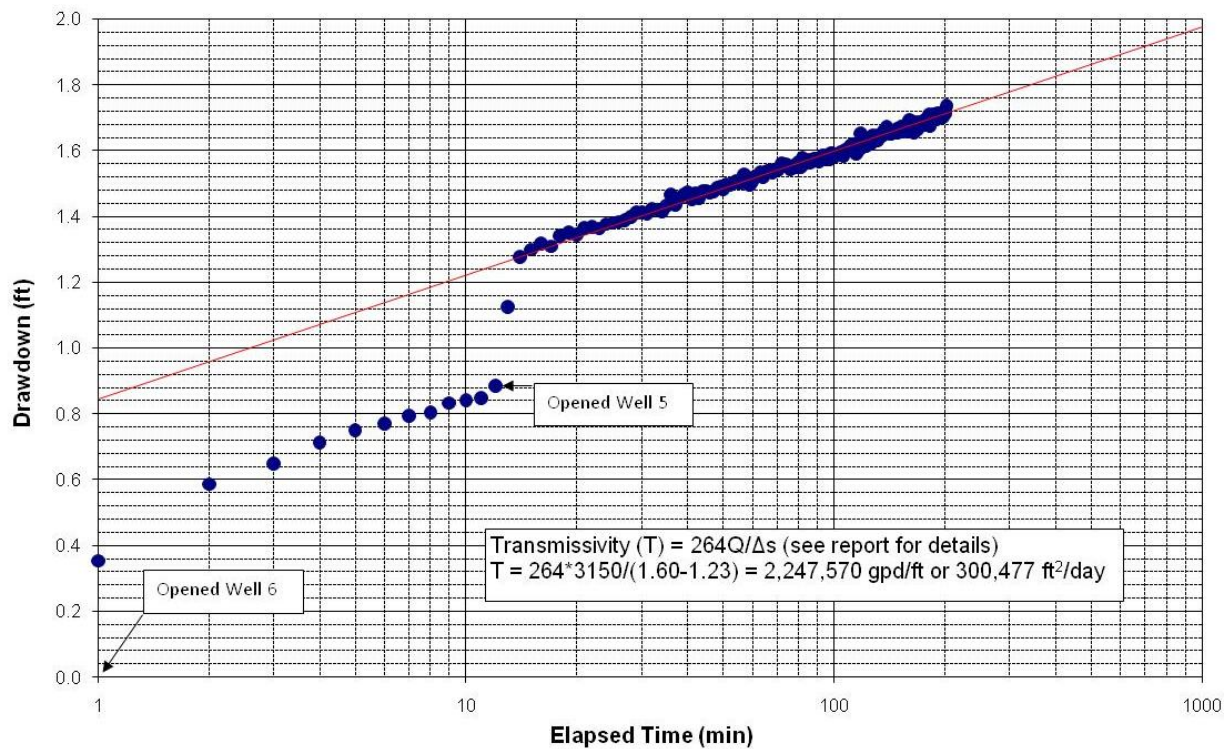
## 4.2. Artesian Flow Testing

In addition to the pumping tests described in Section 4.1, SPF collected artesian flow data for estimating aquifer properties. SPF installed a transducer in Well 3, which was shut in (not flowing). Figure 7 is a plot of pressure versus time in Well 3, showing the aquifer response to a variety of stresses.



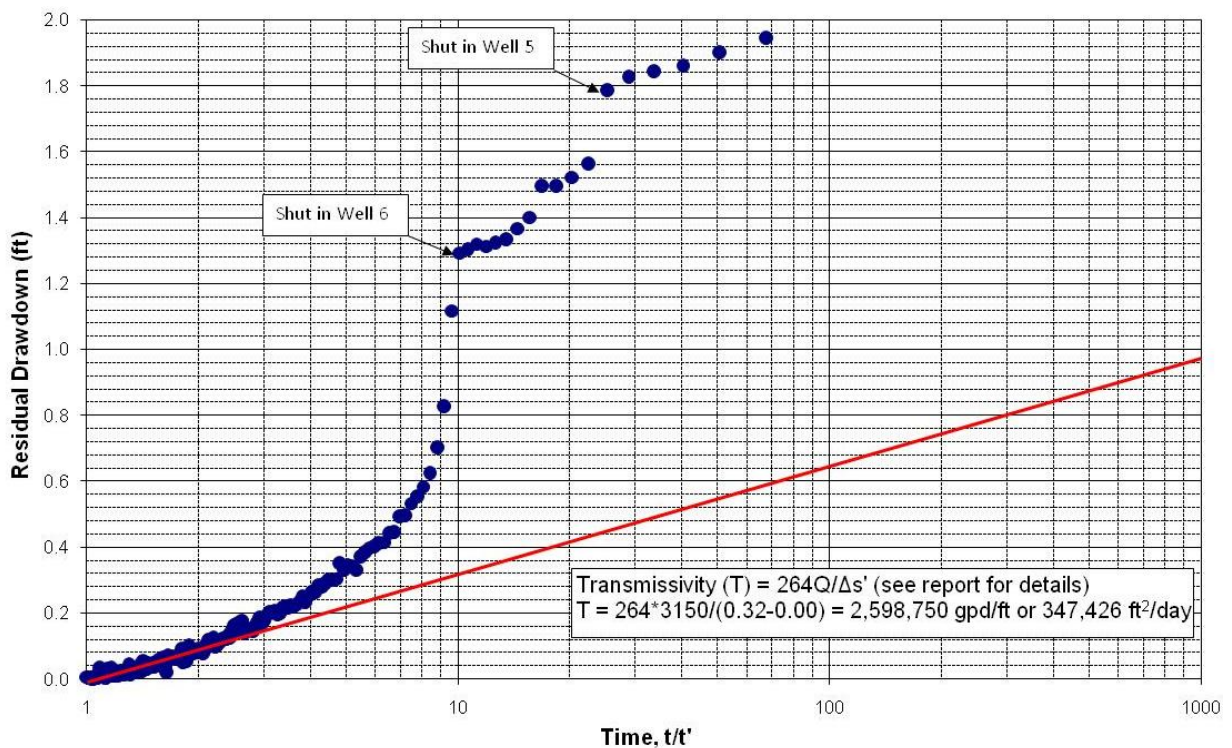
**Figure 7. Well 3 Hydrograph During Testing**

The largest response at Well 3 to aquifer stress occurred during an artesian flow test on November 5, 2010 where four wells were flowing (Wells 1, 4, 5, and 6) under artesian pressure. The total flow from the wells, excluding Well 4 (which was never shut in due to a broken valve) was 3,150 gpm. This aggregate flow consisted of the following flows at each well (values in parentheses are corresponding specific capacities of the wells in gpm/ft): Well 1 at 900 gpm (61), Well 5 at 600 gpm (125), and Well 6 at 1,650 gpm (142). The wells flowed at these rates for approximately three hours before being shut in. Figure 8 is a semi-log plot of drawdown in Well 3 versus time over the 3 hours of the flow test.



**Figure 8. Well 3 Cooper Jacob Evaluation**

Figure 9 is a graph of residual drawdown versus  $t/t'$  (where  $t$  = time since pumping started and  $t'$  = time since pumping stopped) for Well 3 during the recovery period after the 3-hour flow test.



**Figure 9. Well 3 Theis Recovery Evaluation**

Well 3 responded to several other aquifer stresses (Figure 7) as summarized below.

**Stress 1** – Riverside installed the test pump in Well 5 on 11/2/2010, turning the pump on for approximately 10 minutes at a flow of 900 gpm. This stress caused a 0.5-foot drop in the water level in Well 3, which was shut in at the time.

**Stress 2** – Riverside tested Well 5 on 11/3/2010 by pumping the well at approximately 900 gpm for one hour. This stress caused a 0.5-foot drop in the water level in Well 3, which was shut in at the time.

**Stress 3** – SPF opened Well 1 on 11/3/2010, letting it flow under artesian pressure (approximately 900 gpm) for approximately 36 hours. This stress caused a 0.5 foot drop in the water level in Well 3, which was shut in at the time.

### 4.3. Aquifer Parameters

Although the procedure utilized in the artesian flow testing of these wells was not designed for rigorous aquifer analysis, it provides adequate data for estimation of aquifer properties.

Transmissivity (T) can be calculated using the Cooper-Jacob method (Cooper and Jacob, 1946) for pumping drawdown data:

$$T = \frac{264Q}{\Delta s} \quad (4-1)$$

Where:

T = Transmissivity (gallons/day/ft [gpd/ft])

Q = Pumping Rate (gallons per minute [gpm])

$\Delta s$  = Water level drawdown (feet) per log cycle of time, t (min) since pumping started (from Figure 8).

The best-fit straight line shown on Figure 8 for the drawdown data from Well 3 results in a transmissivity of 2,248,000 gpd/ft (300,500 ft<sup>2</sup>/day), calculated using a pumping rate of 3,150 gpm and a drawdown of 0.37 feet/log cycle.

Transmissivity can also be calculated using the Theis recovery method (Theis, 1935) for residual drawdown data during recovery:

$$T = \frac{264Q}{\Delta s'} \quad (4-2)$$

Where:

T = Transmissivity (gallons/day/ft [gpd/ft])

Q = Pumping rate (gallons per minute [gpm])

$\Delta s'$  = Residual drawdown per log cycle of t/t' from Figure 9 (dimensionless)

Where:

t = time since pumping started



$t'$  = time since pumping stopped

The best fit straight line shown on Figure 9 for the drawdown data results in a transmissivity of 2,598,750 gpd/ft (347,426 ft<sup>2</sup>/day), calculated using an average pumping rate of 3,150 gpm and a residual drawdown of 0.32 ft/log cycle.

The transmissivity calculated using the Cooper-Jacob method and the Theis recovery method at the hatchery site are similar, with transmissivity on the order of 2,000,000 gpd/ft.

**Estimation of Aquifer Parameters from 2008 Springfield Hatchery Pumping Tests.** The Idaho Department of Fish and Game's Springfield Hatchery is located approximately 1 mile north of the Crystal Springs Hatchery. The Springfield Hatchery has wells completed in the same aquifer as the Crystals Springs Hatchery. Testing at the Springfield Hatchery in 2008 showed that a 3,000 gpm discharge increase from Well 8 (at the Springfield Hatchery) caused a nearly immediate decrease in flow of 400 gpm from Well 7 (approximately 350 feet away from Well 8). Given the specific capacity of Well 7 (approximately 200 gpm/ft), this flow decrease corresponds to a head decrease of 2 feet at Well 8. Using a Theis analysis, a rapid head change of this magnitude would correspond to a transmissivity of approximately 2,000,000 gpd/ft and a storativity of approximately 0.0001.

**Estimation of Aquifer Parameters from Springfield and Crystal Springs Hatchery Well Specific Capacities.** As noted on page 6 of a 2008 aquifer test report for the Springfield Hatchery, a common empirical equation for estimation of aquifer transmissivity (in gpd/ft) is to multiply specific capacity (gpm/ft) by a factor of 2000 (Driscoll, 1986). The 2008 report (Clearwater Geosciences, 2008) noted an average well specific capacity of 230 gpm/ft, corresponding to an estimated transmissivity of 460,000 gpd/ft based on this empirical method. Field testing at the Crystal Springs Hatchery suggests specific capacity of Wells 1 and 6 are on the order of 100 and 200 gpm/ft, respectively, corresponding to an aquifer transmissivity of 200,000 to 400,000 gpd/ft. The other Crystal Springs Hatchery wells have specific capacities that are less than 100 gpm/ft. In reality, these specific capacity values likely underestimate transmissivity, because the specific capacity includes well loss and neglects the impacts of partial penetration (that is, each well is not perforated throughout the entire aquifer thickness). Therefore, measured specific capacity values indicate that the aquifer transmissivity likely exceeds 500,000 gpd/ft.

Storativity for confined aquifers typically range from 0.001 to 0.0001, and a value of 0.0001 can be used for estimation purposes.

#### 4.4. Aquifer Monitoring

SPF contracted with Riverside to install permanent monitoring equipment at the Crystal Springs Hatchery. The equipment Riverside installed in November 2010 is summarized below.

**Well 1** – Upgrades at Well 1 include a 10-inch diameter discharge line, a 10-inch by 6-inch orifice weir, manometer port on the side of discharge line, and new pressure gage. Flow and shut-in pressure can now be measured at this well. An orifice chart for a 10-inch by 6-inch orifice is included in Appendix C.



**Well 2 and Well 3** – The existing pressure gages on these wells were not operational. Therefore, new pressure gages were added to these wells. Obtaining flow measurements from these wells is not currently possible, but shut-in pressure can be measured.

**Well 4** – No modifications were made to Well 4. Obtaining flow measurements from this well is not currently possible, and the well cannot be shut-in due to a broken valve.

**Well 5** – A 12-inch by 8-inch orifice weir was installed on the discharge line from this well and a manometer port was installed on the side of the discharge line, along with a new pressure gage. Flow and shut-in pressure can now be measured at this well. An orifice chart for a 12-inch by 8-inch orifice is included in Appendix C.

**Well 6** – A 16-inch by 10-inch orifice weir was installed on the discharge line from this well and a manometer port was installed on the side of the discharge line. Flow and shut-in pressure can now be measured at this well. An orifice chart for a 16-inch by 10-inch orifice is included in Appendix C.

Because the hydrogeologic testing and analysis at the Crystal Springs Hatchery indicates the wells will need to be pumped (as opposed to relying solely on artesian flow), there may not be significant value in monitoring head or natural artesian flow at the site over time. If collected, head and/or flow data could provide marginal benefit by documenting seasonal groundwater head patterns. This information would help reduce uncertainty embedded in pumping lift assumptions and provide insight into long-term regional water level trends. Collecting continuous head data (shut-in pressure) at the wells is easy to accomplish and is relatively inexpensive. Costs to do so include purchasing pressure transducers along with labor costs associated with installing the transducers and processing the collected data. The wells could be shut in during the non-irrigation season. During the irrigation season, it is assumed some of the wells might need to be open and flowing (to supply the irrigation pump and associated water rights at the downstream end of the hatchery site). Collecting continuous artesian flow data can be accomplished by equipping manometers on well with transducers. The transducer readings can be converted to flow rates for the applicable weirs.

## 5. CONSIDERATIONS FOR GROUNDWATER SUPPLY PLANNING

---

The hatchery's maximum groundwater demand (which occurs in April of every year) is 24.1 cfs. Minimum groundwater demand is 1.5 cfs and occurs in May. To meet maximum demand, the hatchery will need to install pumps in wells to provide reliable flow beyond that provided under natural (non-pumping) artesian conditions.

To assess the impacts of pumping a total combined flow rate of 24 cfs on aquifer water levels, SPF developed a simple analytical model of the Crystal Springs Hatchery well field to allow prediction of well water levels under various combinations of pumping wells and pumping rates. This model is based on non-equilibrium formula methods and provides a tool to approximate operational conditions at the hatchery related to groundwater production. The predictions we make using this tool are approximations that can be used to help drive design decisions (expected pump lifts, for example). The actual conditions encountered will be different than our predictions, and the difference is tied to variations in subsurface conditions that exist below the hatchery and regional groundwater trends (the tool does not take either into consideration). Because of this, we used the most conservative (but reasonable) aquifer transmissivity and storativity values to provide "worst case" results (that is, to predict the greatest drawdown expected within reasonable aquifer property value ranges).

Under current water-level conditions, the maximum flow under natural (artesian) conditions to the current ground surface elevation is approximately 11 cfs (4,900 gpm), much less flow than the maximum hatchery demand. Therefore, pumping will be needed to meet the hatchery demand. Not all of the existing hatchery wells are suitable for pumping due to excessive drawdown and small casing diameters. The best candidates for pumping are Wells 6, 1, and 5 (in order of suitability). Well 6 could be likely equipped with a pump capable of producing up to 3,500 gpm. Well 1 could be equipped with up to a 2,500 gpm pump. Well 5 could be equipped with up to a 1,500 gpm pump.

To provide the required 24.1 cfs maximum diversion rate, a minimum of two new wells (Wells 7 and 8) should be constructed (Figure 10). The 2 new wells are required because the existing wells are not capable of producing an aggregate discharge of 24.1 cfs. The new wells should be equipped with nominal 8 cfs (3,600 gpm) pumps. Existing Wells 1, 5, and 6 should be equipped with pumps sized to produce 4 cfs (1,800 gpm), 3 cfs (1,350 gpm), and 7 cfs (3,150 gpm), respectively. The remaining wells could be available for artesian flow or abandoned. Under normal operation, Wells 6, 7, and 8 would be pumped during peak use periods, with Wells 1 and 5 available for back-up sources in the case of a well or pump failure.

The new wells would be constructed for maximum efficiency and yield, with 20-inch diameter well casings, stainless steel well screens, and filter packs.

Water rights for the hatchery currently authorize one well in the SENE Section 25 (no existing wells), four wells in the SWNW Section 30 (existing wells 1, 2, 3, and 6) and two wells located in the NWSW Section 30 (existing wells 4 and 5). Well 7 should be constructed in the SENE Section 25, as far west from the existing wells as practical. Well 8 should be constructed in NWSW Section 30, as far south as practical within the site. Well 8 could be constructed as a replacement for existing Well 4.

Utilizing average transmissivity and storativity values of 500,000 gpd/ft and 0.0001 (see Section 4 for details), respectively, we projected drawdown in each hatchery well associated with producing a total of 24.1 cfs from wells 6, 7, and 8 (see Table 3 below). Pumping these wells will cause the other wells to stop flowing, and the water levels in the non-pumping wells will drop below ground surface to an average depth of 28 ft bgs after 180 days of continuous pumping (see Table 3 below).



**Figure 10. Proposed New Pumping Wells**

**Table 3 – Predicted Water Levels Under Continuous Pumping at 24 cfs**

		Predicted Water Levels (ft bgs)				
	Desired Flow Rate (gpm)	30 Days	60 Days	120 Days	180 Days	365 days
<b>Well 1</b>	0	7.0	8.1	9.3	9.9	11.1
<b>Well 2</b>	0	12.3	13.4	14.6	15.3	16.4
<b>Well 3</b>	0	20.2	21.9	23.6	24.6	26.4
<b>Well 4</b>	0	28.7	30.4	32.1	33.2	34.9
<b>Well 5</b>	0	28.9	30.6	32.3	33.3	35.0
<b>Well 6</b>	3,600	32.4	34.1	35.9	36.9	38.6
<b>New Well 7</b>	3,600	25.6	27.3	29.0	30.0	31.8
<b>New Well 8</b>	3,600	33.2	34.9	36.7	37.7	39.4
<b>Total</b>	10,800 (24.1 cfs)					

We also used the analytical model to predict aquifer water level decline associated with the anticipated hatchery operations schedule (shown below) rather than just the anticipated maximum groundwater production.

**Table 4 – Hatchery Water Demands**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(cfs)	17.1	21.3	21.3	24.1	1.5	2.3	3.4	8.8	8.8	13.0	13.0	17.1
(gpm)	7,685	9,550	9,550	10,800	661	1,044	1,543	3,945	3,945	5,815	5,815	7,685

Because the demand in May through September is less than the current natural flow of the wells (approximately 11 cfs), we ran the model starting in October and increased groundwater production over the year by pumping wells to reach a peak flow of 24.1 cfs in April (see table below for pumping rates from each well throughout the year). This analysis assumes all flow from the wells can be used without pumping (under gravity flow) during May through September (although pumping may be necessary to raise water to a sufficient elevation for degasification).

**Table 5 - Well Production from Pumps (gpm)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Well 1</b>	0	0	0	0	F	F	F	F	F	0	0	0
<b>Well 2</b>	0	0	0	0	F	F	F	F	F	0	0	0
<b>Well 3</b>	0	0	0	0	F	F	F	F	F	0	0	0
<b>Well 4</b>	0	0	0	0	F	F	F	F	F	0	0	0
<b>Well 5</b>	0	0	0	0	F	F	F	F	F	0	0	0
<b>Well 6</b>	2,565	3,185	3,185	3,600	F	F	F	F	F	1,940	1,940	2,565
<b>New Well 7</b>	2,565	3,185	3,185	3,600	F	F	F	F	F	1,940	1,940	2,565
<b>New Well 8</b>	2,565	3,185	3,185	3,600	F	F	F	F	F	1,940	1,940	2,565
<b>Total</b>	7,695	9,550	9,550	10,800	F	F	F	F	F	5,815	5,815	7,695

Note: F = well is flowing naturally under artesian pressure

Between May and October, we assume the pumping wells would shut down, and natural discharge (artesian flow) will provide enough water to meet hatchery demand. The analytical model allows us to calculate the water level in each well throughout the year (see Table 6), based on the pumping schedule shown in Table 5.

**Table 6 - Predicted Water Levels (ft bgs)**  
**(assumes pumping at rates shown in Table 5 and 2010 aquifer water levels)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Well 1</b>	0.9	4.5	4.5	7.0	F	F	F	F	F	F	F	0.9
<b>Well 2</b>	6.0	9.8	9.8	12.3	F	F	F	F	F	2.2	2.2	6.0
<b>Well 3</b>	10.0	16.1	16.1	20.2	F	F	F	F	F	3.9	3.9	10.0
<b>Well 4</b>	19.1	24.9	24.9	28.7	F	F	F	F	F	13.2	13.2	19.1
<b>Well 5</b>	19.2	25.0	25.0	28.9	F	F	F	F	F	13.3	13.3	19.2
<b>Well 6</b>	20.8	27.8	27.8	32.4	F	F	F	F	F	13.8	13.8	20.8
<b>New Well 7</b>	13.9	20.9	20.9	25.6	F	F	F	F	F	6.8	6.8	13.9
<b>New Well 8</b>	21.4	28.5	28.5	33.2	F	F	F	F	F	14.2	14.2	21.4

Note: F = well is flowing naturally under artesian pressure

A conservative assumption for the potential drop in aquifer water levels over time (the long-term trend discussed previously) should be made and added to the numbers in the table above for planning purposes. Based on the evaluation of regional water-level trends, we

recommend conservatively assuming aquifer water levels will drop an average of 15 feet over the next 20 years. In addition to planning for regional water-level trends, it may also be appropriate to plan for increased pumping by other users in the vicinity of the Crystal Springs Hatchery (for example, the Springfield Hatchery). Another 5 to 10 feet of additional water-level decline in the aquifer is an appropriate water-level decrease assumption, based on the evaluation of field data and conservative analytical model simulations. Under a 15- to 20-foot loss in aquifer water level, pumping will likely begin in mid-summer to meet projected operational demands. Maximum pumping levels in April (four wells operating at 24.1 cfs total) will increase to between 35 and 45 feet below ground surface. Pumping will need to begin in mid summer.

The analyses above are based on the assumption all available artesian flow from each well can be used without pumping. This assumption may not be valid, as the hatchery will likely need to have the water flow to an elevation above ground surface (to a degasification/aeration facility, for example). Because of this, we evaluated total shut-in pressure if all wells were to be shut in for 30 days. Assuming current water-level conditions (11 cfs of natural flow under artesian conditions), the aquifer water level would rise to an average height of approximately 24 feet above ground surface (assumes the flow from all 6 wells is the same and totals 11 cfs).

The minimum hatchery demand is 1.5 cfs in May. If all wells were shut in except for Well 6, Well 6 would flow 1.5 cfs (675 gpm) at a height of 4 feet above ground surface after 30 days of flow. In June, hatchery demand is 2.3 cfs (1,044 gpm), and Well 6 would flow at this rate at a height of 2 feet above ground surface. These predictions are based on conservative aquifer property values, as discussed in the first paragraph of this Section (Section 5). The hatchery demand increases to 3.4 cfs (1,543) cfs in July. Well 6 would flow very close to ground surface at this flow rate. Spreading the 3.4 cfs in July, and 8.8 cfs in August and September, among wells will result in higher overall water levels, so that that flow under natural artesian pressure to an aeration facility should be possible through the summer and into early fall, depending on the elevation at which this water is needed. In all other months, pumping (either from the wells or from a central lift station) is likely required to supply enough head for aeration and degasification.

## 6. WATER QUALITY

---

SPF collected water quality parameters from accessible wells on site (see summary table below). Field and laboratory results suggest water quality does not vary significantly across the Crystal Springs Hatchery well field. Water quality is good, with total nitrogen of less than 2 mg/L and no detectable metals. Specific conductance, pH, temperature, and dissolved oxygen average 552  $\mu\text{S}/\text{cm}$ , 7.0 s.u., 10.1  $^{\circ}\text{C}$ , and 6.1 mg/L, respectively.

**Table 7 – Crystal Springs Hatchery Wells Field Water Quality Parameter Data**

Date/Time	Well No.	Temp ( $^{\circ}\text{C}$ )	pH	EC	SC	DO	TGP	BP
11/4/2010; 10:45	1	9.9	6.90	399.6	560.9	5.9	655	655
11/4/2010; 13:20	2	10.5	6.85	416.7	571.8	6.0	648	653
11/2/2010; 16:05	3	10.2	6.91	409.8	574.1	6.3	650	659
11/2/2010; 16:15	4	10.2	6.92	385.7	537.1	6.2	654	659
11/2/2010; 16:20	5	10.1	6.92	373.1	521.7	6.3	655	654
11/2/2010; 13:30	6	9.9	7.61	388.1	545.4	5.9	657	659

EC = electrical conductivity ( $\mu\text{S}/\text{cm}$ ); SC = specific conductance ( $\mu\text{S}/\text{cm}$ ); DO = dissolved oxygen (mg/L); TGP = total gas pressure (mm Hg); BP = barometric pressure (mm Hg)

**Table 8 – Crystal Springs Hatchery Wells Laboratory Data**

<b>Analyte</b>	<b>Well 3</b>	<b>Well 6</b>
Aluminum	<0.10	<0.10
Arsenic	<0.003	<0.003
Cadmium	<0.0005	<0.0005
Chromium	0.003	0.002
Copper	<0.01	<0.01
Iron	<0.05	<0.05
Lead	<0.005	<0.005
Magnesium	20.1	20.4
Manganese	<0.05	<0.05
Mercury	<0.0002	<0.0002
Nickel	<0.02	<0.02
Potassium	4.2	4.4
Silver	<0.001	<0.001
Sodium	25.9	25.4
Sulfur	19	19
Zinc	<0.01	<0.01
Nitrate (as N)	1.6	1.7
Ammonia (as N)	<0.04	<0.04
Nitrate + Nitrite (as N)	1.92	1.73
Nitrite (as N)	<0.01	<0.01
Total Kjeldahl Nitrogen (TKN)	<0.10	<0.10
Total Nitrogen	1.64	1.73
Alkalinity (CaCO <sub>3</sub> )	175	185
Fluoride	0.49	0.50
Sulfide	<0.05	<0.05
Total Dissolved Solids (TDS)	322	366
Total Suspended Solids (TSS)	<3	<3

Note: All values in mg/L



## 6. DISCUSSION AND CONCLUSIONS

---

1. The Crystal Springs Hatchery seeks a peak monthly (April) flow rate of 24 cfs.
2. The existing wells will not produce the required peak month hatchery supply of 24 cfs, even if equipped with pumps. A minimum of two new wells will be required to achieve production of 24 cfs. The new wells would be designed to produce up to 4,000 gpm each, and would likely be constructed as follows:
  - 24-inch diameter casing installed and sealed to 40 feet bgs with neat cement.
  - Direct or reverse mud rotary drilled borehole to total depth (approximately 225 feet bgs).
  - 20-inch diameter mild steel casing to 120 feet bgs.
  - Bell reducer between the 20-inch diameter casing and 16-inch diameter stainless steel wire-wrap screen assembly (screen from approximately 150 to 225 feet bgs).
  - Filter pack in annular space surrounding screen.
  - Neat cement seal in annular space above filter pack to ground surface.
3. At a minimum, pumping from wells will be necessary to produce the required supply during the months of October through April. Operation of three pumping wells (Existing Well 6 and new Wells 7 and 8), with two stand-by wells (Wells 1 and 5), is recommended. Artesian flow (without pumping) may be adequate to supply hatchery requirements in other months. The ability to supply hatchery requirements without pumping will depend on (1) required flow rate, (2) the elevation of degasification facilities, (3) regional aquifer water levels, and (4) the wells selected for supply.
4. Maximum pumping water levels under existing aquifer conditions are estimated to range from 35 to 40 feet (three wells, 24.1 cfs total). Maximum pumping water levels under future aquifer conditions will likely be greater. For planning purposes, an assumption of a maximum aquifer water level decline of 15 to 20 feet (and corresponding increase in pumping lifts) after 20 years is appropriate.
5. Depending on degasification and aeration facility elevations, and head losses from wells to facilities, pumping (directly from wells or indirectly from a pump station at the degasification and aeration facilities) may be required from late summer through April.
6. Sand production must be mitigated at all existing wells. Operational mitigation should include flushing to waste upon pump start up for up to one hour. Sand traps should be provided to contain sand prior to entry into hatchery facilities. Future wells will be constructed with well screens and filter packs to eliminate or significantly reduce sand production.
7. Water quality appears to be consistent across the hatchery site. Average groundwater temperature (measured in all six hatchery wells) in November 2010 was 10.1 °C (50.2 °F). Specific conductance averaged 552 µS/cm. There were no detectable metals, and total nitrogen was less than 2 mg/L.

8. Long-term periodic head and flow monitoring at individual wells is now possible at the hatchery (because of the addition of pressure gauges, orifice weirs, and manometers), and would be relatively easy to implement. However, there would only be marginal benefit to collecting head or flow data now that we know with certainty the wells will need to be pumped to meet hatchery demand for most of the year.

## 7. REFERENCES

---

- Bierschenk, W. H. 1963. *Determining Well Efficiency by Multiple Step-Drawdown Tests*. Intern. Assoc. Sci. Hydrol. Publ. 64, pp. 493-507.
- Brockway Engineering, PLLC, 1996. Spring Discharge Patterns and Groundwater Analysis, Crystal Springs Area, Springfield, Idaho. September 10.
- Cooper, H. H. and C.E. Jacob 1946. *A Generalized Graphical Method for Evaluating Formation Constants and Summarizing Well Field History*. Am. Geophys. Union Trans. Vol. 27, pp. 526-534.
- Clearwater Geosciences, 2008. *Springfield Hatchery Wells Data Report Phase 1 Pumping Tests*, June 2008, Clearwater Geosciences, LLP, Idaho Falls, ID.
- Driscoll, F.G., 1986. *Groundwater and Wells*, Second Edition. Published by Johnson Screens, St. Paul, Minnesota.
- Hantush, M.S. 1964. *Hydraulics of Wells*. In: V.T. Chow (editor). *Advances in Hydrosience*, Vol. 1, pp. 281-432. Academic Press, New York and London.
- Jacob, C.E. 1947. *Drawdown Test to Determine the Effective Radius of Artesian Well*. Trans. Amer. Soc. Of Civil Engrs., Vol. 112, Paper 2321, pp. 1047-1064.
- Rorabaugh, M.J. 1953. Graphical and Theoretical Analysis of Step-Drawdown Test of Artesian Well. Proc. Amer. Soc. Civil Engrs., Vol. 79, separate no. 362, 23 pp.
- Theis, C.V. 1935. *The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage*. Trans. Amer. Geophys. Union, Vol. 16, pp. 519-524.

This page is intentionally blank.

**Appendix A**  
**Summary of Existing Wells at the Crystal Springs Hatchery**

---

This page is intentionally blank.

## Well 5 (D0004546)

- Completed in 1998
- 12", 0.250" wall mild steel casing to 180 feet bgs
- Perforated (0.25" by 3" mills knife) from 155 to 178 feet bgs
- 12" discharge and butterfly valve (valve leaks)
- At time of well completion:
  - 51 deg F water
  - 700 gpm flow



**"Corrected Copy"**  
IDAHO DEPARTMENT OF WATER RESOURCES  
**WELL DRILLER'S REPORT**

1. WELL TAG NO. D 0004546 4545 @ 180. 065384  
DRILLING PERMIT NO. 35-98-E-000000 0016-000  
Other IDWR No. 35-04271 1. BB 7/23/98

2. OWNER:  
Name North Fork Energy  
Address P.O. Box 5405  
City Riverson State ID Zip 83205

3. LOCATION OF WELL by legal description:  
Sketch map location must agree with written location.

☒ North ☐ or ☒ South  
☒ East ☐ or ☐ West  
 Sec. 30 1/4 NE 1/4 NE 1/4  
 Gov't Lot \_\_\_\_\_ County SW  
 Lat: \_\_\_\_\_ Long: \_\_\_\_\_  
 Address of Well Site 1800 W. 1050 S.  
 City Springfield  
 (Give at least name of road - Distance to Road or Landmark)  
 Lt. \_\_\_\_\_ Blk. \_\_\_\_\_ Sub. Name \_\_\_\_\_

4. USE:  
☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation  
☐ Thermal ☐ Injection ☐ Other Fish Propagation

5. TYPE OF WORK check all that apply (Replacement etc.)  
☒ New Well ☐ Modify ☐ Abandonment ☐ Other \_\_\_\_\_

6. DRILL METHOD  
☐ Air Rotary ☒ Cable ☐ Mud Rotary ☐ Other \_\_\_\_\_

7. SEALING PROCEDURES

SEAL/FILTER PACK		AMOUNT		METHOD
Material	From To	Sacks or Pounds		
<u>Neat Cement</u>	<u>0</u> <u>40</u>	<u>3yds.</u>	<u>20" Temp. Cas.</u>	
<u>Bentonite chip</u>	<u>10</u> <u>70</u>	<u>50 sacks</u>	<u>four between Annulus 12-16</u>	
<u>Neat Cement</u>	<u>0</u> <u>10</u>	<u>1/2 yds.</u>	<u>four between Annulus 12-16 casing</u>	

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 180  
 Was drive shoe seal tested? ☐ Y ☒ N How? \_\_\_\_\_

8. CASING/LINER:

Diameter	From To	Gauge	Material	Casing	Liner	Welded	Threaded
<u>16</u>	<u>0</u> <u>60</u>	<u>33</u>	<u>STEEL</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<u>12</u>	<u>+1</u> <u>180</u>	<u>"</u>	<u>"</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Length of Headpipe \_\_\_\_\_ Length of Tailpipe \_\_\_\_\_

9. PERFORATIONS/SCREENS  
 Perforations 150 Method Mills Knife  
 Screens \_\_\_\_\_ Screen Type \_\_\_\_\_

From To	Slot Size	Number	Diameter	Material	Casing	Liner
<u>155</u> <u>178</u>	<u>2.5</u>	<u>X</u>	<u>.5</u>		<input type="checkbox"/>	<input type="checkbox"/>

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:  
 \_\_\_\_\_ ft. below ground Artesian pressure \_\_\_\_\_ lb.  
 Depth flow encountered 155 ft. Describe access port or control devices: valve @ well head  
45 33E Sec. 30

11. WELL TESTS:  
☐ Pump ☐ Bailor ☐ Air ☒ Flowing Artesian  
 Yield gal/min \_\_\_\_\_ Drawdown \_\_\_\_\_ Pumping Level \_\_\_\_\_ Time \_\_\_\_\_  
 700  
 Water Temp. 51° Bottom hole temp. 51°  
 Water Quality test or comments: clear  
 Depth first Water Encounter 35'

12. LITHOLOGIC LOG: (Describe repairs or abandonment) Water

Bore Dia.	From To	Remarks: Lithology, Water Quality & Temperature	Y	N
<u>20</u>	<u>0</u> <u>14</u>	<u>Brown sticky clay</u>		<input checked="" type="checkbox"/>
<u>14</u>	<u>18</u>	<u>Grey sand + some gravel</u>		<input checked="" type="checkbox"/>
<u>18</u>	<u>35</u>	<u>Grey sand + clay lumps</u>		<input checked="" type="checkbox"/>
<u>35</u>	<u>40</u>	<u>Brown sand + small gravel</u>	<input checked="" type="checkbox"/>	
<u>16</u>	<u>40</u> <u>44</u>	<u>" " " "</u>	<input checked="" type="checkbox"/>	
<u>44</u>	<u>60</u>	<u>Brown silty clay + sand</u>	<input checked="" type="checkbox"/>	
<u>60</u>	<u>70</u>	<u>Brown sticky clay</u>		<input checked="" type="checkbox"/>
<u>12</u>	<u>70</u> <u>87</u>	<u>Brown sand</u>	<input checked="" type="checkbox"/>	
<u>87</u>	<u>105</u>	<u>Brown silty clay soil</u>		<input checked="" type="checkbox"/>
<u>105</u>	<u>138</u>	<u>Brown sand</u>	<input checked="" type="checkbox"/>	
<u>138</u>	<u>152</u>	<u>Brown clay</u>		<input checked="" type="checkbox"/>
<u>152</u>	<u>155</u>	<u>clay + gravel</u>		<input checked="" type="checkbox"/>
<u>155</u>	<u>180</u>	<u>sand + gravel</u>	<input checked="" type="checkbox"/>	

**RECEIVED**  
JUN 24 1998  
Department of Water Resources  
Eastern Region

**RECEIVED**  
JUL 30 1998  
Department of Water Resources

Completed \_\_\_\_\_ Depth 180' (Measurable)  
 Date: Started 3-12-98 Completed 5-18-98

13. DRILLER'S CERTIFICATION  
 I/We certify that all minimum well construction standards were complied with at the time the rig was removed.  
 Company Name North Fork Energy Firm No. 595  
 Firm Official C.P. Reynolds Date 6-1-98  
 and \_\_\_\_\_  
 Driller or Operator Bea Thibault Date 6-1-98  
 (Sign once if Firm Official & Operator)

## Well 6 (D0004359)

- Completed in 1997
- 16", 0.25" wall mild steel casing to 193 feet bgs
- Perforated (0.25" by 3" mills knife) from 165 to 190 feet bgs
- 16" flange and butterfly valve
- At time of well completion:
  - 8 psi reported shut-in pressure
  - 51 deg F water
  - 1,800 gpm flow



W Form 238-7  
3-85

IDAHO DEPARTMENT OF WATER RESOURCES  
**WELL DRILLER'S REPORT**  
Use Typewriter or Ballpoint Pen 060787

Office Use Only  
Inspected by \_\_\_\_\_  
Twp \_\_\_\_\_ Rge \_\_\_\_\_ Sec \_\_\_\_\_  
1/4 \_\_\_\_\_ 1/4 \_\_\_\_\_ 1/4 \_\_\_\_\_  
Lat: \_\_\_\_\_ Long: \_\_\_\_\_  
☐ Air ☒ Flowing Artesian

1. DRILLING PERMIT NO. 3597 E-0117  
Other IDWR No. D 4359

2. OWNER:  
Name NORTH FORK ENERGY  
Address P.O. Box 5405  
City Boise State ID Zip 83705

3. LOCATION OF WELL by legal description:  
Sketch map location must agree with written location.  

Twp. <u>4</u>	North <input type="checkbox"/> or South <input checked="" type="checkbox"/>
Rge. <u>33</u>	East <input checked="" type="checkbox"/> or West <input type="checkbox"/>
Sec. <u>30</u>	1/4 <u>SW</u> 1/4 <u>NW</u>
Gov't Lot _____	County <u>Bingham</u>
Lat: _____	Long: _____

 Address of Well Site \_\_\_\_\_ City Springfield  
 (Give at least name of road - Distance to Road or Landmark)  
 Lt. \_\_\_\_\_ Blk. \_\_\_\_\_ Sub. Name \_\_\_\_\_

4. USE:  
☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation  
☐ Thermal ☐ Injection ☒ Other Fish Propagation

5. TYPE OF WORK check all that apply (Replacement etc.)  
☒ New Well ☐ Modify ☐ Abandonment ☐ Other \_\_\_\_\_

6. DRILL METHOD  
☐ Air Rotary ☒ Cable ☐ Mud Rotary ☐ Other \_\_\_\_\_

7. SEALING PROCEDURES

SEAL/FILTER PACK		AMOUNT		METHOD
Material	From To	Sacks or Pounds		
<u>Neat Cement</u>	<u>0</u> <u>40</u>	<u>5 yds</u>	<u>Pressure Grout</u>	
<u>Neat Cement</u>	<u>0</u> <u>30</u>	<u>3 yds</u>	<u>Pressure Grout</u>	

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 193'  
 Was drive shoe seal tested? ☐ Y ☒ N How? \_\_\_\_\_

8. CASING/LINER:

Diameter	From To	Gauge	Material	Casing	Liner	Welded	Threaded
<u>20</u>	<u>+1</u> <u>48</u>	<u>250</u>	<u>steel</u>	<input checked="" type="checkbox"/> X	<input type="checkbox"/>	<input checked="" type="checkbox"/> X	<input type="checkbox"/>
<u>16</u>	<u>+1.5</u> <u>193</u>	<u>250</u>	<u>steel</u>	<input checked="" type="checkbox"/> X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Length of Headpipe \_\_\_\_\_ Length of Tailpipe 11-7-97

9. PERFORATIONS/SCREENS  
☒ Perforations Method Mills Knife  
☐ Screens Screen Type \_\_\_\_\_

From To	Slot Size	Number	Diameter	Material	Casing	Liner
<u>165</u> <u>190</u>	<u>3x.5</u>	<u>150</u>		<u>steel</u>	<input checked="" type="checkbox"/> X	<input type="checkbox"/>

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:  
 \_\_\_\_\_ ft. below ground Artesian pressure 8 lb.  
 Depth flow encountered 162 ft. Describe access port or control devices: valve @ well head

11. WELL TESTS:  
☐ Pump ☐ Bailor  
 Yield gal/min. \_\_\_\_\_ Drawdown \_\_\_\_\_ Pumping Level \_\_\_\_\_ Time \_\_\_\_\_  
4 CES

Water Temp. 51 Bottom hole temp. 51  
 Water Quality test or comments: Clean  
 Depth first Water Encountered 40'

12. LITHOLOGIC LOG: (Describe repairs or abandonment) Water

Bore Dia.	From To	Remarks: Lithology, Water Quality & Temperature	Y	N
<u>24</u>	<u>0</u> <u>1</u>	<u>Topsoil</u>		<input checked="" type="checkbox"/> X
<u>1</u>	<u>4</u>	<u>Gravel &amp; Clay</u>		<input checked="" type="checkbox"/> X
<u>4</u>	<u>6</u>	<u>Basalt</u>		<input checked="" type="checkbox"/> X
<u>6</u>	<u>22</u>	<u>Basalt</u>		<input checked="" type="checkbox"/> X
<u>22</u>	<u>35</u>	<u>Dark Brown clay &amp; sand</u>		<input checked="" type="checkbox"/> X
<u>35</u>	<u>40</u>	<u>Light Brown clay</u>		<input checked="" type="checkbox"/> X
<u>40</u>	<u>64</u>	<u>Small Gravel &amp; sand</u>		<input checked="" type="checkbox"/> X
<u>64</u>	<u>84</u>	<u>Brown clay sticky</u>		<input checked="" type="checkbox"/> X
<u>84</u>	<u>112</u>	<u>Soft Brown clay</u>		<input checked="" type="checkbox"/> X
<u>112</u>	<u>148</u>	<u>Sand</u>		<input checked="" type="checkbox"/> X
<u>148</u>	<u>162</u>	<u>Brown clay</u>		<input checked="" type="checkbox"/> X
<u>162</u>	<u>200</u>	<u>Gravel &amp; Sand</u>		<input checked="" type="checkbox"/> X

RECEIVED  
 MAR 23 1998  
 Department of Water Resources  
 Eastern Region

RECEIVED  
 MAR 30 1998  
 Department of Water Resources

Completed Depth 193'  
 Date Started 11-7-97 Completed \_\_\_\_\_ (Measurable)  
 Date \_\_\_\_\_

13. DRILLER'S CERTIFICATION  
 I/We certify that all minimum well construction standards were complied with at the time the rig was removed.  
 Firm Name NORTH FORK ENERGY Firm No. 595  
 Firm Official \_\_\_\_\_ Date 3-13-98  
 and \_\_\_\_\_  
 Supervisor or Operator Boyle Date 3-13-98  
 (Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES





This page is intentionally blank.

## Model DV-200c

### Standard Features

- Hot Dip Galvanized Trailers and Skids
  - Radiator Enclosure
  - Battery Box
  - Wheels
- Zinc Plated Jacks
- Emissions Certified Engines
  - Perkins and John Deere
- DOT LED lights
- Electric Brakes with Safety breakaway
- Locking Battery Box

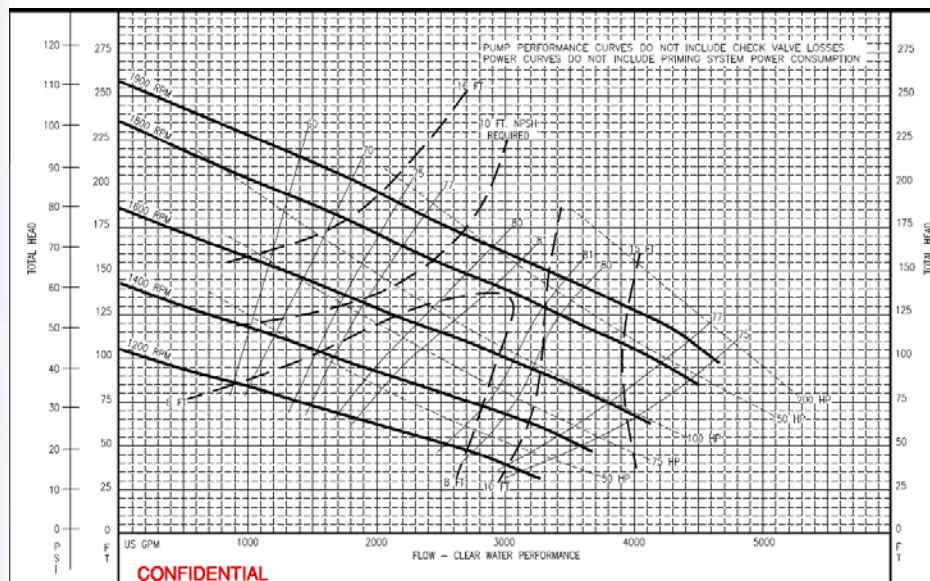
### Pump Features

- Solids-handling capabilities to 3.375" diameter maximum
- Continuous self-priming
- Runs dry unattended
- Suction lift up to 28 ft.
- Skid- or trailer-mounted
- Auto-start-capable control panel



### Technical

- SAE-mounted
- 12 volt, electric start with control panel
- Skid- or trailer-mounted with optional lifting bale
- 24-hour minimum capacity fuel tank
- Compressor/Venturi automatic priming system
- Electric drive option available
- Sound attenuated option available
- **Material Specifications**
  - Standard Build – ASTM A48 CLASS 30 Gray Iron volute Enclosed 2 vane non-clog impeller and replaceable wear rings
  - Pump Shaft  
LaSalle 1144 stress proof steel
  - Mechanical Seal  
Tungsten carbide vs. silicon carbide mating faces  
Oil-bath lubrication for dry running
  - Suction / discharge flanges ANSI 150# FF



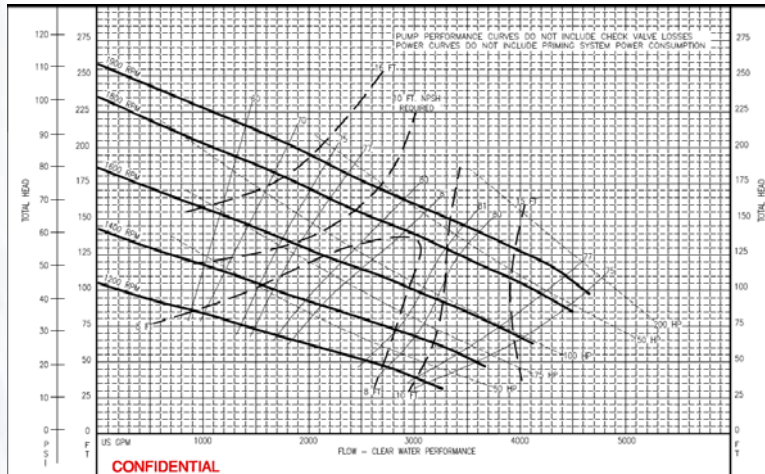
**Rain for Rent**  
 P.O. Box 2248  
 Bakersfield CA 93303  
 800-742-7246  
 661-393-1542  
 FAX 661-393-1542  
[www.rainforrent.com](http://www.rainforrent.com)  
[info@rainforrent.com](mailto:info@rainforrent.com)

Rain for Rent is a registered trademark of Western Oilfields Supply Company. Features and Specifications are subject to change without notice.



## DV-200c Technical Specifications

### Production Curve



### Performance Specs

#### 2 VANE NON-CLOG IMPELLER

Minimum Operating Speed: 1400 RPM

Maximum Operating Speed: 1900 RPM

Maximum Head: 260 FT

Maximum Flow: 4600 GPM

Fuel Consumption:

Perkins 1106D-E60TA

(4000 GPM @ 125' TDH) 8.5 GPH @ 1900 RPM

### Design Details

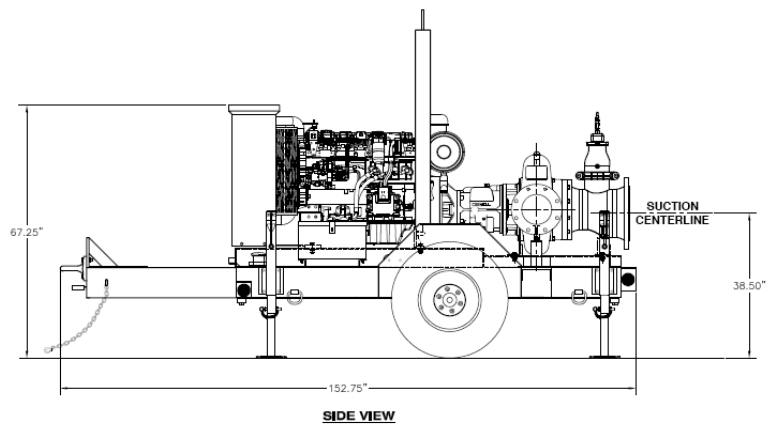
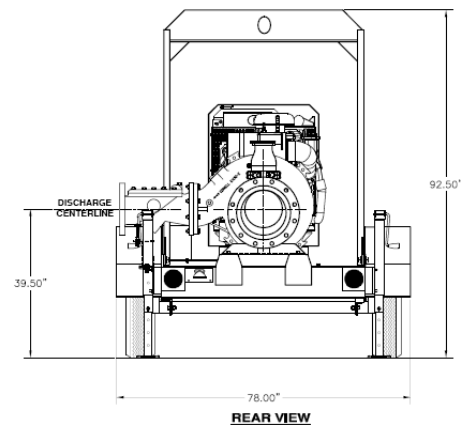
**Pump Designation:** DV-200C

**Pump Description:** Centrifugal end suction pump, single stage, volute type, 2 vane non-clog impeller

**Solid Handling Size:** Up to 3.375 inches (45mm)

**Operating Temperature:** MIN: -4°F (-20°C) - MAX: +212°F (+100°C)

### Dimensions



**Rain for Rent**

P.O. Box 2248  
Bakersfield CA 93303  
800-742-7246  
661-399-9124  
FAX 661-393-1542  
www.rainforrent.com  
info@rainforrent.com

Rain for Rent is a registered trademark of Western Oilfields Supply Company. Features and Specifications are subject to change without notice.

## **Appendix C**

### **Orifice Charts**

This page is intentionally blank.

Head of water in	4-in Pipe		6-in Pipe		8-in Pipe		10-in Pipe		12-in Pipe		16-in Pipe			
	2½-in orifice gpm	3-in orifice gpm	3-in orifice gpm	4-in orifice gpm	4-in orifice gpm	5-in orifice gpm	6-in orifice gpm	6-in orifice gpm	7-in orifice gpm	8-in orifice gpm	8-in orifice gpm	10-in orifice gpm	12-in orifice gpm	
5	55	89	76	145	131	220	355	310	460	300	580	530	880	1,420
6	60	97	82	158	144	240	390	340	500	325	640	580	960	1,560
7	65	105	88	171	156	260	420	370	540	350	690	620	1,040	1,680
8	69	112	94	182	166	275	450	395	580	375	730	670	1,110	1,800
9	73	119	100	193	176	295	475	420	610	400	780	710	1,180	1,910
10	77	126	106	204	186	310	500	440	640	420	820	750	1,240	2,010
12	85	138	115	223	205	340	550	480	700	460	900	820	1,360	2,200
14	92	149	125	241	220	365	595	520	760	500	970	880	1,470	2,380
16	98	159	132	258	235	390	635	555	810	530	1,040	940	1,570	2,540
18	104	168	140	273	250	415	675	590	860	560	1,100	1,000	1,670	2,690
20	110	178	150	288	265	440	710	620	910	590	1,160	1,050	1,760	2,840
22	115	186	158	302	275	460	745	650	950	620	1,220	1,110	1,840	2,980
25	122	198	168	322	295	490	795	690	1,020	660	1,300	1,180	1,960	3,180
30	134	217	182	353	325	540	870	760	1,120	730	1,420	1,290	2,150	3,480
35	145	235	198	380	355	580	940	820	1,210	790	1,530	1,400	2,320	3,760
40	155	251	210	405	370	620	1,000	880	1,290	840	1,640	1,490	2,480	4,020
45	164	267	223	430	395	660	1,060	930	1,370	890	1,740	1,580	2,630	4,260
50	173	280	235	455	415	690	1,120	980	1,440	940	1,830	1,670	2,780	4,490
60	190	310	260	500	455	760	1,230	1,080	1,580	1,030	2,010	1,830	3,040	4,920
70	205	350	280	525	490	810	1,280	1,140	1,710	1,110	2,170	1,970	3,280	5,310

This page is intentionally blank.



## **Appendix F**

---

*Memorandum of Agreement between  
Shoshone-Bannock Tribes, BPA, Corps of  
Engineers and Bureau of Reclamation*

This page is intentionally blank.

**2008 Columbia Basin Fish Accords  
Memorandum of Agreement between the  
Shoshone-Bannock Tribes and FCRPS Action Agencies**

This page is intentionally blank.

SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT  
November 7, 2008

**TABLE OF CONTENTS**

<b>Section</b>	<b>Page</b>
I. INTRODUCTION .....	1
II. HYDRO COMMITMENTS .....	2
A. Hydro Performance .....	2
A.1. Performance Standards, Targets, and Metrics: .....	2
A.2. Performance and Adaptive Management: .....	2
A.3. Research, Monitoring, and Evaluation: .....	2
B. Emergency Operations for Unlisted Fish .....	3
III. HABITAT AND HATCHERY COMMITMENTS .....	3
A. BPA Funding for Habitat and other Non-Hatchery Actions .....	3
A.1 General Principles: .....	3
A.2. Types of Projects: .....	3
A.3. Expense Projects: .....	4
A.4. Non-Hatchery (Wildlife) Capital Projects: .....	4
B. Funding for Hatchery Actions .....	4
B.1. General Principles: .....	4
B.2. Expense and Capital Hatchery Actions: .....	5
B.3. Implementation Sequence: .....	5
C. General Provisions For All Projects .....	6
D. Northwest Power and Conservation Council and ISRP Review .....	6
D.1. General principles: .....	6
D.2. ISRP review of projects implemented pursuant to this Agreement: .....	7
E. Replacement Projects and Adaptive Management .....	8
E.1. General Principles: .....	8
E.2. Replacement Projects: .....	8
E.3. Adaptive Management: .....	8
F. Inflation, Ramp Up, Planning v. Actuals, Carry-over .....	8
F.1. Inflation: .....	8
F.2. Treatment of Ramp-up of new/expanded work: .....	9
F.3. Assumptions regarding Planning versus Actuals: .....	9
F.4. Unspent funds, and pre-scheduling/rescheduling: .....	9
IV. FORBEARANCE, WITHDRAWAL, AND DISPUTE RESOLUTION .....	10
A. Forbearance .....	10
B. Affirmation of Adequacy .....	11
C. Council Program Amendment Process .....	12
D. Good Faith Implementation and Support .....	13
E. Changed Circumstances, Renegotiation/Modification, Withdrawal .....	14
F. Dispute Resolution .....	16
F.1. Negotiation .....	16
F.2. Mediation .....	17
G. Modification .....	17

SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

V.	MISCELLANEOUS PROVISIONS.....	17
A.	Term of Agreement.....	17
B.	Applicable Law .....	17
C.	Authority .....	17
D.	Consistency with Trust and Treaty Rights.....	17
E.	Effective Date & Counterparts.....	18
F.	Binding Effect.....	18
I.	Waiver, Force Majuere, Availability of Funds .....	18
J.	Notice.....	19
K.	List of Attachments.....	20

# SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

## **MEMORANDUM OF AGREEMENT AMONG THE SHOSHONE-BANNOCK TRIBES, BONNEVILLE POWER ADMINISTRATION, U.S. ARMY CORPS OF ENGINEERS, AND U.S. BUREAU OF RECLAMATION**

### **I. INTRODUCTION**

The Bonneville Power Administration (BPA), the U.S. Army Corps of Engineers (Corps) and the U.S. Bureau of Reclamation (Reclamation)( the “Action Agencies”) and the Shoshone-Bannock Tribes of Fort Hall (“the Tribes”) (collectively “the Parties”) developed this Memorandum of Agreement (“Agreement” or “MOA”) through good faith negotiations. This Agreement addresses direct and indirect effects of construction, inundation, operation and maintenance of the Federal Columbia River Power System<sup>1</sup> and Reclamation’s Upper Snake River Projects,<sup>2</sup> on the fish and wildlife resources of the Columbia River Basin. The Action Agencies and the Tribes intend that this Agreement provide benefits to all the Parties. Reasons for this Agreement include the following:

- To resolve issues between the Parties regarding the Action Agencies’ compliance with the Endangered Species Act (“ESA”) regarding these FCRPS and Upper Snake Projects;
- To resolve issues between the Parties regarding compliance with the Pacific Northwest Electric Power Planning and Conservation Act (“NWPA”) and the Clean Water Act (“CWA”);
- To address the Parties’ mutual concerns for certainty and stability in the funding and implementation of projects for the benefit of fish and wildlife affected by the FCRPS and Upper Snake Projects, affirming and adding to the actions proposed in the draft FCRPS and Upper Snake Biological Opinions; and
- To foster a cooperative and partnership-like relationship in implementation of the mutual commitments in this Agreement.

---

<sup>1</sup> For purposes of this Agreement, the FCRPS comprises 14 Federal multipurpose hydropower projects. The 12 projects operated and maintained by the Corps are: Bonneville, the Dalles, John Day, McNary, Chief Joseph, Albeni Falls, Libby, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, and Dworshak dams. Reclamation operates and maintains the following FCRPS projects: Hungry Horse Project and Columbia Basin Project, which includes Grand Coulee Dam.

<sup>2</sup> The Upper Snake River Projects (Upper Snake) are Minidoka, Palisades, Michaud Flats, Ririe, Little Wood River, Boise, Lucky Peak, Mann Creek, Owyhee, Vale, Burnt River and Baker.

## II. HYDRO COMMITMENTS

### **A. Hydro Performance**

#### **A.1. Performance Standards, Targets, and Metrics:**

The Tribes concur in the use of the hydro performance standards, targets, and metrics as described in the Main Report, Section 2.1.2.2 of the Action Agencies' August 2007 Biological Assessment (pages 2-3 through 2-6) and the FCRPS BiOp at RPA No. 51 (pages 70-74 of 98). Provided that, the Tribes and their representatives may recommend to the Action Agencies actions that may exceed performance standards, which will be considered and may be implemented at the discretion of the Action Agencies.

#### **A.2. Performance and Adaptive Management:**

The Parties agree the BiOps will employ an adaptive management approach, including reporting and diagnosis, as described in Section 2.1 of the Biological Assessment. The Parties agree if biological or project performance expectations as described above are not being met over time as anticipated, diagnosis will be done to identify causes, and remedies will be developed to meet the established performance standard. The performance standard for species or the federal projects will not be lowered during the terms of the BiOps (although as provided in the BA, tradeoffs among Snake River and lower river dams are allowed). In addition, the Parties agree the current delay and SPE metrics described in Attachment A will not be lowered unless they impede survival.

The Parties recognize new biological information will be available during the term of the MOA that will inform the methods and assumptions used to analyze the effects of hydro operations on fish species covered by this Agreement. The Parties will work together to seek agreement on methods and assumptions for such analyses, building on analyses performed in development of the FCRPS Biological Opinion as warranted.

As described in the FCRPS BiOp, a comprehensive review will be completed in June, 2013 and June, 2016 that includes a review of the state of implementation of all actions planned or anticipated in the FCRPS and Upper Snake BiOps and a review of the status and performance of each ESU addressed by those BiOps. The Parties agree that they will discuss the development, analyses and recommendations related to these comprehensive evaluations and, in the event performance is not on track, to discuss options for corrective action.

#### **A.3. Research, Monitoring, and Evaluation:**

Maintaining and improving research, monitoring, and evaluation programs is critical to informed decision making on population status assessments and improving management action effectiveness. The Action Agencies will implement status and effectiveness research, monitoring and evaluation sufficient to robustly track survival improvements and facilitate rebuilding actions accomplished, through projects and programs identified in the FCRPS BiOp



## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

and Attachment A. The Parties further agree the Action Agency effort should be coordinated with implementation partners including other fishery managers.

### **B. Emergency Operations for Unlisted Fish**

The Action Agencies agree to take reasonable actions to aid non-listed fish during brief periods of time due to unexpected equipment failures or other conditions and when significant detrimental biological effects are demonstrated. When there is a conflict in such operations, operations for ESA-listed fish will take priority.

## **III. HABITAT AND HATCHERY COMMITMENTS**

### **A. BPA Funding for Habitat and other Non-Hatchery Actions**

#### **A.1 General Principles:**

- BPA and the Tribes seek to provide certainty and stability regarding BPA commitments to implement fish and wildlife mitigation activities in partnership with the Tribes, including additional and expanded actions which further address the needs of ESA-listed anadromous fish.
- Projects funded under this Agreement are to be linked to biological benefits based on limiting factors for ESA-listed fish. The Parties agree to identify the benefits attributable to the projects for ESA-listed fish consistent with the methodology identified in the FCRPS BiOp.
- Projects funded under this Agreement are consistent with ESA recovery plans and subbasin plans now included in the Columbia Basin Fish and Wildlife Program. More specific linkages will be documented as a function of the BPA contracting process.
- Projects may be modified by mutual agreement over time based on biological priorities, feasibility, science review comments, or accountability for results.

#### **A.2 Types of Projects:**

BPA is committing to funding a suite of projects and activities summarized in Attachment A, for non-hatchery expense projects, plus additional commitments for new hatchery operations and maintenance expenses as summarized in Attachment A and further described in Attachment B. The projects or actions are categorized as follows:

- Ongoing actions (currently or recently implemented through the Columbia Basin Fish and Wildlife Program). The actions include actions addressing ESA-listed salmon and steelhead ("ESA actions") as well as non-listed fish species and wildlife.
- Expanded actions in support of FCRPS BiOp and Program implementation.
- New actions benefiting ESA-listed and non-listed species.

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

### **A.3. Expense Projects:**

- BPA's funding commitment in the form of annual expense planning budgets for each project is identified in Attachment A.
- BPA may provide additional funding for habitat improvements for the Yankee Fork population if BPA determines it is needed for ESA purposes and the Tribes have identified appropriate projects.
- BPA's funding commitment is also subject to the General Provisions for All Projects below.

### **A.4. Non-Hatchery (Wildlife) Capital Projects:**

BPA will commit a minimum of \$16,550,000 over the 10 year period to implement wildlife habitat acquisitions for the Southern Idaho Wildlife Mitigation project as described in Attachment B. Based on reviews to date, BPA finds that the wildlife projects typically meet BPA's capital policy for fish and wildlife. If a project is subsequently found not to meet capital requirements, BPA and the Tribes will work together to find a replacement project or alternative project that can be implemented. In addition, BPA will provide additional capital funding, up to a total of \$5 million (i.e., an additional \$3,345,000 on top of the \$1,655,000 annual commitment) in any single year for additional wildlife acquisitions, provided BPA determines it has (a) remaining Southern Idaho Wildlife habitat unit needs; (b) sufficient available capital, and (c) the Tribes' request is made early enough in the fiscal year to give BPA sufficient time to evaluate and process the additional acquisition(s). All wildlife habitat acquisitions with the Tribes will be implemented in accordance with the terms and conditions of the 1997 Memorandum of Agreement regarding wildlife habitat acquisitions entered into by BPA and the Tribes.

## **B. Funding for Hatchery Actions**

### **B.1. General Principles:**

- The Action Agencies and the Tribes recognize that hatcheries can provide important benefits to ESA-listed species and to the Tribes in support of their treaty fishing interests.
- BPA and the Tribes seek to provide certainty and stability to BPA funding of hatchery actions by supporting specific on-going hatchery actions implemented by the Tribes, and to make funding available for new hatchery actions (including hatchery reform efforts) by the Tribes and others as they complete required review processes.
- BPA's funding will be in addition to and not replace funding for hatcheries provided by other entities, including but not limited to funding provided by Congress pursuant to the Mitchell Act, and funding required from other hydropower operators implementing habitat conservation plans and other related agreements.
- If a hatchery project identified in this Agreement is not able to be implemented, the Action Agencies are not obligated to fund a replacement or alternative project, and the unused hatchery funds will not be required to be shifted to non-hatchery projects.

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

### **B.2. Expense and Capital Hatchery Actions:**

- BPA will make available a total not to exceed \$7,750,000 over ten years for the Crystal Springs Hatchery and related facilities as described in the Attachments A and B. BPA will also provide expense funding not to exceed the amounts described in Attachment A to provide for planning expenses or other non-capital activities associated with hatchery design, construction, and implementation, and then used for operation and maintenance funding once hatchery construction is completed. In addition, BPA will provide funding that may be used for the planning and implementation of supplementation projects, as described in Attachments A and B.
- Starting with the FY2011 rate period, BPA will collaborate with the Tribes to develop a capital spending plan in advance of each new rate period that arises during the Agreement, so as to ensure that adequate rate period capital budgets are available for funding the capital actions in this MOA.
- In planning and development of the Crystal Springs Hatchery, and any out-planting or supplementation of fishes into natural habitats, the Tribes will work diligently to obtain required reviews and approvals from others, including the 3-Step Process and ISRP review through the Council's Program, obtaining NOAA and/or United States Fish and Wildlife Service review and approval as needed, coordinating with other co-managers in the State including the Idaho Department of Fish and Game, and obtaining any needed review or concurrence through the *U.S. v. Oregon* process.
- BPA and the Tribes will develop an agreement to address more detailed implementation issues regarding the construction, management, operation and maintenance of the Crystal Springs Hatchery.

### **B.3. Implementation Sequence:**

The Tribes, BPA, (and other federal agencies where applicable) will, as part of developing a capital plan, develop an implementation sequence for these projects. The overall funding commitment reflected in Section III.B.2 above is shown in 2009 dollars, and an annual inflation adjustment of 2.5 percent, applied beginning in FY10, will be utilized in developing the capital plan and implementation sequence for these (i.e., capital projects that are assumed to begin in FY10 will have a 2.5 percent inflation factor applied to the FY10 budget; projects that are assumed to begin five years later will have five years of a 2.5 percent annual inflation factor applied to the project's first-year budget).

- The Tribes will consider, among other things, the following as they develop the sequence of implementation:
  - Degree of readiness for implementation
- Sequencing will not be guided by project-by-project speculation regarding NOAA's willingness to approve or accept the project. Rather, NOAA input on these actions (to the extent they require it) will be sought consistent with this comprehensive Agreement.

## **C. General Provisions For All Projects**

**C.1.** The Parties Agree all projects funded pursuant to this Agreement are to be consistent with the Council's Program (including sub-basin plans), as amended; applicable draft ESA recovery plans; BPA's In-Lieu Policy; and, the data management protocols incorporated in the project contracts.

**C.2.** For BPA funded commitments, the Tribes will report results annually (including ongoing agreed upon monitoring and evaluation) via PISCES and/or other appropriate databases.

**C.3.** For non-hatchery projects identified as providing benefits to listed ESA fish, the Tribes shall:

- Provide estimated habitat quality improvement and survival benefits from the project (or suite of projects) to a population or populations of listed salmon and steelhead based on key limiting factors;
- Refine the estimates during the course of the Agreement if it appears benefits may significantly deviate from the original estimates; and
- Support these estimates of habitat improvement and survival benefits in appropriate forums.

**C.4.** For hatchery projects, the Tribes will:

- Continue to make available identified biological benefits associated with a hatchery projects included in this Agreement, and will support those biological benefits;
- Obtain a NOAA or USFWS determination as appropriate that the hatchery project will not impede and where possible will contribute to recovery;
- Secure or assist in securing all legally necessary permits for hatchery construction and operation.

**C.5.** The Parties will coordinate their RM&E projects with each other and with regional RM&E processes (particularly those needed to ensure consistency with the FCRPS BiOp RM&E framework), as appropriate and agreed to among the Parties.

**C.6.** For actions on federal lands, the Tribes will consult with the federal land managers and obtain necessary permits and approvals.

## **D. Northwest Power and Conservation Council and ISRP Review**

### **D.1. General principles:**

- In developing this Agreement, the Parties recognize the Council's Program is a maturing program, one that through several decades of implementation has established a continuing framework for mitigating the impacts of hydroelectric development in the Columbia River Basin.

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

- The Parties agree the BPA funding commitments in this Agreement are ten (10)-year commitments of the Bonneville Fund for implementation of projects. The Parties believe this Agreement and the specific projects are consistent with the Council's Program.
- The Council's expertise and coordination is valuable in addressing science review and accountability on a region-wide scale.
- The Parties recognize the current regional process for reviewing and funding projects to meet Action Agency obligations under the NWPA and/or ESA have been designed in large part to prioritize actions for a particular implementation period. As such, the process has reviewed "proposals" that essentially are competing with one another for a funding within a set overall budget. This Agreement, however, along with the BiOps, reflects specific and binding funding commitments to the projects in the attached spreadsheets, subject to the other terms and conditions in this Agreement.

### **D.2. ISRP review of projects implemented pursuant to this Agreement:**

- Subject to the commitments in Section III.E.2, the Parties will actively participate in ISRP review of the projects funded under this Agreement. The Parties will work with the Council to streamline and consolidate ISRP project reviews by recommending that the ISRP: (1) review projects collectively on a subbasin scale, (2) focus reviews for ongoing or longer term projects on future improvements/priorities, and (3) unless there is a significant project scope change since last ISRP review, minimize or abbreviate re-review of ongoing projects.
- Subject to the commitments in Section III.E.2 the Parties may agree to expedited ISRP review of new projects that are not substantially similar to projects or activities previously reviewed by the ISRP.
- The Parties will consider reasonable adjustments to non-hatchery projects based on ISRP and Council recommendations. The decision on whether or not to make such reasonable adjustments will require agreement of the Tribes and BPA. If the reasonable adjustment results in a reduction of a project budget, the Tribes and BPA will select another project to use the funds equal to the amount of the reduction. If the Tribes and BPA cannot agree on whether a recommended adjustment should be made, a replacement project that meets the requirements of this Agreement will be identified. In any event, BPA's financial commitment to non-hatchery projects will not be reduced to an aggregate level below amounts specified in this Agreement for the Tribes so long as a replacement project meets the requirements of this Agreement could be identified (see replacement project discussion, below).
- The proponent for any new hatchery project will participate in then-applicable streamlined ISRP and Council 3-step review processes recognizing that the ultimate decision to implement the projects is for BPA subject to the terms of this Agreement. Capital funding for any new hatchery project is subject to these review processes. The Parties will consider reasonable adjustments to hatchery projects based on ISRP and Council recommendations. The decision on whether or not to make such reasonable adjustments will require agreement of the Tribes and BPA.

## **E. Replacement Projects and Adaptive Management**

### **E.1. General Principles:**

- This section applies to non-hatchery projects
- The Parties agree a non-hatchery project identified in this Agreement may not ultimately be implemented or completed due to a variety of possible factors, including but not limited to:
  - Problems arising during regulatory compliance (e.g., ESA consultation, NEPA, NHPA review, CWA permit compliance, etc);
  - New information regarding the biological benefits of the project (e.g., new information indicating a different implementation action is of higher priority, or monitoring or evaluation indicates the project is not producing its anticipated benefits);
  - Changed circumstances (e.g., completion of the original project or inability to implement the project due to environmental conditions); or
  - Substantive non-compliance with the implementing contract.
- Should a non-hatchery project not be implemented due to one or more of the above factors, the Action Agencies and the Tribes will promptly negotiate a replacement project.

### **E.2. Replacement Projects:**

- A replacement project should be the same or similar to the one it replaces in terms of target species, limiting factor, mitigation approach, geographic area and/or subbasin and biological benefits.
- A replacement project may not require additional Council or ISRP review if the original project had been reviewed.
- A replacement project would have the same or similar planning budget as the one it replaces (less any expenditures made for the original project) and will take into account carry-forward funding as agreed to by the Parties.

### **E.3. Adaptive Management:**

In addition to project-specific adaptation described above, the Parties may mutually agree to adaptively manage this shared implementation portfolio on a more programmatic scale based on new information or changed circumstances.

## **F. Inflation, Ramp Up, Planning v. Actuals, Carry-over**

### **F.1. Inflation:**

Beginning in fiscal year 2010, BPA will provide an annual inflation adjustment of 2.5 percent.

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

### **F.2. Treatment of Ramp-up of new/expanded work:**

In recognition of the need to “ramp up” work (timing of Agreement execution, contracting, permitting, etc), the Parties agree that average BPA spending for the new/expanded projects in fiscal year 2009 is expected to be approximately one-third of the average planning level shown in the attached project-specific spreadsheets; and for fiscal year 2010, it is expected to be up to 75 percent of the average planning level, with full planning levels expected for most new/expanded projects starting in fiscal year 2011.

### **F.3. Assumptions regarding Planning versus Actuals:**

Historically, the long-term average difference between BPA’s planned expenditures for implementing the expense component of the Power Council’s Fish and Wildlife Program, and actual spending (what BPA is invoiced and pays under the individual contracts), has been about 7%, with the actual spending averaging 93% of planned spending. While BPA will plan for spending up to 100 percent of the funding commitments described in this Agreement, nevertheless, due to a variety of factors, BPA’s actual expenditures may be less. As a result, the Parties agree, provided BPA’s actual spending for the totality of projects commitments in this Agreement averages 93% of the planning amount annually, BPA is in compliance with its funding commitments. If BPA is not meeting the 93% average annually due to circumstances beyond the Parties control, BPA will not be in violation of this Agreement, but the Parties will meet to discuss possible actions to remove the impediments to achieving 93%. The Parties also agree, for the reasons regarding ramp up in Section III.F.2, new projects and projects expansions during their FY09 and FY10 ramp up phase will be excluded from this calculation.

### **F.4. Unspent funds, and pre-scheduling/rescheduling:**

Annual project budgets may fluctuate plus or minus 20% in relation to the planning budgets for each project, to allow for shifts in work between years (within the scope of the project overall), if work will take longer to perform for reasons beyond the sponsors’ control (reschedule) or can potentially be moved to an earlier time (preschedule). Fluctuations within an overall project’s scope of work, but outside of the 20 percent band, can also occur if mutually agreeable for reasons such as, but not limited to, floods, fires, or other emergency or *force majeure* events.

Unspent project funds (excluding new/expanded projects subject to ramp-up assumptions covered in Section F.2 above) carried over per the reschedule/preschedule provisions above (i.e., within +/- 20% of the annual project budget and within the project’s scope of work) may be carried forward from one contract year (e.g., Year 1), to as far as two contract years (e.g., Year 3) into the future before such funds are no longer available. The one exception to this reschedule/preschedule criteria is that for the project expansions and new projects, if actual total FY09 and FY10 spending is less than the sum of 33% of the FY09 budget and up to 75% of the FY10 budgets reflected in the spreadsheet attachments due to circumstances within the Tribes’ control, then the increment between what is actually spent in FY09/10 and the sum of 33% of the FY09 budget and up to 75% of the FY10 budgets reflected in the spreadsheet cannot be carried over into FY11.

November 7, 2008

To the extent that the projects proposed for funding in this Agreement involve the acquisition of interests in land from willing sellers, BPA and the Tribes may, by mutual agreement, adjust the 20 percent fluctuation band for the budgets for such projects to accommodate the uncertainties of negotiations with sellers. In addition, BPA may extend the two year carry-forward limit for such projects, provided that the Tribes provide at least six months notice of the potential need for such an extension, and provided further that BPA may decline to extend the carry-forward limit to avoid a “bow wave” of spending in any given year, or towards the end of this Agreement’s term, or on any other reasonable ground.

#### **IV. FORBEARANCE, WITHDRAWAL, AND DISPUTE RESOLUTION**

##### **A. Forbearance**

**A.1.** The Tribes will not initiate, join in (whether by intervention or amicus), or otherwise participate in any manner in the current litigation against the FCRPS and Upper Snake BiOps (*NWF v. NMFS*).

**A.2.** The Tribes covenant during the term of this Agreement:

- a. The Tribes will not initiate, join in, or support in any manner ESA, Northwest Power Act, Clean Water Act or APA suits against the Action Agencies or NOAA regarding the legal sufficiency of the FCRPS PA, FCRPS BiOp, Upper Snake BiOp, the 2008 Columbia Basin Fish Accords, this Agreement and/or conforming implementing RODs.
- b. So long as the Agreement is being implemented by the Action Agencies, the Tribes will not initiate, join in, or support in any manner ESA, Northwest Power Act, Clean Water Act or APA suits against the Action Agencies or NOAA regarding the effects on fish resources and water quality (water quality issues addressed in the FCRPS BA and the BiOps or otherwise related to the operation or existence of the 14 FCRPS projects regarding temperature and total dissolved gas<sup>3</sup>) resulting from the operations of the FCRPS and Reclamation dams that are specifically addressed in the FCRPS PA, FCRPS BiOp, Upper Snake BiOp, the 2008 Columbia Basin Fish Accords, this Agreement and/or conforming implementing RODs.
- c. The Tribes' participation in ongoing and future BPA rate making/approval/review proceedings will be consistent with the terms of this Agreement. This means, for example, the Tribes agree not to request additional fish or wildlife funding from BPA in on-going and future BPA rate making/approval/review proceedings during the term of this Agreement, and the Tribes will not make such requests in ongoing or future rate making/approval/review proceedings based on alleged infirmities in prior rate

---

<sup>3</sup> Water quality here is not intended to include matters not specifically addressed in the FCRPS BA and BiOps such as the Corps' 404 regulatory program, toxics clean-up issues.



## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

making/approval/review proceedings, including but not limited to the 2002-2006 rate period.

- d. The Tribes agree breaching will not occur within the term of the Agreement. In addition, the Tribes will not advocate for breaching dams covered by the FCRPS and Upper Snake Biological Opinions during the term of this Agreement. This commitment is made subject to the following mutual understandings and a single exception specified below:
- It is understood by all Parties nothing in this Agreement may be interpreted or represented as any tribe rescinding or altering their long-standing policy, scientific, and legal positions regarding breach of federal dams.
  - As required by the NOAA Fisheries FCRPS Biological Opinion, a comprehensive review will be completed in June, 2013 and June, 2016 that includes a review of the state of implementation of all actions planned or anticipated in the FCRPS and Upper Snake BiOps and a review of the status and performance of each ESU addressed by those BiOps. As described in Section II.A.2 of this Agreement, the Parties agree to meet to discuss the results of the 2013 comprehensive evaluation and, in the event performance is not on track, to discuss options for corrective action. If, after the June, 2016 comprehensive review, the status of Snake River ESUs is not improving and the Tribes review of Diagnostic Performance Framework indicates contingent actions are needed, the Tribes may advocate actions to implement Snake River dam breaching after 2017 should be initiated.

**A.4.** Nothing in this Agreement shall be construed by the Parties in any forum to limit or restrict the Parties or their agents or employees from advocating for actions they believe are required to implement this Agreement. Disputes among the Parties regarding implementation will be handled under the Good Faith and dispute resolutions sections.

### **B. Affirmation of Adequacy**

**B.1.** This Agreement builds upon and expands the commitments of the Action Agencies called for in the FCRPS and Upper Snake Biological Opinions (the BiOps). This Agreement also takes into account and supports the 2008 - 2017 *United States v. Oregon* Management Plan and its pending BiOp. The Parties support this package of federal and tribal actions as an adequate combined response of these Parties for the ten year duration of the Agreement and BiOps to address the government's duties for:

- conserving listed salmon and steelhead, including avoiding jeopardy and adverse modification of critical habitat under the Endangered Species Act;
- protection, mitigation, enhancement and equitable treatment of fish and wildlife under the Northwest Power Act; and
- Clean Water Act provisions related to the FCRPS dams.

**B.2.** The Tribes further agree:

- the Action Agencies' commitments under this Agreement and the BiOps as to hatchery projects are adequate for 30 years from the effective date of this Agreement except if after year 15 of the 30 year forbearance for hatcheries there is a change in the status of an

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

ESU (e.g., a new listing), or if after year 15 there is new information or changed circumstances that indicate additional hatchery actions are needed to assist in mitigating impacts of the FCRPS consistent with current science and applicable law, the Tribes are not precluded from seeking additional funding from the Action Agencies for hatcheries. If within the year prior to the expiration of this Agreement, due to no fault of the Parties, any capital funded hatchery actions identified in this Agreement have not begun construction, BPA will continue to make the identified capital funding in this Agreement available for the identified project (or projects) for an additional five years at which point the Parties will meet and discuss the disposition of any hatcheries that have not completed construction and the related capital funding.

- the Action Agencies' commitments under the 2008 Columbia Basin Fish Accords for lamprey actions are adequate for the duration of this Agreement such that the Tribes will not petition to list lamprey or support third party efforts to list lamprey as threatened or endangered pursuant to the ESA.

**B.3.** The Tribes' determination of adequacy under applicable law is premised on several important assumptions and understandings with which the federal parties to this Agreement concur:

- The specific actions identified in this Agreement and/or funding for such actions is provided by the federal parties in full and timely manner;
- Other actions not specifically identified in this Agreement, but committed to in the FCRPS BiOp, are carried out in a timely manner;
- The biological performance and status of the species affected by the development and operation of the FCRPS and Upper Snake hydroprojects are diligently and comprehensively monitored, analyzed, and reported to the Tribes and others as provided in the BiOps; and
- Adaptive management will be used as described in the Section II.A.2 to ensure achievement of performance objectives for the FCRPS. If during the 2013 or 2016 comprehensive review called for in the BiOps it is found that the status of ESA covered species are not improving as anticipated in the Adaptive Management section of the BA, the Tribes will have the opportunity to advocate that actions over and above those in the Agreement and/or BiOps should be implemented in the future, consistent with the terms of this Agreement.

**B.4.** The Tribes agree to affirmatively support the adequacy of the package of federal and tribal actions contained in the BiOps and this Agreement in appropriate forums, including NOAA's administrative record. This commitment includes, but is not limited to, the Tribes' withdrawing their comments to NOAA regarding the draft FCRPS BiOp and withdrawing their comments to BPA regarding the Columbia Basin Fish Accords.

### **C. Council Program Amendment Process**

**C.1.** During the term of the Agreement, the Action Agencies and Tribes will submit recommendations or comments or both in relation to Council Program amendments consistent with, and are intended to, effectuate this Agreement. The Tribes and the Action Agencies have agreed to submit the following to the Council in any recommendations or comments each may

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

make for Program amendments solicited in 2008 to describe this Agreement and its role in such Program amendments:

Description and Rationale: The Action Agencies and the Tribes have agreed to a 10 year commitment of actions in support of the Action Agencies' obligations both generally under the Northwest Power Act, as well as specifically for anadromous species listed under the Endangered Species Act. The commitments include support for the actions in the 2008 Biological Opinions for the FCRPS and the Upper Snake. The commitments also include actions already reviewed and recommended by the Council to BPA, as well as expanded and new actions. The Action Agencies and the Tribes found these commitments consistent with the Program and the Council's intent to integrate Power Act and ESA responsibilities. The expanded and new actions are, moreover, subject to reasonable modifications determined by the Parties to the Agreement based on Council and ISRP review.

The Tribes and the Action Agencies will recommend that the Council amend the Fish and Wildlife Program to incorporate the BiOps and Agreement, consistent with the following approach:

- The actions in the 2008 Biological Opinions for the FCRPS and Upper Snake should be implemented, in conjunction with the FCRPS Action Agencies' Biological Assessment, as measures to protect, mitigate, and enhance listed salmon and steelhead affected by the federal hydro system.
- The actions in the 2008 Memoranda of Agreement between the FCRPS Action Agencies and the Tribes should be implemented per its terms as additional measures to protect, mitigate and enhance both listed and non-listed fish, as well as wildlife.

**C.2.** Neither the Tribes, nor the Action Agencies, waive the right to assert, if adopted by the Council based on its own recommendations, or recommendations of third parties, an amendment contrary to this Agreement is either lawful or unlawful under the Northwest Power Act, or any other law, provided they act consistent with the terms of this Agreement.

### **D. Good Faith Implementation and Support**

This Agreement is based on bargained-for consideration. The Parties agree to work together to implement the mutual commitments in this Agreement. Although neither the Action Agencies nor the Tribes are relinquishing their respective authorities through this Agreement, they commit to make best effort to sit down with each other prior to making decisions in implementation of this Agreement.

The Parties enter into this Agreement cognizant of its scope, duration, and complexity, and commit to its implementation and support at all levels and in all areas, e.g. policy, legal, and technical. Further, the Parties understand matters explicitly addressed within and/or related to this Agreement are routinely dealt with in a wide variety of contexts and fora, often on short notice and in time-sensitive situations. Even with those understandings, the Parties will vigorously endeavor to implement and support this Agreement in good-faith. Best effort good-

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

faith implementation and support of this Agreement is the general duty to which all Parties agree to be bound. Nonetheless, the Parties understand from time to time questions or concerns may arise regarding a Party's compliance with the terms of this Agreement. In furtherance of the continuing duty of good faith, each Party agrees the following specific actions or efforts will be carried out:

**D.1** On a continuing basis, it will take steps to ensure all levels of their government/institution is made aware of the existence of this Agreement and specific commitments and obligations herein, and emphasize the importance of meeting them;

**D.2** Each Party will designate a person to be initially and chiefly responsible for coordinating internal questions regarding compliance with the Agreement;

**D.3** Each Party will make best efforts to consult with other Parties prior to taking any action that could reasonably be interpreted as inconsistent with any part of this Agreement. To assist in this, the Parties will designate an initial contact point; the Tribes will designate their legal representative as their initial contact points, the contacts for the Action Agencies are to be determined. The formality and nature of the consultation will likely vary depending on circumstances. The initial contact points are initially charged with attempting to agree on what form of consultation is required. In some instances, contacts between representatives may suffice for consultation, while in others, they may need to recommend additional steps. The Parties agree consultations should be as informal and with the least amount of process necessary to ensure that the Parties are fulfilling the good-faith obligation to implement and support the Agreement.

**D.4** If a Party believes another has taken action contrary to the terms of the Agreement, or may take such action, it has the option of a raising a point of concern with other Parties asking for a consultation to clarify or redress the matter. The Parties will endeavor to agree upon any actions required to redress the point of concern. If after raising a point of concern and, having a consultation, the Parties are unable to agree that the matter has been satisfactorily resolved, any Party may take remedial actions as it deems appropriate, so long as those remedial actions do not violate the terms of the Agreement.

### **E. Changed Circumstances, Renegotiation/Modification, Withdrawal**

**E.1** The Parties enter into this Agreement acknowledging NOAA issued final biological opinions for the FCRPS, Upper Snake, and 2008 – 2017 *United States v. Oregon* Management Plan. These BiOps have concluded based on a combined comprehensive analysis that the respective proposed actions, with reasonable and prudent alternatives if any, are not likely to jeopardize the continued existence of any ESA-listed salmon and steelhead or result in the destruction or adverse modification of critical habitat of such species.

**E.2** If any court, regardless of appeal, finds the FCRPS or Upper Snake BiOp or agency action is arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law, and subsequently remands the BiOp to NOAA Fisheries, this Agreement shall remain in force. If any court, regardless of appeal, finds the BiOp or agency action is arbitrary, capricious, an abuse

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

of discretion, or otherwise not in accordance with law, the Parties will seek to preserve this Agreement and will meet promptly to determine the appropriate response as described below:

- In the event a portion(s) of this Agreement is in direct conflict with a court order or resulting amended BiOp, the Parties shall meet and agree on an appropriate amendment to that section, or, if such amendment is not possible under the terms of the court order or resulting amended BiOp, then a substitute provision shall be negotiated by the Parties.
- If court-ordered FCRPS operations or resulting amended BiOp require additional actions that are either financially material to an Action Agency or that materially constrain the Corps or Reclamation from meeting FCRPS purposes, Section IV.E.4 below shall apply. The Parties intend that determinations of materiality will only be made in cases of great consequence.
- The Parties will participate in any court-ordered process or remand consultation in concert with IV.D and IV.E of this Agreement.
- Without limiting the other provisions of this Section IV.E.2, in the case of a court order or resulting amended BiOp that constrains actions in the 2008 – 2017 *United States v. Oregon* Management Plan, the Parties agree this Agreement shall remain in effect unless a court order or resulting amended BiOp materially constrains the actions in the 2008 – 2017 *United States v. Oregon* Management Plan. The Parties intend that determinations of materiality will only be made in cases of great consequence.

E.3. Regardless of any legal challenge, BPA will take steps to:

- Ensure the commitments in this Agreement are not modified or reduced based on agency-wide streamlining or other cost-cutting efforts;
- Imbed the estimated cost of implementing this Agreement in the agency's revenue requirement to be recovered through base wholesale power rates;
- Propose and, if established after a Northwest Power Act section 7(i) hearing, exercise rate risk mitigation mechanisms as needed to maintain the funding commitments in this Agreement (e.g., cost recovery adjustment clauses); and
- Consider agency cost reductions, or other measures to maintain the funding commitments in this Agreement.

E.4. In the event of the occurrence of any of the material effects in E.2, or in the event of material non-compliance with the Agreement not resolved by dispute resolution, the affected Party or Parties shall notify the other Parties immediately, identifying why the event is considered material. The Parties shall utilize dispute resolution if there is a disagreement as to whether the event is material. In addition, prior to any withdrawal, the Parties shall first make a good faith effort to renegotiate mutually agreeable modifications to the Agreement. If renegotiation is not successful, the affected Party may notify the other Parties in writing of its intent to withdraw by a date certain. A Party may not withdraw from the Agreement on the basis of its own non-compliance. If renegotiation is not successful, at the time the withdrawal is effective, all funding commitments and/or other covenants made by the withdrawing Party cease, and the withdrawing Party shall have no further rights or obligations pursuant to the Agreement,

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

and reserves any existing legal rights under applicable statutes, including all arguments and defenses, and this Agreement cannot be used as an admission or evidence.

If the affected Party does not withdraw, that Party may challenge in any appropriate forum the asserted non-compliance with the terms of this Agreement, provided that judicial review of disputes arising under this Agreement is limited to BPA.

The Parties may, by mutual agreement, consider negotiations or withdrawal for changed circumstances other than those enumerated above.

If one Party withdraws from the Agreement, any other Party has the option to withdraw as well, with prior notice.

The provisions of this Agreement authorizing renegotiation, dispute resolution, withdrawal, or challenge in appropriate forums provide the sole remedies available to the Parties for remedying changed circumstances or disputes arising out of or relating to implementation of this Agreement.

**E.5. Savings.** In the event of withdrawal, BPA will continue providing funding for projects necessary for support of BiOp commitments (as determined by the Action Agencies), and will provide funding for other on-going projects or programs that the Parties mutually agree are important to continue.

## **F. Dispute Resolution**

### **F.1. Negotiation**

***1.a.*** The Parties shall attempt in good faith to resolve any dispute arising out of or relating to implementation of this Agreement in accordance with this section and without resort to administrative, judicial or other formal dispute resolution procedures. The purposes of this section is to provide the Parties an opportunity to fully and candidly discuss and resolve disputes without the expense, risk and delay of a formal dispute resolution.

***1.b.*** If the Parties are unable to resolve the dispute through informal dispute resolution, then the dispute shall be elevated to negotiating between executives and/or officials who have authority to settle the controversy and who are at a higher level of management than the person with direct responsibility for administration of this Agreement. All reasonable requests for information made by one Party to the other will be honored, with the Action Agencies treating “reasonable” within the context of what would be released under the Freedom of Information Act.

***1.c.*** In the event a dispute over material non-compliance with the Agreement has not been resolved by negotiation, the affected Party may seek to withdraw or seek review in appropriate forums in accordance with Section IV.E, above.

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

### **F.2. Mediation**

In the event the dispute has not been resolved by negotiation as provided herein, the disputing Parties may agree to participate in mediation, using a mutually agreed upon mediator. To the extent that the disputing Parties seeking mediation do not already include all Parties to this Agreement, the disputing Parties shall notify the other Parties to this Agreement of the mediation. The mediator will not render a decision, but will assist the disputing Parties in reaching a mutually satisfactory agreement. The disputing Parties agree to share equally the costs of the mediation.

### **G. Modification**

The Parties by mutual agreement may modify the terms of this Agreement. Any such modification shall be in writing signed by all Parties.

## **V. MISCELLANEOUS PROVISIONS**

### **A. Term of Agreement**

Except as otherwise provided regarding hatcheries, see Section IV.B.2, the term of this Agreement will extend from its effective date through the end of fiscal year 2018 which is midnight on September 30, 2018.

### **B. Applicable Law**

All activities undertaken pursuant to this Agreement must be in compliance with all applicable laws and regulations. No provision of this Agreement will be interpreted or constitute a commitment or requirement that the Action Agencies take action in contravention of law, including the Administrative Procedure Act, the National Environmental Policy Act, the Endangered Species Act, Federal Advisory Committee Act, Information Quality Act, or any other procedural or substantive law or regulation. Federal law shall govern the implementation of this Agreement and any action, whether mediated or litigated, brought or enforced.

### **C. Authority**

Each Party to this Agreement represents and acknowledges that it has full legal authority to execute this Agreement.

### **D. Consistency with Trust and Treaty Rights**

Nothing in this Agreement is intended to nor shall in any way abridge, abrogate, or resolve any rights reserved to the Tribes by treaty. The Parties agree that this Agreement is consistent with the treaty rights of the signatory Tribes and the United States' trust obligation to tribes, but does not create an independent trust obligation. The Tribes specifically represent and warrant that no approval of this Agreement by the Secretary of the Interior or the Bureau of Indian Affairs or any

## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

other federal agency or official is required in order for the Tribes to execute this Agreement or for this Agreement to be effective and binding upon the Tribes.

### **E. Effective Date & Counterparts**

The effective date of this Agreement shall be the date of execution by the last Party to provide an authorized signature to this Agreement. This Agreement may be executed in counterparts, each of which is deemed to be an executed original even if all signatures do not appear on the same counterpart. Facsimile and photo copies of this Agreement will have the same force and effect as an original.

### **F. Binding Effect**

This Agreement shall be binding on the Parties and their assigns and successors. Each Party may seek dispute resolution in accordance with Sections IV.F, or to withdraw in accordance with Sections IV.E, if the dispute is not resolved. The commitments made by the Parties in this Agreement apply to the Parties, their staff, any persons hired or volunteering for a Party, any representative or organization under a Party's guidance or control, and any person or entity acting as an agent for a Party, and to participation in all forums (e.g., Tribal participation in the Columbia Basin Fish and Wildlife Authority, Action Agency participation in the Pacific Northwest Coordination Agreement processes). The commitments made by the Parties in this Agreement also includes a commitment not to directly or indirectly support third-party efforts to challenge the adequacy of the BiOps, this Agreement, or the Parties efforts to implement them.

**G.** No third party beneficiaries or third party beneficiary rights are intended or created by this Agreement.

**H.** All previous communications between the Parties, either verbal or written, with reference to the subject matter of this Agreement are superseded, and this Agreement duly accepted and approved constitutes the entire Agreement between the Parties.

### **I. Waiver, Force Majuere, Availability of Funds**

**I.1.** The failure of any Party to require strict performance of any provision of this Agreement or a Party's waiver of performance shall not be a waiver of any future performance of or a Party's right to require strict performance in the future.

**I.2.** No Party shall be required to perform due to any cause beyond its control. This may include, but is not limited to fire, flood, terrorism, strike or other labor disruption, act of God or riot. The Party whose performance is affected by a force majuere will notify the other Parties as soon as practicable of its inability to perform, and will make all reasonable efforts to promptly resume performance once the force majuere is eliminated. If the force majuere cannot be eliminated or addressed, the Party may consider withdrawal pursuant to Sections IV.E and IV.F.



## SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

**I.3** The actions of the Corps and Reclamation set forth in this Agreement are subject to the availability of appropriated funds. Nothing in this Agreement shall be construed to require the obligation or disbursement of funds in violation of the Anti-Deficiency Act.

### **J. Notice.**

1. Any notice permitted or required by the Good Faith provisions of this Agreement, Section IV.D, may be transmitted by e-mail or telephone to a Party's initial contact points, as that person is defined pursuant to the Good Faith provisions.
2. All other notices permitted or required by this Agreement shall be in writing, delivered personally to the persons listed below, or shall be deemed given five (5) days after deposit in the United States mail, addressed as follows, or at such other address as any Party may from time to time specify to the other Parties in writing. Notices may be delivered by facsimile or other electronic means, provided that they are also delivered personally or by mail. The addresses listed below can be modified at any time through written notification to the other Parties.

#### **Notices to BPA should be sent to:**

Vice President, Environment Fish & Wildlife  
Mail Stop KE-4  
Bonneville Power Administration  
P.O. Box 3621  
Portland, OR 97208-3621

#### **Notices to the U.S. Army Corps of Engineers should be sent to:**

U.S. Army Corps of Engineers, Northwestern Division  
Chief, Planning, Environmental Resources and Fish Policy Support Division  
1125 NW Couch Street  
Suite 500  
P.O. Box 2870  
Portland, OR 97208-2870

#### **Notices to the U.S. Bureau of Reclamation should be sent to:**

Deputy Regional Director  
Bureau of Reclamation  
Pacific Northwest Region  
1150 N. Curtis Rd., Suite 100  
Boise, ID 83706

SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

**Notices to the Shoshone-Bannock Tribes should be sent to:**

Chairman, Shoshone-Bannock Tribes  
P.O. Box 306  
Fort Hall, ID 83203

and to:

Director, Tribal Fisheries Program  
Shoshone-Bannock Tribes  
P.O. Box 306  
Fort Hall, ID 83203

**K. List of Attachments**

*Attachment A: Project spreadsheet*

*Attachment B: Project narratives and benefits*

SHOSHONE-BANNOCK TRIBES-ACTION AGENCY AGREEMENT

November 7, 2008

**SIGNATURES**

*/s/ Stephen J. Wright*

*November 7, 2008*

---

Stephen J. Wright  
Administrator and Chief Executive Officer  
Bonneville Power Administration

Date

*/s/ G. Witt Anderson (for Gen. Rapp)*

*November 7, 2008*

---

William E. Rapp, P.E.  
Brigadier General, U.S. Army Corps of Engineers  
Division Commander

Date

*/s/ J. William MacDonald*

*November 7, 2008*

---

J. William MacDonald  
Regional Director  
U.S. Bureau of Reclamation  
Pacific Northwest Region

Date

*/s/ Alonzo A. Coby*

*November 7, 2008*

---

Alonzo A. Coby  
Chairman  
Fort Hall Business Council  
Shoshone-Bannock Tribes of the Fort Hall Reservation

Date

This page is intentionally blank.

General Note: All projects (expense and capital) will receive a 2.5% adjustment for inflation beginning in fiscal year 2010, which is not reflected in the amounts described below.														
#	PROJECT NAME  Expense	STATUS	BPA PROJECT No.*	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	TOTAL
1	Habitat Imprvmnt/Enhnmnt - Fort Hall, Idaho	Existing	199201000	\$ 283,718	\$ 283,718	\$ 283,718	\$ 283,718	\$ 283,718	\$ 283,718	\$ 283,718	\$ 283,718	\$ 283,718	\$ 283,718	\$ 2,837,180
2	Salmon River Habitat Enhancement	Existing	199405000	\$ 231,380	\$ 231,380	\$ 231,380	\$ 231,380	\$ 231,380	\$ 231,380	\$ 231,380	\$ 231,380	\$ 231,380	\$ 231,380	\$ 2,313,800
3	Southern Idaho Wildlife Mitigation	Existing	199505702	\$ 380,000	\$ 380,000	\$ 430,000	\$ 430,000	\$ 480,000	\$ 480,000	\$ 530,000	\$ 530,000	\$ 580,000	\$ 580,000	\$ 4,800,000
4	Idaho Supplementation Studies ( <i>SBT Contract</i> )	Existing	under 198909800	\$ 235,883	\$ 235,883	\$ 235,883	\$ 235,883	\$ 235,883	\$ 235,883	\$ 235,883	\$ 235,883	\$ -	\$ -	\$ 1,887,064
5	Snake River Sockeye Salmon Habitat and Limnological Monitoring (see Note 1)	Existing	199107100 under 200740200	\$ 425,000	\$ 425,000	\$ 425,000	\$ 425,000	\$ 425,000	\$ 425,000	\$ 425,000	\$ 425,000	\$ 425,000	\$ 425,000	\$ 4,250,000
YEARLY Totals:				\$ 1,555,981	\$ 1,555,981	\$ 1,605,981	\$ 1,605,981	\$ 1,655,981	\$ 1,655,981	\$ 1,705,981	\$ 1,705,981	\$ 1,520,098	\$ 1,520,098	\$ 16,088,044

\* Note: BPA Project numbers may change over time

PROJECT NAME		STATUS	BPA PROJECT No.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	TOTAL
Capital Projects														
6	Southern Idaho Wildlife Mitigation (see Note 2)	Existing	199505702	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 16,550,000
7	Crystal Springs Hatchery Construction	New	TBD		\$ 2,000,000	\$ 2,000,000	\$ 2,000,000	\$ 1,750,000						\$ 7,750,000
YEARLY Totals:				\$ 1,655,000	\$ 3,655,000	\$ 3,655,000	\$ 3,655,000	\$ 3,405,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 1,655,000	\$ 24,300,000

	PROJECT NAME	STATUS	BPA PROJECT No.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	TOTAL
	NEW PROPOSALS													
8	Umbrella planning project (see Note 3)	New	TBD	\$ 150,000	\$ 150,000								\$ -	\$ 300,000
9	ESA Habitat Restoration (see Notes 4,5)	New	TBD	\$ 300,000	\$ 300,000	\$ 400,000	\$ 400,000	\$ 400,000	\$ 400,000	\$ 400,000	\$ 400,000	\$ 400,000	\$ 400,000	\$ 3,800,000
10	Yankee Fork (see Note 6)	Expanded	200205900	\$ 350,000	\$ 350,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 4,700,000
11	Nutrient Supplementation for ESA	New	TBD	\$ 100,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 2,350,000
12	Supplementation projects (see Note 7)	New	TBD	\$ 150,000	\$ 150,000	\$ 200,000	\$ 200,000	\$ 400,000	\$ 400,000	\$ 400,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 3,400,000
13	Crystal Springs Planning and O&M	New	TBD	\$ 500,000	\$ 250,000	\$ 250,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 6,250,000
YEARLY Totals:				\$ 1,550,000	\$ 1,450,000	\$ 1,600,000	\$ 2,100,000	\$ 2,300,000	\$ 2,300,000	\$ 2,300,000	\$ 2,400,000	\$ 2,400,000	\$ 2,400,000	\$ 20,800,000

- Note 1: Restores 60k reduction from FY07-09
- Note 2: Per the MOA, BPA may fund up to \$5M in any given year on a case-by-base basis.
- Note 3: Provides funding to develop/plan both habitat and supplementation projects.
- Note 4: Includes \$100k/yr line item for office space in closer proximity to on-the-ground work under this agreement.
- Note 5: First priority would be to augment Yankee Fork project if needed for priority sites; otherwise may select from Warm Springs culvert replacement, Beaver Crk. Riparian restoration, and Upper Salmon reconnect/restoration or develop replacement projects
- Note 6: BPA funding contingent on ISRP review, 3-step process, and very significant cost share. Per the MOA, funding for habitat improvements for Yankee Fork population may be increased.
- Note 7: May include steelhead streamside incubator, Panther Creek, Yankee Fork, and Yellow Belly Lake

This page is intentionally blank.

**Appendix B**  
**Shoshone-Bannock Tribes Project Narratives**  
**September 15, 2008**

**#1 - Habitat Improvement/Enhancement –Fort Hall, Idaho Project # 199201000 (Ongoing)**

The primary goal of the Shoshone-Bannock Tribe's (Tribes) habitat improvement/enhancement project is to restore, enhance, and protect Fort Hall Indian Reservation (Reservation) streams and riparian areas so they can support native fish populations at historic levels. The objective of this project is to provide conditions to recover weak populations of focal species (native Yellowstone cutthroat) to self-sustaining levels on the Reservation by improving/enhancing habitat. Streams on the Reservation have been negatively affected (i.e. loss of riparian vegetation, down-cutting, and lateral scouring of stream banks) by a variety of sources; Bureau of Reclamation's construction and operation of the Palisade Reservoirs.

Negative impacts from stream bank failures include: widened stream channels; reduction in riparian vegetation and in-stream cover; increased summer water temperatures; and deposition of fines on critical spawning and rearing substrates resulting in a loss of stream complexity necessary for native fish populations.

This project continues to advance the principles of the Northwest Power and Conservation Council's (NPCC) 1994 Fish and Wildlife Program (Program) as outlined in Section 10.1A, to protect, mitigate, and enhance resident fish populations affected by construction and operation of dams, including Palisades Reservoir, and protection of focal species as outlined in the Upper Snake Subbasin Plan adopted into the NPCC Program in 2005. Fish populations and riparian areas are enhanced by cost sharing partnerships with the Tribes and the Bureau of Indian Affairs, which provide for riparian restoration, including bank stabilization, re-vegetation projects and in-stream structures to protect and enhance habitat diversity. This project would benefit fish and wildlife resources on the Reservation and provides opportunities for subsistence harvest by Tribal members.

**Target Population:** Resident salmonoids (Yellowstone cutthroat Trout, federal sensitive species), Ute's Ladies Tress (ESA-listed botanical species)

**Projected Benefits:** Improve habitat by stabilizing eroding banks, deepening and narrowing stream channels, improve water quality and restoring diversity to the spring-stream biota with in-stream structures and bank protection measures.

**#2 - Salmon River Habitat Enhancement Project # 199405000 (Ongoing)**

The Salmon River Habitat Enhancement (SRHE) project's goal is to monitor Chinook salmon and steelhead populations and evaluate their response to habitat actions in the

Salmon River Basin. Under the 1994 and 2000 Fish and Wildlife Program objectives, the SRHE project restored habitat and biological systems to promote healthy, naturally producing fish populations. The SRHE provides appropriate habitat management on the ecosystem through detailed monitoring of past project enhancement efforts and evaluation of affected systems.

The SRHE project objectives follow the 2000 FWP, under HABITAT and Appendix D involving Provisional Statement of Biological Objectives for Environmental Characteristics at the Basin Level. The Tribes evaluation includes both physical and biological parameters on the East Fork and Yankee Fork. Information is collected on the physical characteristics of the stream, stream substrate, stream bank, riparian community, fish, invertebrates and vegetation. The project continues to pursue new enhancement opportunities and research, where appropriate, throughout the Salmon River basin to protect and restore anadromous fish habitat.

**Target Populations:** Snake River Spring/Summer Chinook Salmon (East Fork and Yankee Fork), Snake River Steelhead (East Fork, Upper Salmon River), and bull trout (East Fork and Yankee Fork).

**Projected Benefits:** SRHE monitors physical and biological characteristics of the Salmon River and its tributaries and evaluates the effectiveness of habitat actions to address limiting factors affecting anadromous and resident fish populations and habitat.

### **#3 - Southern Idaho Wildlife Mitigation Project # 199505702 (Expanded)**

The Shoshone Bannock Tribes- Southern Idaho Wildlife Mitigation (SIWM) program is an ongoing program of the Fish and Wildlife Program. The SIWM was created to mitigate for habitat losses associated with FCRPS hydropower development in southern Idaho. The Tribes signed a Memorandum of Agreement with BPA in 1997 (BPA and SBT 1997) to mitigate for wildlife habitat losses in the mid and upper Snake River provinces. The Upper Snake Province habitat losses were identified at 37,070 HU for the Palisades Dam (Sather-Blair and Preston 1985) and 10,503 HU for the Minidoka Dam and 5,129 HU gains through its construction (Martin and Meuleman 1989). To date, SBT-SIWM has protected 8,441 acres and mitigated for 14,916 HU.

Expense funds allocated from BPA provide for administrative, operations and maintenance contracts to identify potential properties for habitat protection, determine appraised value, approach potential sellers, work with BPA staff to acquire property, and maintain and enhance project lands according to CBFWA guidelines (1998) and BPA requirements. The SIWM works collaboratively with other fish and wildlife management agencies, sub-basin work groups, and federal land managers in the region.

The SIWM was created to meet the objectives for wildlife mitigation outlined in the Fish and Wildlife Program (NPCC 2000):



- Quantify wildlife losses caused by the construction, inundation, and operation of the hydropower projects.
- Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses.
- Coordinate mitigation activities throughout the basin and with fish mitigation and restoration efforts, specifically by coordinating habitat restoration and acquisition with aquatic habitats to promote connectivity of terrestrial and aquatic areas.
- Maintain existing and create habitat values.
- Monitor and evaluate habitat and species responses to mitigation actions.

The budget for this project accommodates existing operation and maintenance (O&M), as well as periodic increases over time to account for additional acquisitions and the necessary O&M and associated monitoring for adaptive management and habitat enhancement resulting in additional habitat credits.

**Target Population:** Mid and upper Snake River fish and wildlife populations and habitat impacted by the construction, operation and inundation of the mid and upper Snake River hydroelectric facilities.

**Projected Benefits:** Protection and enhancement of lands for the benefit of fish and wildlife to meet the BPA obligations to mitigate for habitat losses on the Mid and Upper Snake River identified through habitat unit loss assessments.

#### **#4 – Idaho Supplementation Studies # 198909800 (Ongoing)**

The Idaho Salmon Supplementation (ISS) Studies is an ongoing project, which addresses critical uncertainties associated with hatchery supplementation of Chinook salmon *Oncorhynchus tshawytscha* populations (i.e. effects on productivity, persistence, establishment, advantages of localized broodstocks) in Idaho (Bowles and Leitzinger 1991). The ISS program also addresses questions identified in the Supplementation Technical Work Group Five Year Work Plan (STWG 1988), defines the potential role of supplementation in managing Idaho's anadromous fisheries, and evaluates its usefulness as a recovery tool for salmon populations in the Snake River basin (Bowles and Leitzinger 1991).

The ISS initially identified two goals: 1) assess the use of hatchery Chinook salmon to increase natural populations in the Salmon River and Clearwater River subbasins, and 2) evaluate the genetic and ecological impacts of hatchery Chinook salmon on naturally reproducing Chinook salmon populations.

In response to these goals, ISS addresses four objectives: 1) monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapement of naturally produced Chinook salmon; 2) monitor and evaluate changes in the productivity and genetic composition of naturally spawning target and adjacent populations following

supplementation activities; 3) determine which supplementation strategies (broodstock and release stage) provide the most rapid and successful response in natural production without adverse effects on productivity; and 4) develop supplementation recommendations (Bowles and Leitzinger 1991).

The ISS program is a cooperative research project involving the Idaho Department of Fish and Game (IDFG), the Nez Perce Tribe (NPT), the Shoshone-Bannock Tribes (SBT), and the United States Fish and Wildlife Service (USFWS). The Bonneville Power Administration (BPA) provides funding for the project. Each agency is responsible for data collection on a subset of the study streams across the Clearwater River and Salmon River subbasins as developed in the original study design (Bowles and Leitzinger 1991). Data collected include estimates of escapement for natural and supplementation origin adults, biological data from salmon carcasses, juvenile production in treatment and control streams, and juvenile passive integrated transponder (PIT) tag interrogations at detection facilities throughout the Columbia River basin, supplementation treatments, and stray rates of general production hatchery adults into study streams.

ISS PIT tagging efforts, hatchery and habitat evaluations contribute to a broad number of strategies and associated RPA's of the 2008 FCRPS Biological Opinion. Results derived from the Idaho Supplementation Studies will address key uncertainties associated with supplementation of natural populations of listed Chinook salmon and help address RM&E Strategies 1-3, 6 - RPA # 50, 51, 52, and 63 identified in the 2008 FCRPS Biological Opinion.

**Target Population:** Snake River Spring/Summer Chinook salmon

**Projected Benefits:** Identifying limiting factors for all life stages of Chinook salmon will increase understanding of the systemic impacts for the species. This will inform and improve adaptive management strategies at project levels and improve coordination on species enhancement efforts.

#### **#5 - Snake River Sockeye Salmon Habitat/Limnological Research Project # 199107100 (Expanded)**

In March 1990, the Tribes petitioned the National Marine Fisheries Service (NMFS) to list Snake River sockeye salmon (*Oncorhynchus nerka*) as endangered. Snake River sockeye salmon were officially listed as endangered in November 1991 under the Endangered Species Act (56 FR 58619). In 1991, the Snake River Sockeye Salmon Habitat and Limnological Research Project was implemented. This ongoing project is part of an interagency effort to prevent the extinction of the Redfish Lake stock of Snake River sockeye salmon. The Tribal goal for this project is two tiered: increase the population of Snake River sockeye salmon while preserving the unique genetic characteristics of the Evolutionarily Significant Unit (ESU) and maintain a viable population that warrants de-listing; providing for Tribal harvest opportunities.

Collaborators in the recovery effort include the National Oceanic and Atmospheric Administration, the Idaho Department of Fish and Game, the University of Idaho, Oregon Dept. of Fish and Wildlife, and the Shoshone-Bannock Tribes. On-going project tasks, and additional tasks mentioned herein, will directly address specific goals and objectives outlined in the FCRPS Biological Opinion and the Endangered Species Act.

Project tasks include: 1) monitor limnological parameters of the Sawtooth Valley lakes to assess lake productivity; 2) conduct lake fertilization in Redfish, Pettit, and Alturas lakes; 3) reduce the number of mature kokanee spawning in Fishhook and Alturas Lake creeks; 4) monitor, evaluate, and enumerate sockeye salmon smolt migration from Pettit and Alturas lakes; 5) monitor spawning kokanee escapement and estimate fry recruitment in Fishhook and Alturas lakes; 6) conduct sockeye and kokanee salmon population surveys; 7) evaluate potential competition and predation between stocked juvenile sockeye salmon and a variety of fish species in Redfish, Pettit, and Alturas lakes; and 8) assist IDFG with captive broodstock production activities.

In addition to on-going tasks, the Tribes would: 1) modify the Pettit Lake Creek weir to accommodate flow conditions during the entire Snake River sockeye salmon smolt migration period; 2) design, purchase, and implement kokanee salmon weirs to manage spawning escapement and recruitment of non-native intraspecific competitors in Alturas Lake Creek and Fishhook Creek; 3) utilize existing Snake River sockeye salmon critical habitat through potential re-introductions (12(d)); 4) evaluate natural (unmarked) origin *O. nerka* smolt migrants from Redfish, Pettit, and Alturas lakes- using readily available genetic tools- to assess release strategy performance and natural production and productivity and 5) support an Salmon Basin Sockeye Technical Oversight Committee trap and haul program proposal that would, under certain environmental conditions, trap and haul adult Snake River sockeye salmon migrants from Lower Granite Dam to the Sawtooth Valley.

**Target Population:** Snake River Sockeye salmon

**Projected Benefits:** Project will identify limiting factors for the species and identify solutions to improve adaptive management strategies on a system-wide level. The project would increase the population of Snake River sockeye salmon while preserving the unique genetic characteristics of the Evolutionarily Significant Unit (ESU) and strive to achieve a viable population that warrants de-listing; providing for Tribal harvest opportunities.

#### **#6 – Southern Idaho Wildlife Mitigation # 199505702 (Capital) (Ongoing)**

Southern Idaho Wildlife Mitigation (SIWM) is an ongoing protection and enhancement project that provides the capital funding to acquire habitat units for the benefit wildlife in perpetuity, with direct and indirect benefits provided to resident fish. SIWM targets habitat units identified in loss assessments for the inundation, construction and operations

of Mid and Upper Snake FCRPS hydroelectric facilities for fee-title acquisitions, conservation easements, and other protection and enhancement methods. The Tribes signed a Memorandum of Agreement with BPA in 1997 (BPA and SBT 1997) to provide capital and expenses to mitigate for wildlife habitat losses in the mid and upper Snake River provinces.

**Target Population:** Resident fish and wildlife, botanical species

**Project Benefit:** Protection and enhancement of lands for the benefit of fish and wildlife to meet the BPA obligations to mitigate for habitat losses on the Mid and Upper Snake River identified through habitat unit loss assessments.

**#7(a) - Crystal Springs Hatchery Facility (New)**

The Crystal Springs Hatchery is an existing BPA property in Southern Idaho on the Snake River. The hatchery facility will be owned and operated by the Tribes, funded by BPA, to meet identified supplementation goals over the course of the agreement. The Tribes seek to develop the Crystal Springs Hatchery facility to rear Yellowstone Cutthroat trout, Snake River Spring/Summer chinook salmon, Snake River Steelhead and endangered Snake River sockeye salmon. The goal will be the production of Snake River sockeye smolt equivalents, Chinook and steelhead smolts and smolt equivalents, and 8,000 catchable Yellowstone Cutthroat trout.

In planning and development of the Crystal Springs Hatchery, and any out-planting or supplementation of fishes into natural habitats, the Tribes will work diligently to obtain required reviews and approvals from others, including the 3-Step Process and ISRP review through the NPCC's Program, obtaining NOAA and/or U.S. Fish and Wildlife Service review and approval as needed, coordinating with other co-managers in the State including the Idaho Department of Fish and Game, and obtaining any needed review or concurrence through the *U.S. v. Oregon* process. Priorities for, and magnitude of, production objectives will be established during master planning and feasibility assessments under the 3-Step process and regulatory processes with NOAA Fisheries, U.S. Fish and Wildlife Service, and Idaho Department of Fish and Game.

This is a capital project to construct the hatchery with the fish subsequently produced used in supplementation project #12. The project will specifically address supplementation RPA's outlined in the FCRPS and Upper Snake River Basin Biological Opinions.

The objectives for this hatchery are: to increase the population of Snake River sockeye salmon, while preserving the unique genetic characteristics of the Evolutionarily Significant Unit (ESU); develop a locally adapted chinook brood for Upper Salmon River, Panther Creek and the East Fork Salmon River; develop a locally adapted brood for Snake River Steelhead; and, rear genetically pure strains of Yellowstone Cutthroat Trout.

**Target Populations:** Snake River Sockeye Salmon, Chinook Salmon, Steelhead, Resident Salmonids

**Projected Benefits:** Crystal Springs will produce Snake River Sockeye Salmon smolt equivalents for release in critical habitat; Snake River Spring/Summer Chinook for the Tribes' supplementation program; Snake River Steelhead smolt and smolt equivalents for the Tribes' supplementation program; Yellowstone Cutthroat Trout for reservation populations. This will help meet the viable threshold populations for recovery goals across the Salmon River Basin.

#### **#7(b) – Adult Holding Facility, Crystal Springs Hatchery Program (New)**

The Tribes propose to construct an adult holding/spawning facility in the Yankee Fork Salmon River, to utilize the locally adapted Chinook and steelhead stocks to be used in the Crystal Springs Hatchery programs. An adult holding facility on Yankee Fork will provide a central location to collect locally adapted stocks for the Tribes' Supplementation program. Adult Chinook and steelhead will be trapped, ponded, and spawned on-site at a satellite facility located adjacent to the Yankee Fork Salmon River. The eggs will then be transported to the Crystal Springs Hatchery to rear smolts and smolt equivalents adapted to the Salmon River Basin.

**Target Population:** Yankee Fork Spring/Summer Chinook salmon, Upper Salmon Steelhead

**Projected Benefit:** Collect and develop locally adapted broodstock to produce smolts or smolt equivalents at the Crystal Springs Hatchery. This will enable a supplementation effort to implement plans to meet TRT goals and biological objectives from the 2008 BiOp.

#### **#8 – Umbrella Planning Project (New)**

The umbrella planning project will accomplish tasks associated with planning and developing new work under both expanded ongoing and new projects. The Tribes propose to utilize umbrella planning project funds to complete the following capacity building objectives: 1) write the initial proposals for the ten year MOA program and submit to ISRP for review; 2) reply to ISRP questions/concerns regarding the ten year program or any of its component parts; 3) create draft Statement of Work (SOW) and negotiate with BPA regarding the implementation or planning of any project in the ten

year program; 4) create draft Line Item Budget and negotiate with BPA to ensure that the ten year program sets achievable expenditure goals and maintains year-to-year flexibility as proposed by the MOA; 5) create a data tracking system to manage contract deliverables, expenditures, perform budget forecasting/auditing, as well as enhance coordination for each project in the ten year program to ensure comprehensive efforts to actively recover anadromous fish utilizing multiple components; 6) perform strategic planning and drafting of a plan for the Tribes' ten year program; including, researching and forecasting possible permit requirements, investigating NEPA compliance issues, coordination with other MOA Parties to maximize benefits to ESA listed species and habitat.

Upon completion of planning, development and execution of a new contract or expansion of an ongoing project, billing will transition from the umbrella project/contract to the new or expanded project's contract.

**Projected Benefits:** Allowing for capacity building in the first two years will provide ample opportunity to plan a ten year program for the Shoshone-Bannock Tribes.

#### **#9 – ESA Habitat Restoration/Rehabilitation Project (New)**

The goal of the ESA Habitat Restoration Project will be to inventory, assess, plan and implement necessary actions to improve connectivity to critical habitat, to provide adequate water quantity and quality, and restore native vegetation to riparian areas for all life stages of anadromous and resident fish in the Salmon River Basin.

ESA Habitat Restoration Project would accomplish this goal through a series of tasks involving culvert or bridge replacement, diversion consolidation, and riparian restoration. Culvert and bridge replacement improves connectivity to critical habitat for migrating and returning anadromous fish. Diversion consolidation can increase the quantity of water available at critical life stages for anadromous and resident fish. Riparian restoration, through native species replanting, bank stabilization, in-stream structures or grazing deferment, can decrease water temperature and improve availability of spawning/rearing habitat.

The Tribes' first priority would be to augment the Yankee Fork Salmon River habitat project; otherwise an alternate project focusing on upper Salmon River populations will be selected, such as the Warm Springs culvert replacement, Beaver Creek riparian restoration, and/or Upper Salmon reconnect/restoration. These habitat projects have been identified as potential project locations for habitat actions that meet the needs identified in the BiOp and contribute to species recovery throughout the basin.

**Target Populations:** Spring/Summer Chinook salmon Yankee Fork population, East Fork Population, Panther Creek Population, Snake River Steelhead Salmon River upper mainstem population, bull trout

**Project Benefits:** These habitat improvement projects would provide inventory, assessment, planning and implementation for necessary actions to improve connectivity to critical habitat, to provide adequate water quantity and quality, and restore native vegetation to riparian areas for all life stages of anadromous and resident fish in the Salmon River Basin. See attached Estimated Benefits to Primary Limiting Factors from Habitat Actions by Population and Watershed, for estimated species benefits from proposed actions.

#### **#10 – Yankee Fork Floodplain Restoration Project # 200205900 (Expanded)**

Dredge mining in the early-mid 1900s severely impacted 10 kilometers of the stream, eliminating the natural meander pattern and associated in stream habitat as well as riparian vegetation and the values it provided. The existing stream-floodplain complex consists of unconsolidated and un-vegetated dredge tailings that offer little habitat for aquatic and terrestrial species.

The goal of the Yankee Fork Floodplain Restoration Project is to restore natural river channel characteristics, floodplain function, hydraulic and sediment regimes, and aquatic habitat within the dredged reach, so the system would be self-sustaining. Restoring the river to less disturbed conditions would create a healthier, functioning riparian community that would benefit fish and wildlife and help restore cultural significance.

The Tribes and BPA would work cooperatively to identify appropriate cost-sharing partners and seek permanent protections for the restored sections of Yankee Fork. The focus is to address the impacts to the Yankee Fork population of spring/summer Chinook with projects and activities that will provide cost-effective mitigation. BPA is not responsible for addressing all of the impacts from mining activities.

**Target Populations:** Spring/Summer Chinook salmon Yankee Fork population, Snake River Steelhead Salmon River upper mainstem population, bull trout

**Project Benefits:** The Yankee Fork Floodplain Restoration Project will address limiting factors associated with the dredged section of the Yankee Fork Salmon River that impair anadromous fish productivity.

The primary limiting factors for the dredged section of the Yankee Fork are: lack of tributary and floodplain connectivity, lack of stream channel complexity, lack of riparian vegetation, water quality and loss of spawning and rearing habitat. Habitat actions to improve system function will include: reconnecting tributaries to the Yankee Fork, placement of in-stream structures to increase stream channel complexity, increase access to historic floodplain, riparian vegetation planting. If the project design is fully implemented, the Tribes estimate, using the Hillman methodology, a 4% improvement within ten-year period and 63% improvement within a twenty-five year period in the assessment unit for steelhead and a 8% ten-year and 73% twenty-five year improvement for Chinook salmon. See attached Estimated Benefits to Primary Limiting Factors from

Habitat Actions by Population and Watershed, for estimated species benefits from proposed actions.

This project will enable BPA to meet the long-term ESA habitat goal for the Yankee Fork Salmon River from the 2008 FCRPS Biological Opinion.

#### **#11 - Salmon River Nutrient Enhancement Project (New)**

Pacific salmon and steelhead once contributed large amounts of marine-derived carbon, nitrogen, and phosphorus to freshwater ecosystems in the Pacific Northwest (PNW) of the United States of America (California, Oregon, Washington, and Idaho). Declines in historically abundant anadromous salmonid populations represent a significant loss of returning nutrients across a large spatial scale. Decreased freshwater productivity, and correspondingly diminished carrying capacities, may represent important limiting factors in what often appears to be otherwise pristine habitat. In the absence of abundant anadromous salmon and steelhead populations, nutrient enhancement may help to restore freshwater productivity affected by a severe lack of marine-derived nutrients and help promote restoration efforts aimed at increasing naturally spawning populations of salmon and steelhead.

The Tribes propose a large scale nutrient enhancement program that aims to increase freshwater productivity and corresponding growth rates and survival of salmon and steelhead in the Salmon River basin using salmon carcass analogs, or, if not available, inorganic nutrients. Salmon carcass analog(s) (SCA) developed by Pearsons et al. (2007) contain similar complements of nutrients and carbon-based compounds (rare earth elements) as naturally returning salmon; therefore, their effect on stream food webs is hypothesized to mimic natural enrichment pathways. Salmon carcass analogs are pasteurized to create a pathogen free product that slowly releases nutrients and particulates similar to naturally decomposing salmon and are easy to store, transport, and distribute.

The Tribes conducted studies evaluating the stream food web response to a salmon carcass analog treatment in two central Idaho streams. Results have been published in *Freshwater Biology* (Kohler et al., 2007). Our study illustrated that periphyton chlorophyll *a* and AFDM and macro-invertebrate biomass were significantly higher in stream reaches treated with salmon carcass analogs. Enriched stable isotope ( $\delta^{15}\text{N}$ ) signatures were observed in periphyton and macro-invertebrate samples collected from treatment reaches in both treatment streams, indicating trophic transfer from salmon carcass analogs to consumers. Densities of ephemereIIDae, elmidae, and brachycentridae were significantly higher in treatment reaches. Our results suggest that salmon carcass analog addition successfully increased periphyton and macro-invertebrate biomass with no detectable response in stream water nutrient concentrations. Correspondingly, no change in nutrient limitation status was detected based on dissolved inorganic nitrogen to soluble reactive phosphorus ratios (DIN/SRP) and nutrient diffusing substrata



experiments. Salmon carcass analogs appear to effectively increase freshwater productivity.

**Target Population:** Snake River Sockeye, bull trout, Spring/Summer Chinook and Snake River Steelhead

**Projected Benefits:** The Salmon River Nutrient Enhancement Program mitigates marine-derived nutrient loss by supplementing target streams with nutrients and carbon based compounds. Nutrient enhancement will supplement the natural nutrient cycle provided by returning anadromous adults. While the importance of marine derived nutrients to freshwater and associated riparian and terrestrial productivity has been documented, the direct response to aquatic habitat productivity from nutrient supplementation is far more difficult to quantify. In a previous study using salmon carcass analogue treatment in central Idaho streams we documented a statistically significant response in primary and secondary production following nutrient enrichment (Kohler et al. 2008).

To quantify potential habitat quality improvements expected from nutrient enhancement measures a detailed project design is needed. Based on previously published data, projected benefits include: increased freshwater productivity with corresponding increases in juvenile salmonid growth rates and survival. An important objective of the Salmon River Nutrient Enhancement Project will be to quantify the response to large-scale nutrient supplementation at multiple trophic levels, with specific focus on the growth and survival of listed anadromous and resident salmonid species. The Tribes will develop a detailed experimental design and project proposal, coordinating with co-managers to obtain the necessary permits.

#### **#12 - Shoshone-Bannock Tribes Supplementation Program (New)**

Steelhead trout, Sockeye Salmon and Chinook salmon are culturally and socially significant to the Tribes. A decline in natural production of steelhead and salmon in the Salmon River sub-basin resulted in these species being listed under the ESA. The Tribes initiated hatchery supplementation activities designed to improve runs, re-distribute fish, and improve natural production.

Success of supplementation activities can be based on improving viability at the distinct population level; changes in abundance, productivity, diversity and distribution of steelhead and Chinook salmon can be measured.

#### **#12 (a) – Snake River spring/summer Chinook Salmon**

The Tribes Supplementation projects are designed to increase abundance, distribution, and diversity of naturally spawning populations of Snake River spring/summer Chinook salmon and reintroduce extirpated spring/summer Chinook salmon to historical habitats in the Salmon River sub-basin. The projects may initially rear and release listed hatchery

salmon from local hatcheries in target populations and/or develop locally adapted broodstock with hatchery or natural populations.

Recent and historical data on spawning populations of Chinook salmon in the targeted populations indicates one population (Panther Creek) is extirpated, with insufficient information on the other three populations to assess recovery. The Tribes propose to supplement target populations and collect life history, genetic, abundance, and survival data to evaluate progress toward recovery.

Discussions with the Lower Snake River Compensation Plan office identifies a possible partnership to utilize the East Fork Salmon River satellite facility for adult trapping, holding, and spawning. Panther Creek is proposed for reintroduction under the Blackbird Mine settlement agreement when the fish managers agree on a proposal, affording a potential cost-share partnership for the reintroduction effort. The Tribes are currently initiating a supplementation program in the Yankee Fork Salmon River and have included a goal to develop a supplementation program for the Lemhi River population in the US v. Oregon management plan.

**Target ESU/Population (s):**

Snake River spring/summer Chinook salmon

<u>Population</u>	<u>Life History</u>
Yankee Fork Salmon River	spring
East Fork Salmon River	spring/summer
Panther Creek	extirpated
Lemhi River	spring/summer

**Project Benefits:** Release of smolts and smolt equivalents utilizing locally adapted and endemic stocks within the target populations will increase Chinook abundance by 75-100%. The program will increase abundance of target populations and assist in achieving Interior Columbia Basin Technical Recovery Team Viable Population Thresholds.

**#12 (b) - Snake River Steelhead**

The Tribes supplementation program is designed to increase abundance, productivity, distribution, and diversity of naturally spawning populations of Snake River Steelhead and to reintroduce extirpated steelhead to historical habitats in the Salmon River Sub-basin. The projects will initially rear and release steelhead from local hatcheries, including Sawtooth and Pahsimeroi and collect in target populations while investigating and potentially developing locally adapted broodstocks. Developing a locally adapted broodstock to reintroduce or supplement steelhead can increase reproductive success of returning adults.

Data on the spawning populations of steelhead in streams within the Salmon sub-basin are very limited. To address the need for additional information on recovery objectives (abundance, spatial structure, productivity, and diversity) listed in the FCRPS BiOp,

these projects will collect life history, genetic, and abundance data to assess the recovery of the target populations, coordinated through the ongoing collaboration process to develop a regional strategy for RME.

**Target Populations:**

Upper Salmon  
East Fork Salmon River  
Panther Creek

**Project Benefits:** Release of smolts and smolt equivalents and the development of locally adapted stock in the target populations can be expected to increase steelhead productivity by 75% or more.

**#12 (c) - Snake River Sockeye**

The designated critical habitat for Snake River sockeye salmon includes five nursery rearing lakes in the Sawtooth Valley, ID: Redfish, Pettit, Alturas, Stanley, and Yellowbelly lakes (Federal Register/Vol. 58, No. 247, 1993). Currently, only Redfish, Pettit, and Alturas lakes are being utilized for Snake River sockeye salmon recovery efforts. Yellowbelly Lake is the only critical lake rearing habitat that does not have a non-native kokanee salmon population. Kokanee salmon are intra-specific competitors for a common zooplankton food resource and serve to diminish the carrying capacity of the majority of Sawtooth Valley lakes for Snake River sockeye salmon rearing. The Tribes propose to introduce Snake River Sockeye salmon parr and/or eyed-egg equivalents, annually into non-utilized, Sawtooth Valley ESA critical habitat to increase the spatial distribution, productivity, abundance and genetic diversity of the ESU. Yellowbelly Lake exhibits the highest total zooplankton biomass relative to the other Sawtooth Valley lakes, presenting a unique opportunity for rearing endangered Snake River Sockeye salmon. Monitoring and evaluation will include smolt survival estimates using PIT tags, pelagic fish population monitoring using a combination of passive net surveys techniques, limnological sampling and zooplankton monitoring, and spawning ground surveys to evaluate residual populations that will likely occur following re-introduction.

**Target Population:** Snake River Sockeye Salmon

**Project Benefits:** The project would increase the spatial distribution, productivity, abundance and genetic diversity of the ESU in designated critical habitat not currently utilized in the Sawtooth Valley.

**#13 – Crystal Springs Planning and Operation and Maintenance (New)**

In 1992, a feasibility study was completed (CH2M Hill) outlining options for production potential of the Crystal Springs Hatchery on the Fort Hall Reservation. In 1996, a master

plan (Montgomery-Watson) was written which outlined program requirements and three possible sites for construction of a new hatchery. The most suitable site was selected based on these findings, and in 1998, an Environmental Assessment was completed for Phase I and II of the project and included a cultural resources review (Emerson and Boreson 1997). Water quality and quantity were monitored at the proposed hatchery site (Houghland Farms) and the property was purchased by BPA in 1998.

This is an expense project that supports planning and design of hatchery prior to when costs can be capitalized under Project #7 and that supports operations and maintenance once a hatchery is constructed. The Tribes would begin master planning for the Crystal Springs Hatchery based on reports and recommendations gathered during the planning phase. The Tribes would also initiate development of a master plan for an adult holding facility on the Yankee Fork Salmon River. Capital expenditures will be utilized (Project #7) to construct these facilities once the permitting and consultation process is complete.

**Target Populations:** Snake River Sockeye Salmon, Chinook Salmon, Steelhead, Resident Salmonids

**Projected Benefits:** Effective planning will allow the facility to be constructed utilizing the best available practices for hatchery design, disease management and water quality. Expenses for operations and maintenance will support ongoing hatchery operations and provide a mechanism for the Tribes to continue supplementation efforts in the Snake River Basin.

## Estimate Benefits to Primary Limiting Factors (PLFs) from Habitat Actions by Population and Watershed

Future improvements to limiting factors are estimates from the best professional judgement of tribal biologists, assuming the implementation of all tribal habitat actions in the MOA. Limiting factors are weighted as to their relative importance in order to calculate watershed improvements.

Chinook Salmon				
Assessment Unit (AU)	Primary Limiting Factor(s) (PLF) by AU	Actions	Survival benefit associated with BPA funds (multiplier)	
			10 Years	25 Years
Elk Creek	Sediment from roads, cattle grazing, - effects on rearing and spawning success, interstitial space and pool volume, diversion, discharge	Increase space and pool volume, rearing and spawning habitat, decrease uptake of water at diversion	1.03	1.59
	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	Riparian Rehabilitation & Large Woody Debris		
	Lack of passage - Lack of access to diversity of habitats,	Removal of diversion		
Yankee Fork	Sediment from roads and historic mining - effects on rearing and spawning success, interstitial space and pool volume.	Road drainage improvements, maximizing rearing and spawning habitat, minimizing sediment	1.00	1.51
	Loss of riparian vegetation and complexity -	Riparian Rehabilitation & Large Woody Debris		

	Lack of passage - Lack of access to diversity of habitats	Bridge		
Panther Creek	Sediment from roads, timber harvest,- effects on rearing and spawning success, interstitial space and pool volume.	Road drainage improvements, maximizing rearing and spawning habitat, minimizing sediment, monitor chemicals	<b>1.00</b>	<b>1.29</b>
	Loss of riparian vegetation and complexity	Riparian Rehabilitation & Large Woody Debris		
	Lack of passage - Lack of access to diversity of habitats.	Culvert Replacement		
Warm Springs	Sediment from roads, timber harvest, cattle grazing,- effects on rearing and spawning success, interstitial space and pool volume	Reduce sediment load	<b>1.01</b>	<b>1.44</b>
	Loss of riparian vegetation and complexity	Riparian planting		
	Lack of passage - Lack of access to diversity of habitats.	Culvert Replacement		
Beaver Creek	High summer water temperature	Riparian fencing, planting,	<b>1.00</b>	<b>1.30</b>
	Loss of riparian function from grazing	Riparian fencing, planting, streambank bioengineering		
	Lack of passage - Lack of access to diversity of habitats,	Culvert Replacement		

Upper Salmon Main	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	Riparian fencing, planting,	1.00	1.23
	Loss of riparian function from grazing and floodplain development, sediment load	Riparian fencing, planting, streambank bioengineering		
	Lack of passage - Lack of access to diversity of habitats,	Fish screen, passage, diversion		
East Fork	Sediment from upstream sources	Road drainage improvements, upland rehabilitation	1.05	1.44
	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	Riparian fencing, planting,		
	Loss of riparian function from grazing and floodplain development	Riparian fencing, planting, streambank bioengineering		
Basin Creek	Sediment from upstream sources and road	road drainage improvements and upland vegetation	1.15	1.73
	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	vegetation, instream spawning and rearing habitat		
	Loss of riparian function from grazing	planting, streambank bioengineering		

Slate Creek	Sediment from upstream sources and road	1 mile upper end road decommissioning and road drainage improvements	<b>1.00</b>	<b>1.50</b>
	High summer water temperature	Riparian fencing		
	Loss of riparian function from grazing and floodplain development, seasonal blow-outs	Riparian fencing, planting, streambank bioengineering, instream spawning and rearing habitat		
	Water Chemistry	Create barrier from tailings		
Smiley Creek	Sediment from upstream sources	.5 mile upper end road decommissioning and road drainage improvements, upland vegetation	<b>1.00</b>	<b>1.59</b>
	High summer water temperature	Riparian fencing, planting, remove diversion and pump at lower end and replace with wells		
	Loss of riparian function from grazing and floodplain development	Riparian fencing, planting, streambank bioengineering		
	Lack of passage - Lack of access to diversity of habitats,	Culvert Replacement		
Yankee Fork Restoration (Dredge)	Lack of spawning and rearing habitat, water quality	Improve channel complexity	<b>1.08</b>	<b>1.73</b>
	Loss of floodplain connectivity	Floodplain reconnect, instream structures and vegetation		
	Fish passage barrier	Tributary Reconnect		
	Lack of passage - Lack of access to diversity of habitats,	Culvert & Bridge Replacement		



## Estimate Benefits to Primary Limiting Factors (PLFs) from Habitat Actions by Population and Watershed

Future improvements to limiting factors are estimates from the best professional judgement of tribal biologists, assuming the implementation of all tribal habitat actions in the MOA.

Limiting factors are weighted as to their relative importance in order to calculate watershed improvements.

Steelhead				
Assessment Unit (AU)	Primary Limiting Factor(s) (PLF) by AU	Actions	Survival benefit associated with BPA funds (multiplier)	
			10 Years	25 Years
Elk Creek	Sediment from roads, cattle grazing, mining - effects on rearing and spawning success, interstitial space and pool volume, diversion, discharge	Increase space and pool volume, rearing and spawning habitat, decrease uptake of water at diversion	1.19	1.85
	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	Riparian Rehabilitation & Large Woody Debris		
	Lack of passage - Lack of access to diversity of habitats,	Removal of diversion		

Yankee Fork	Sediment from roads and historic mining - effects on rearing and spawning success, interstitial space and pool volume.	Road drainage improvements, maximizing rearing and spawning habitat, minimizing sediment	1.04	1.28
	Loss of riparian vegetation and complexity -	Riparian Rehabilitation & Large Woody Debris		
	Lack of passage - Lack of access to diversity of habitats	Bridge		
Panther Creek	Sediment from upland fires- effects on rearing and spawning success, interstitial space and pool volume and temperature.	Road drainage improvements, maximizing rearing and spawning habitat, minimizing sediment, monitor chemicals	1.26	1.76
	Water quality toxic	Water quality control, supplement with nutrients		
	Lack of instream complexity	Engineer pool, riffle complex & Large Woody Debris		
	Lack of passage - Lack of access to diversity of habitats.	Culvert Replacement		
Warm Springs	Sediment from upland fire, cattle grazing,- effects on rearing and spawning success, interstitial space and pool volume	Reduce sediment load	1.08	1.24
	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	Riparian planting		

	Lack of passage - Lack of access to diversity of habitats.	Culvert Replacement		
Beaver Creek	Diversions	Fish screen, passage, remove diversion	1.03	1.28
	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	Riparian fencing, vegetation		
	Loss of riparian function from grazing	Riparian fencing, planting, streambank bioengineering		
	Sediment from upland fire, cattle grazing,- effects on rearing and spawning success, interstitial space and pool volume	Reduce sediment load		
	Lack of passage - Lack of access to diversity of habitats,	Culvert Replacement		
Upper Main Salmon River	Sediment from upland fire, cattle grazing, Development- effects on rearing and spawning success, interstitial space and pool volume	Reduce sediment load	1.04	1.25
	Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures	Riparian fencing, planting,		

	Loss of riparian function from grazing and floodplain development, sediment load	Riparian fencing, planting, streambank bioengineering		
	Diversions	Fish screen, passage, remove diversion		
	Lack of passage - Lack of access to diversity of habitats,	Fish screen, passage, diversion		
East Fork	Sediment from upland fire, cattle grazing, Development and Mining- effects on rearing and spawning success, interstitial space and pool volume	Reduce sediment load	1.00	1.35
	Loss of riparian function from grazing and floodplain development	Riparian fencing, planting, streambank bioengineering		
	Diversions	Fish screen, passage, remove diversions		
Basin Creek	Sediment from upland fire and seasonal blowouts	reduce sediment load	1.00	1.26
	Loss of riparian function from grazing	planting, streambank bioengineering		
Slate Creek	Sediment from upstream sources and road	1 mile upper end road decommissioning and road drainage improvements	1.02	1.31
	High summer water temperature	Riparian fencing		
	Loss of riparian function from grazing and floodplain development, seasonal blow-outs	Riparian fencing, planting, streambank bioengineering, instream spawning and rearing habitat		

	Water quality toxic	Create barrier from tailings		
Smiley Creek	Sediment from upstream sources	.5 mile upper end road decommissioning and road drainage improvements, upland vegetation	1.05	1.37
	High summer water temperature	Riparian fencing, planting, remove diversion and pump at lower end and replace with wells		
	Loss of riparian function from grazing and floodplain development	Riparian fencing, planting, streambank bioengineering		
	Lack of passage - Lack of access to diversity of habitats,	Culvert Replacement		
Yankee Fork Restoration (Dredge)	Lack of spawning and rearing habitat, water quality	Improve channel complexity	1.04	1.63
	Loss of floodplain connectivity	Floodplain reconnect, instream structures and vegetation		
	Fish passage barrier	Tributary Reconnect		
	Lack of passage - Lack of access to diversity of habitats,	Culvert & Bridge Replacement		

This page is intentionally blank.

## **Appendix G**

---

### *Preliminary Design Drawings*

This page is intentionally blank.



---

## *Crystal Springs Design Drawings*

This page is intentionally blank.



**McMILLEN, LLC**

SHOSHONE BANNOCK TRIBES

CRYSTAL SPRINGS HATCHERY

---

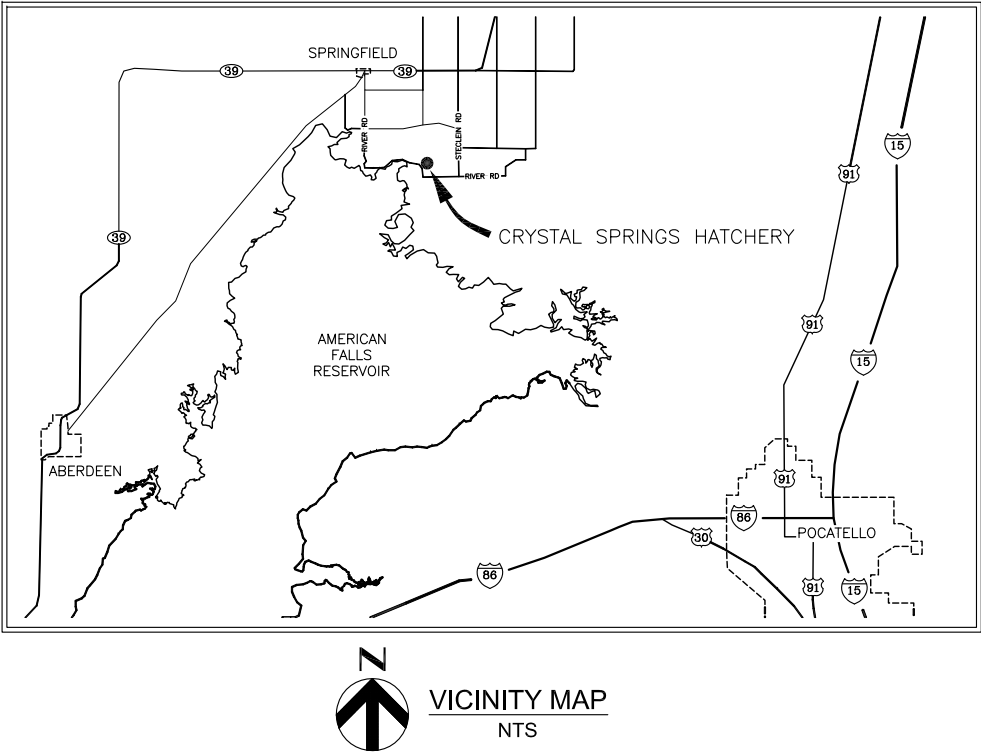
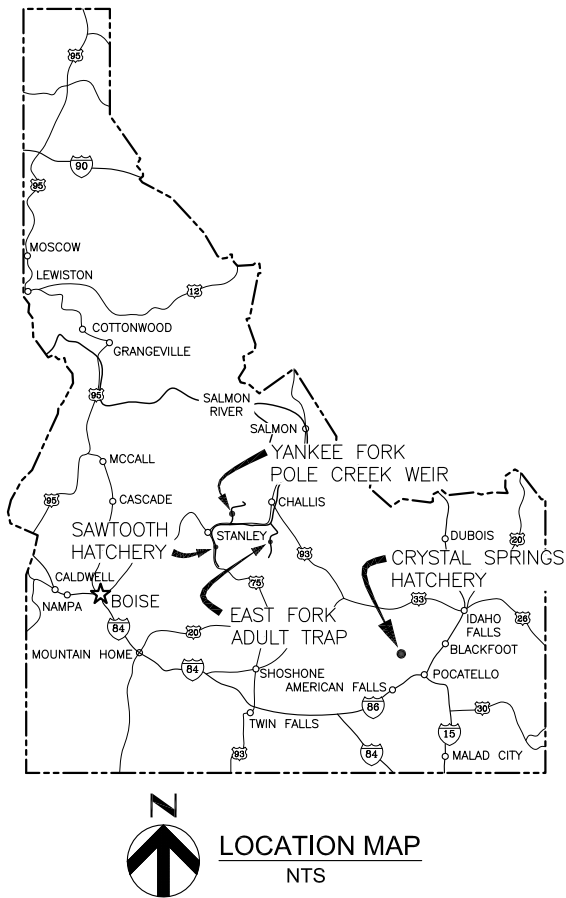
MASTER PLAN  
FEBRUARY 2011

---

# SHOSHONE-BANNOCK TRIBES

## CRYSTAL SPRINGS HATCHERY

### MASTER PLAN



INDEX OF DRAWINGS	
DRAWING NUMBER	DRAWING TITLE
	COVER SHEET
CS-1	LOCATION MAP, VICINITY MAP AND INDEX OF DRAWINGS
CS-1.1	OVERALL EXISTING SITE PLAN
CS-2	CONCEPTUAL HYDRAULIC PROFILE
CS-3	EAST SITE PROPOSED SITE PLAN
CS-4	EAST SITE PIPING PLAN
CS-5	ENLARGED SITE PLAN

REV	DATE	BY	DESCRIPTION



WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

**McMILLEN, LLC**

1401 SHORELINE DRIVE  
SUITE 100  
BOISE, ID 83702

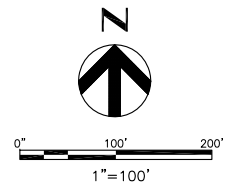
OFFICE: 208.342.4214  
FAX: 208.342.4216



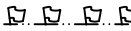


SHOSHONE-BANNOCK TRIBES
CRYSTAL SPRINGS HATCHERY MASTER PLAN
LOCATION MAP, VICINITY MAP AND INDEX OF DRAWINGS

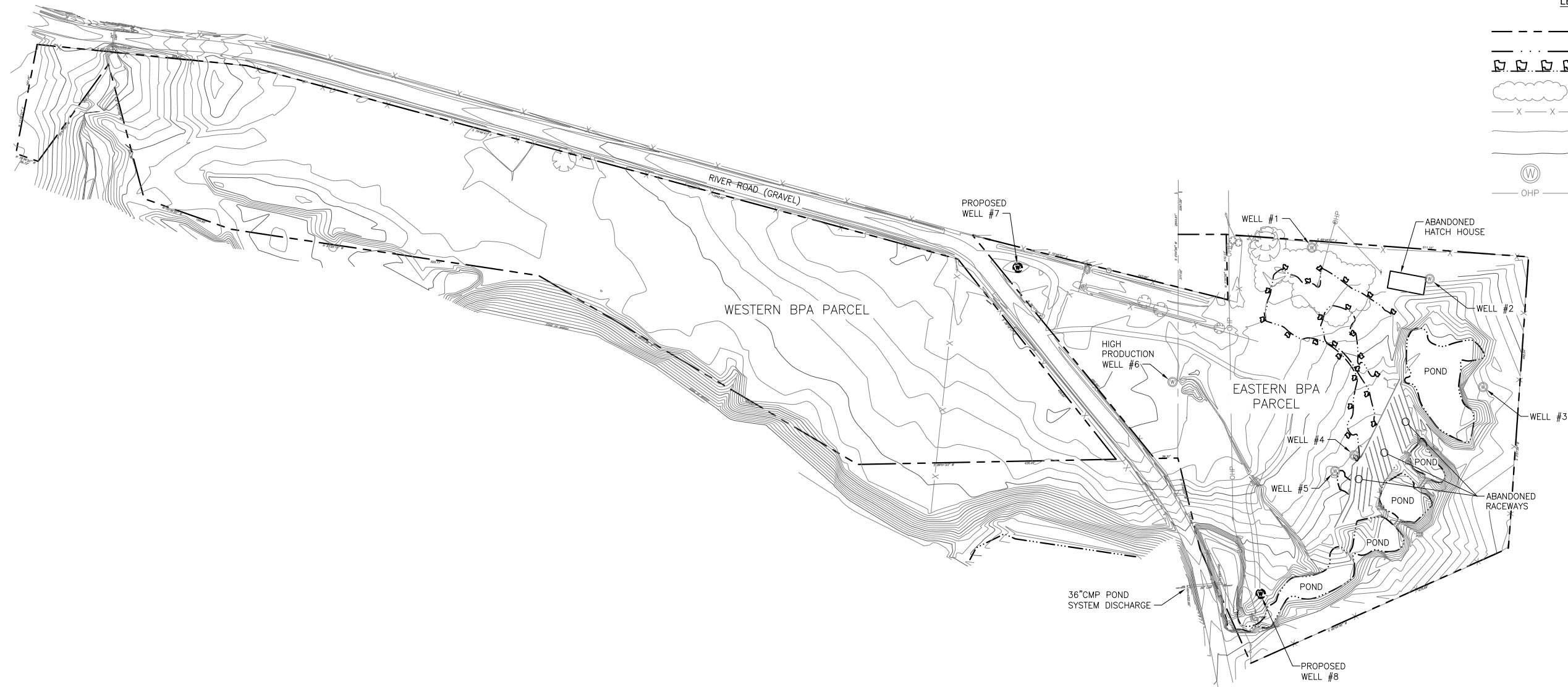
DESIGNED <u>MCR</u>
DRAWN <u>DL</u>
CHECKED <u>MCM</u>
ISSUED DATE <u>XX/XX/XX</u>

DRAWING
<b>CS-1</b>
Sheet 01 of XX
SCALE: NONE

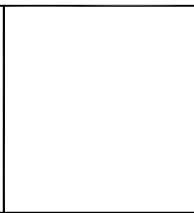
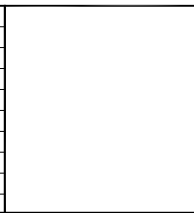


LEGEND

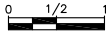
- PROPERTY LINE
- . - . - EDGE OF WATER
-  WETLANDS BOUNDARY
-  BRUSH/TREES
- X - X - FENCE
- 1' CONTOURS
- 5' CONTOURS
-  WELL
- OHP --- OVERHEAD POWER



REV	DATE	BY	DESCRIPTION



WARNING



IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

**McMILLEN, LLC**

1401 SHORELINE DRIVE  
SUITE 100  
BOISE, ID 83702

OFFICE: 208.342.4214  
FAX: 208.342.4216



SHOSHONE-BANNOCK TRIBES

CRYSTAL SPRINGS HATCHERY MASTER PLAN

OVERALL EXISTING SITE PLAN

DESIGNED MCR

DRAWN DL

CHECKED MCM

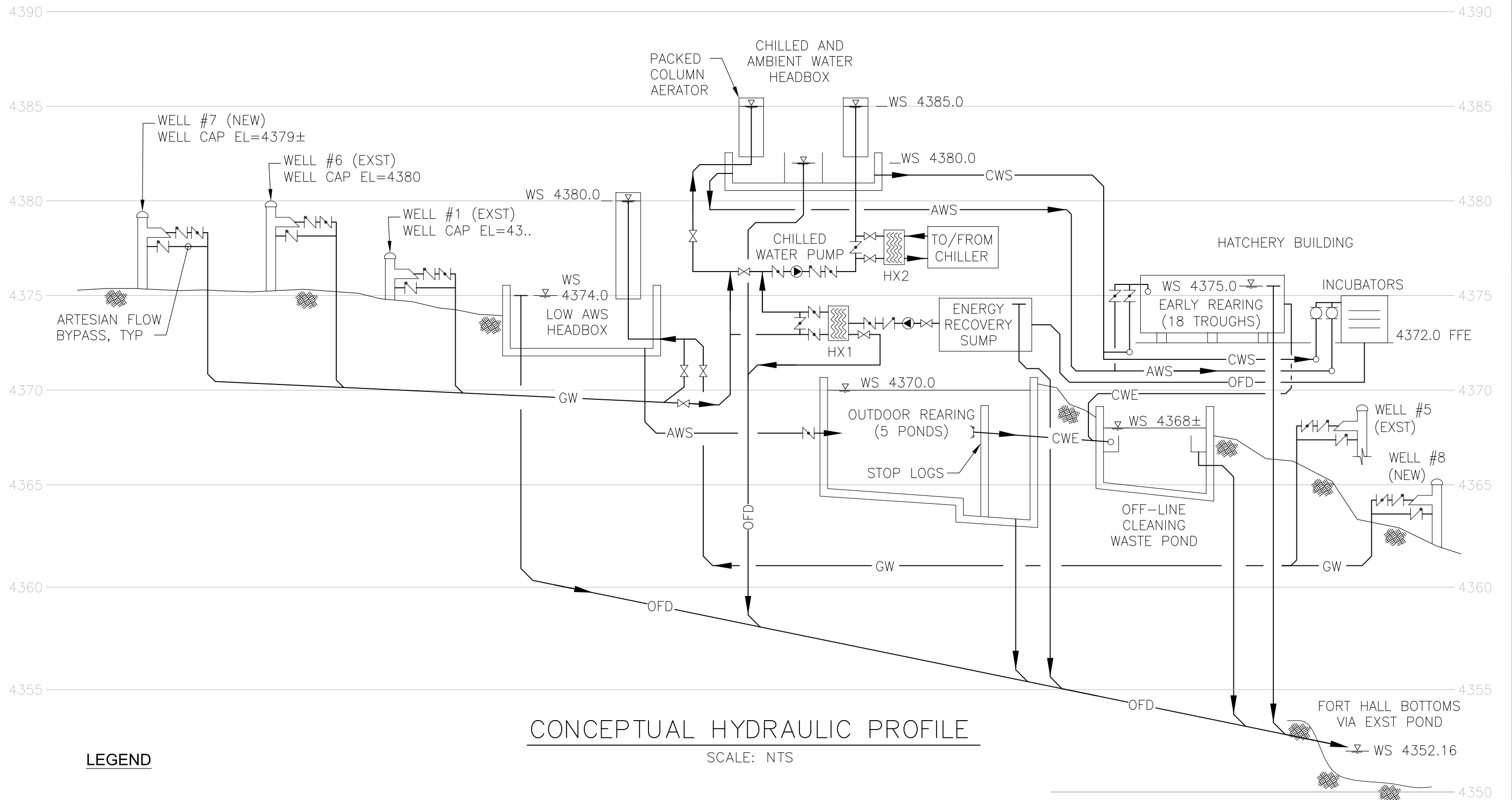
ISSUED DATE XX/XX/XX

DRAWING

**CS-1.1**

Sheet 01 of XX

SCALE: 1"=100'



## CONCEPTUAL HYDRAULIC PROFILE

SCALE: NTS

### LEGEND

AWS	AMBIENT WATER SUPPLY
CWS	CHILLED WATER SUPPLY
FFE	FINISH FLOOR ELEVATION
GW	GROUND WATER
OFD	OVERFLOW DRAIN
WS	WATER SURFACE

**McMILLEN, LLC**

1401 SHORELINE DRIVE  
SUITE 100  
BOISE, ID 83702  
OFFICE: 208.342.4214  
FAX: 208.342.4216

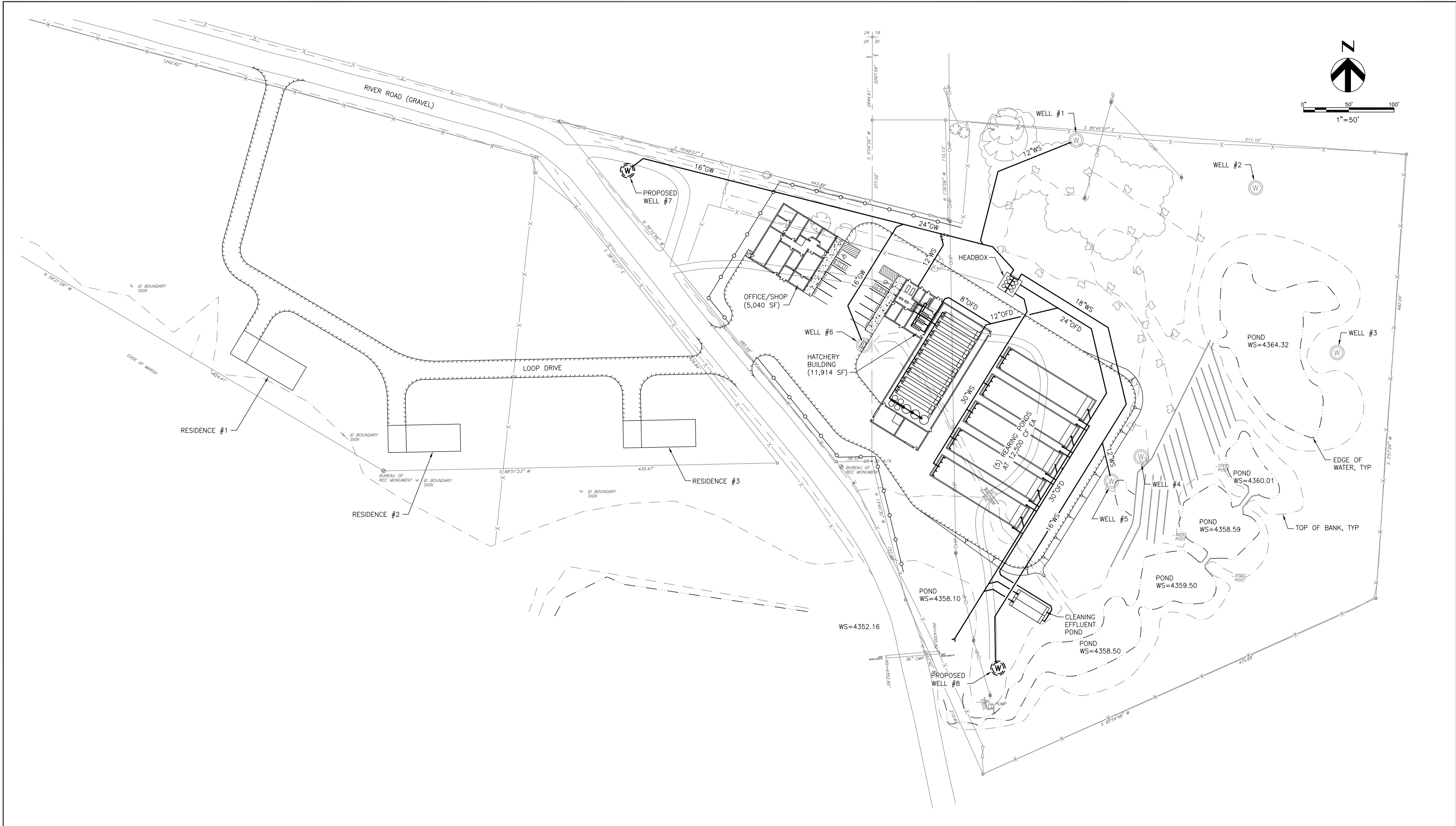
SHOSHONE-BANNOCK TRIBES

CRYSTAL SPRINGS HATCHERY MASTER PLAN

CONCEPTUAL HYDRAULIC PROFILE

**CS-2**





REV	DATE	BY	DESCRIPTION


WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

**McMILLEN, LLC**

1401 SHORELINE DRIVE  
SUITE 100  
BOISE, ID 83702

OFFICE: 208.342.4214  
FAX: 208.342.4216

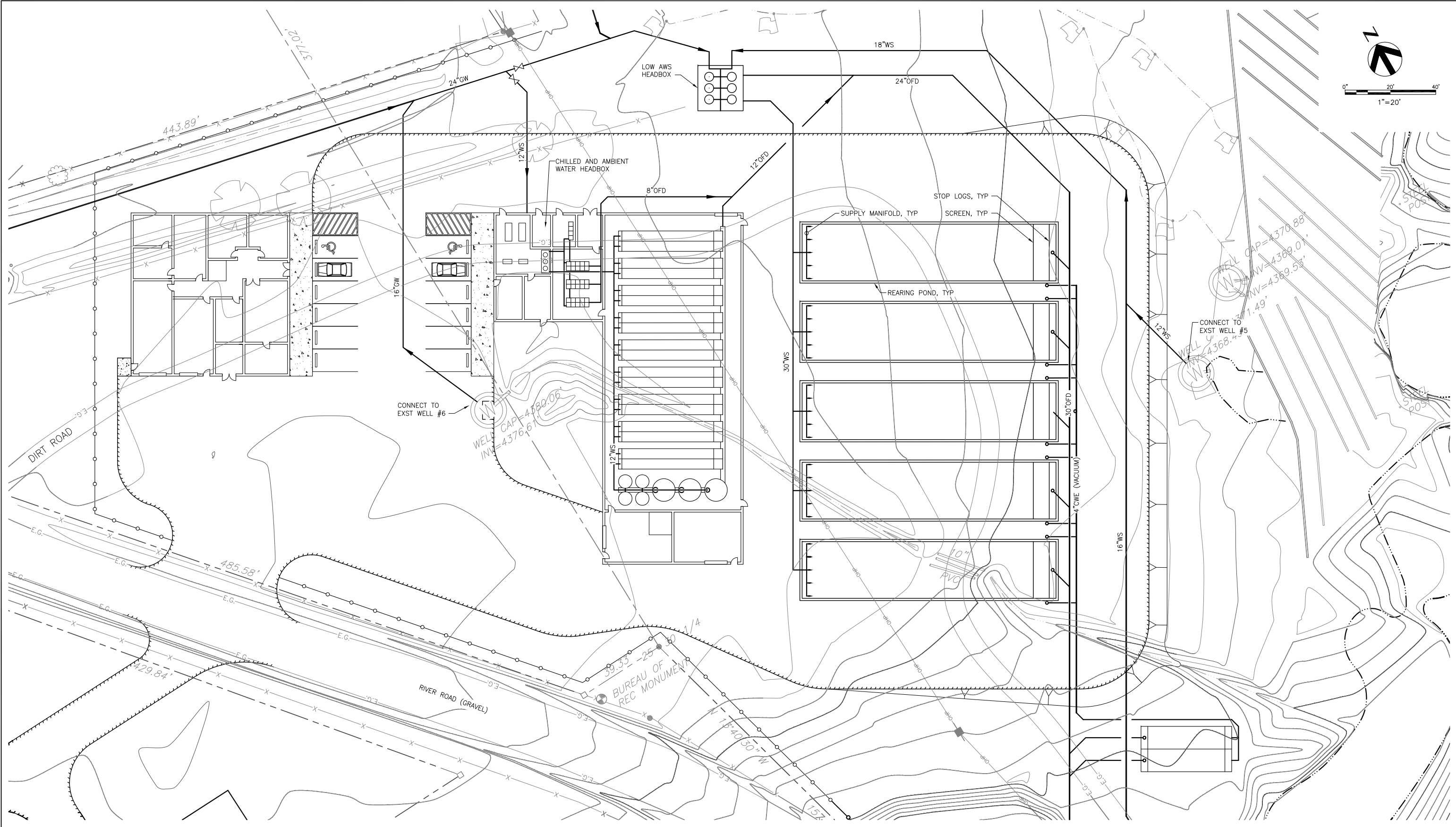


SHOSHONE-BANNOCK TRIBES
CRYSTAL SPRINGS HATCHERY MASTER PLAN
EAST SITE PIPING PLAN

DESIGNED MCR
DRAWN DL
CHECKED MCM
ISSUED DATE XX/XX/XX

DRAWING
CS-4
Sheet 05 of XX
SCALE: 1"=50'





REV	DATE	BY	DESCRIPTION


WARNING

0 1/2

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

**McMILLEN, LLC**

1401 SHORELINE DRIVE  
SUITE 100  
BOISE, ID 83702

OFFICE: 208.342.4214  
FAX: 208.342.4216



SHOSHONE-BANNOCK TRIBES

CRYSTAL SPRINGS HATCHERY MASTER PLAN

ENLARGED SITE PLAN

DESIGNED MCR

DRAWN DL

CHECKED MCM

ISSUED DATE XX/XX/XX

DRAWING

**CS-5**

Sheet 06 of XX

SCALE: 1"=30'

This page is intentionally blank.

---

## *Yankee Fork Design Drawings*

This page is intentionally blank.



**McMILLEN, LLC**

SHOSHONE BANNOCK TRIBES

YANKEE FORK AND PANTHER CREEK  
SPRING CHINOOK SUPPLEMENTATION PROGRAM

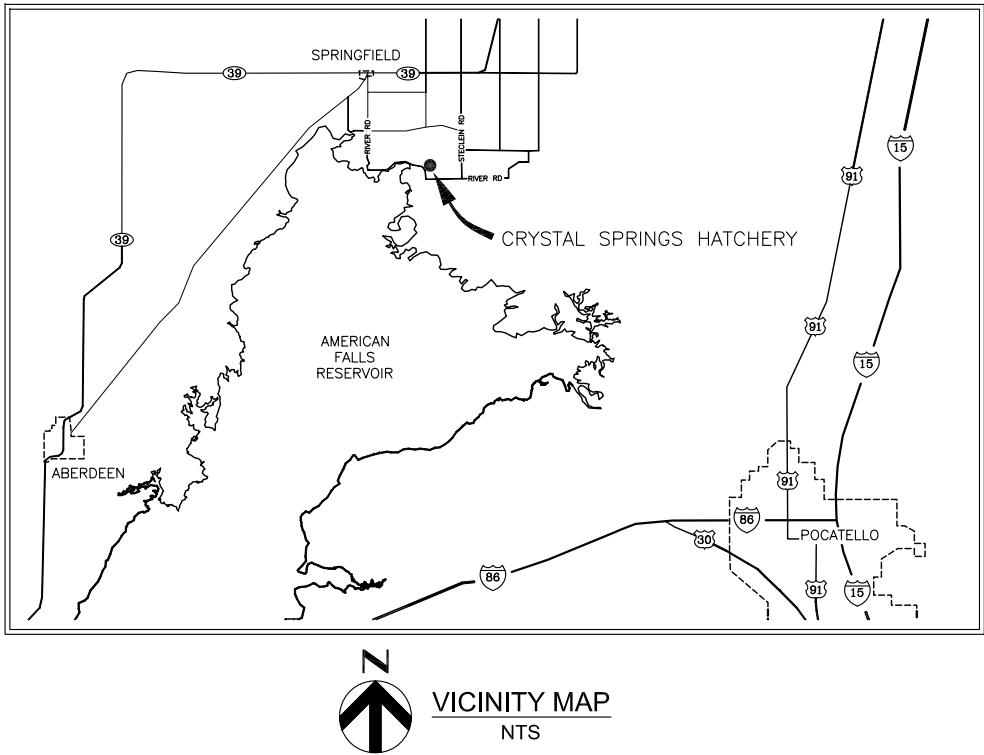
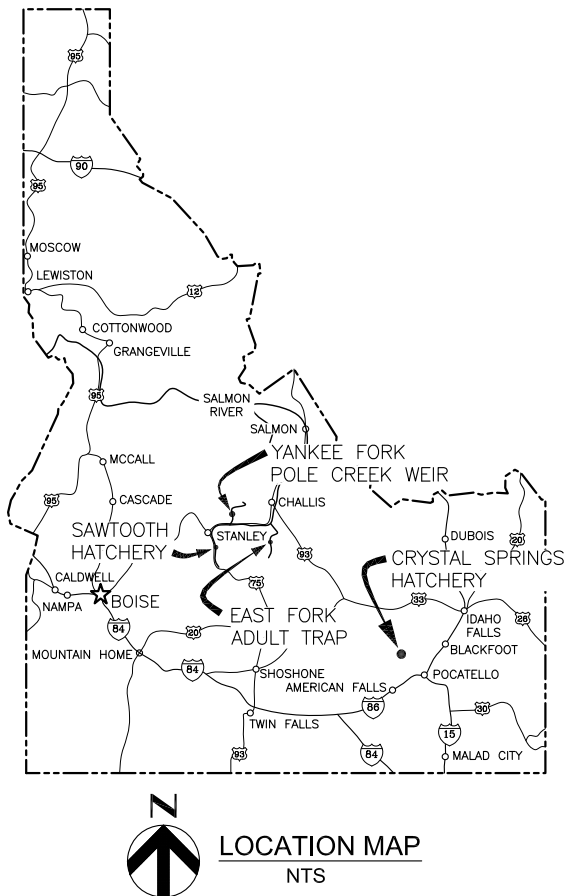
---

MASTER PLAN  
FEBRUARY 2011

---

# SHOSHONE-BANNOCK TRIBES

## YANKEE FORK AND PANTHER CREEK SPRING CHINOOK SUPPLEMENTATION PROGRAM



INDEX OF DRAWINGS	
DRAWING NUMBER	DRAWING TITLE
	COVER SHEET
YF-1	LOCATION MAP, VICINITY MAP AND INDEX OF DRAWINGS
YF-2	EXISTING CONDITIONS SITE PLAN
YF-3	YANKEE FORK TRAP SITE PLAN ALTERNATIVE A
YF-4	YANKEE FORK TRAP SITE PLAN ALTERNATIVE B
YF-5	YANKEE FORK STRESS RELIEF/ADULT HOLDING IMPROVEMENTS
PC-1	PANTHER CREEK STRESS RELIEF/ADULT HOLDING IMPROVEMENTS

REV	DATE	BY	DESCRIPTION


WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

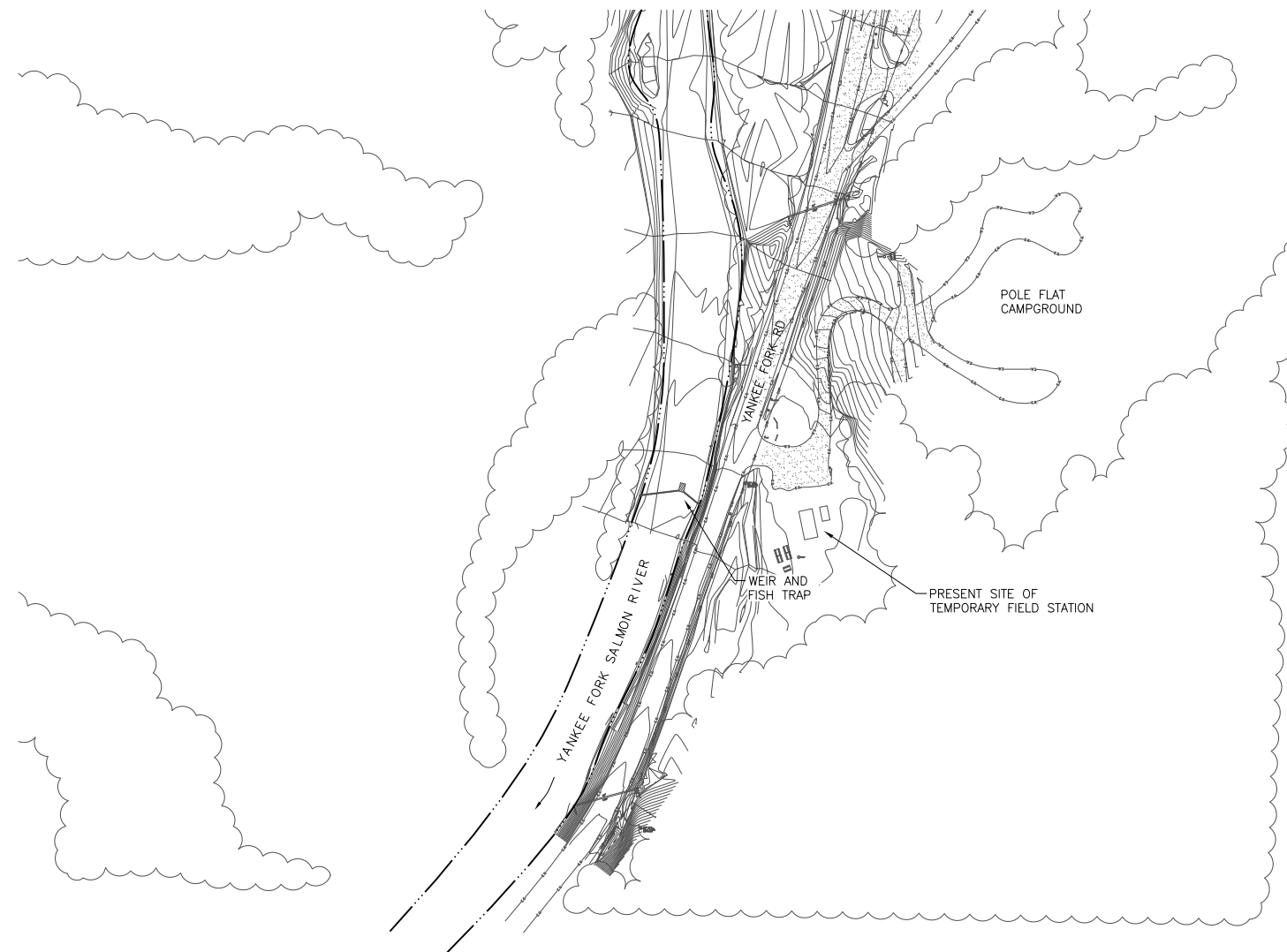
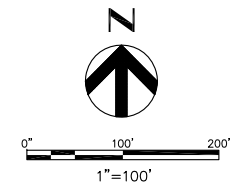
<b>McMILLEN, LLC</b>
THE SONNA BUILDING 910 MAIN ST. SUITE 258 BOISE, ID 83702
OFFICE: 208.342.4214 FAX: 208.342.4216




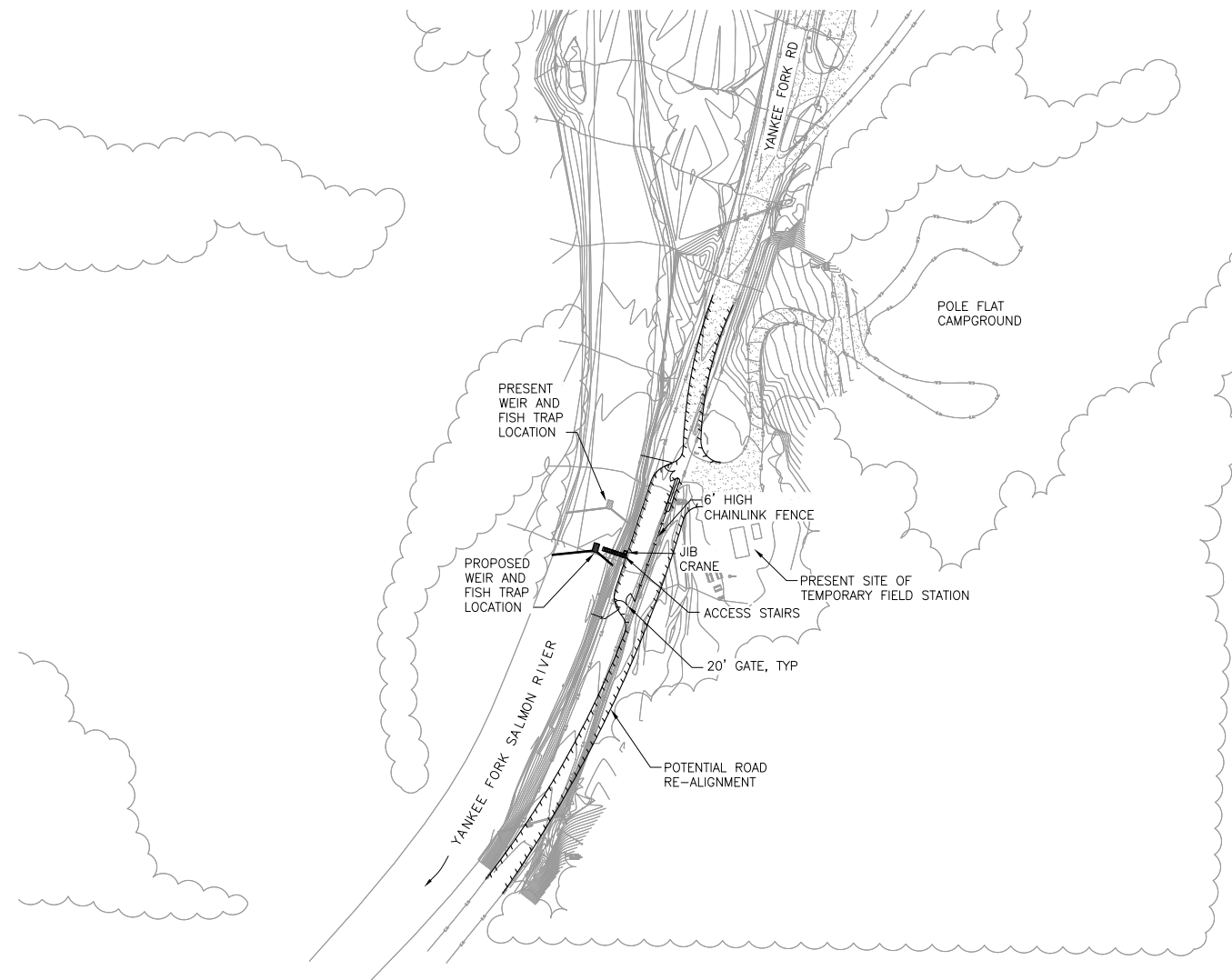
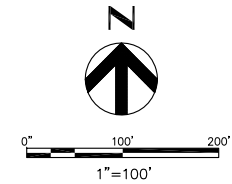
SHOSHONE-BANNOCK TRIBES
YANKEE FORK AND PANTHER CREEK SPRING CHINOOK SUPPLEMENTATION PROGRAM
LOCATION MAP, VICINITY MAP AND INDEX OF DRAWINGS

DESIGNED _____
DRAWN _____
CHECKED _____
ISSUED DATE _____

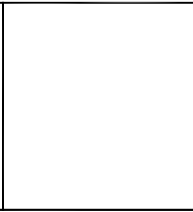
DRAWING
YF-1
01
SCALE: NONE



						<div>WARNING</div> <div><div>01/21</div></div> <div>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</div>	<div>McMILLEN, LLC</div> <div>THE SONNA BUILDING 910 MAIN ST. SUITE 258 BOISE, ID 83702</div> <div>OFFICE: 208.342.4214 FAX: 208.342.4216</div>	<div></div>	SHOSHONE-BANNOCK TRIBES	DESIGNED _____	DRAWING  YF-2  XX  SCALE: 1"=100'
									YANKEE FORK AND PANTHER CREEK SPRING CHINOOK SUPPLEMENTATION PROGRAM	DRAWN _____	
									YANKEE FORK TRAP EXISTING CONDITIONS SITE PLAN	CHECKED _____	
										ISSUED DATE _____	
REV	DATE	BY	DESCRIPTION								



REV	DATE	BY	DESCRIPTION



WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

**McMILLEN, LLC**

THE SONNA BUILDING  
910 MAIN ST. SUITE 258  
BOISE, ID 83702

OFFICE: 208.342.4214  
FAX: 208.342.4216



SHOSHONE-BANNOCK TRIBES

YANKEE FORK AND PANTHER CREEK  
SPRING CHINOOK SUPPLEMENTATION PROGRAM

YANKEE FORK TRAP  
SITE PLAN ALTERNATIVE A

DESIGNED \_\_\_\_\_

DRAWN \_\_\_\_\_

CHECKED \_\_\_\_\_

ISSUED DATE \_\_\_\_\_

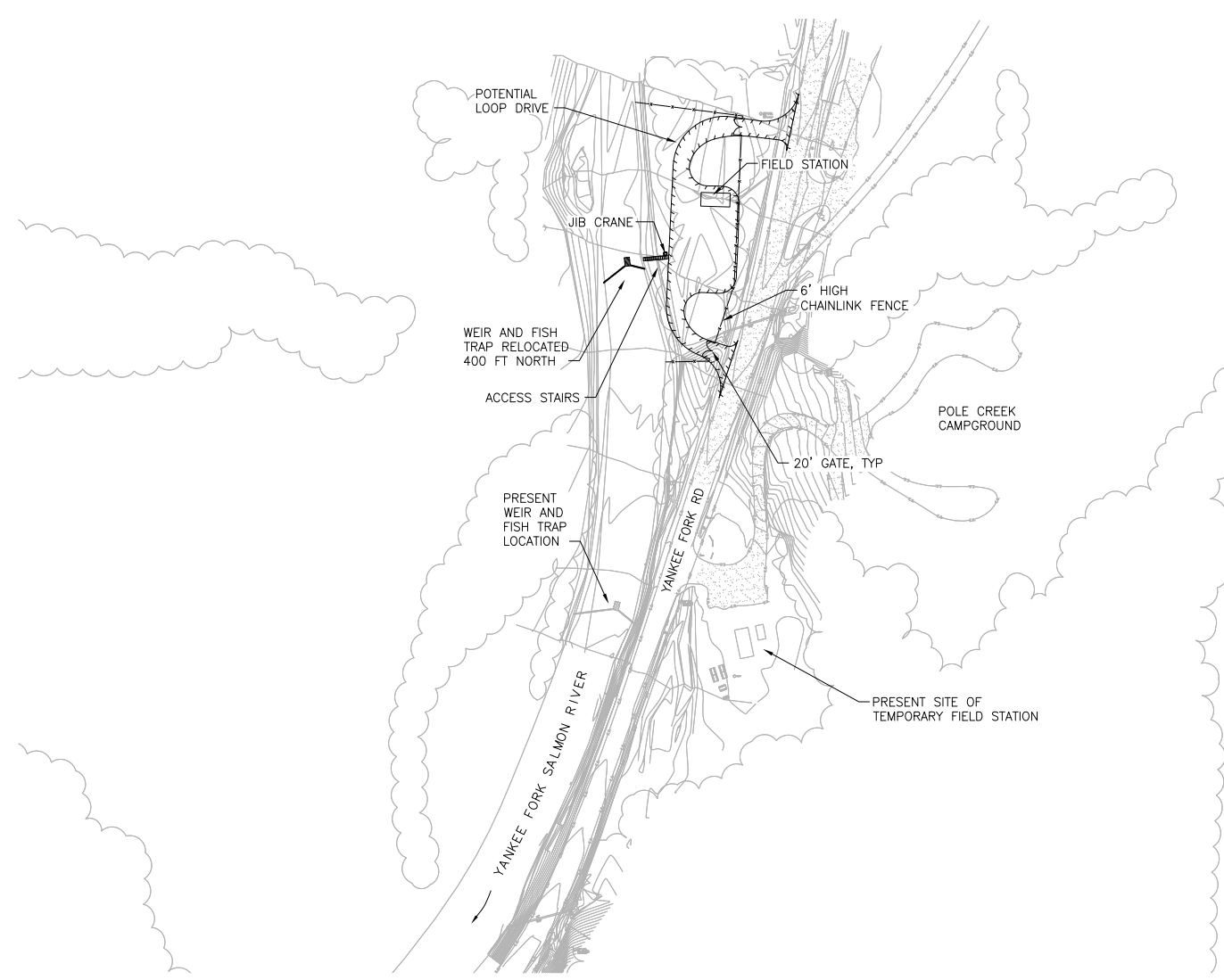
DRAWING

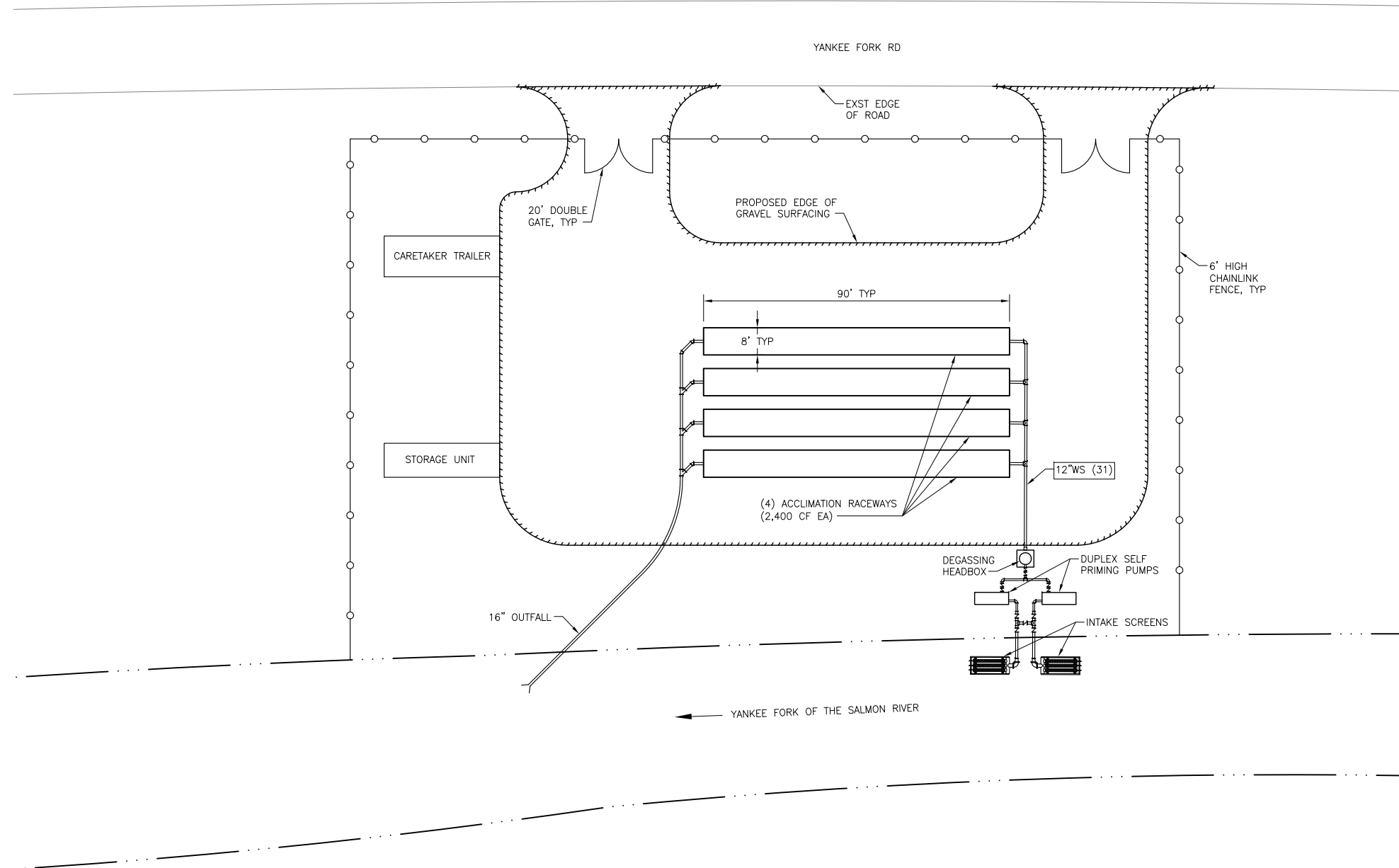
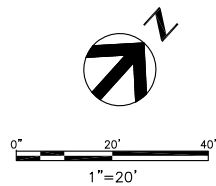
**YF-3**

XX

SCALE: 1"=100'



[illegible]



REV	DATE	BY	DESCRIPTION



WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

**McMILLEN, LLC**

THE SONNA BUILDING  
910 MAIN ST. SUITE 258  
BOISE, ID 83702

OFFICE: 208.342.4214  
FAX: 208.342.4216



SHOSHONE-BANNOCK TRIBES

YANKEE FORK AND PANTHER CREEK  
SPRING CHINOOK SUPPLEMENTATION PROGRAM

YANKEE FORK  
STRESS RELIEF/ADULT HOLDING IMPROVEMENTS

DESIGNED \_\_\_\_\_

DRAWN \_\_\_\_\_

CHECKED \_\_\_\_\_

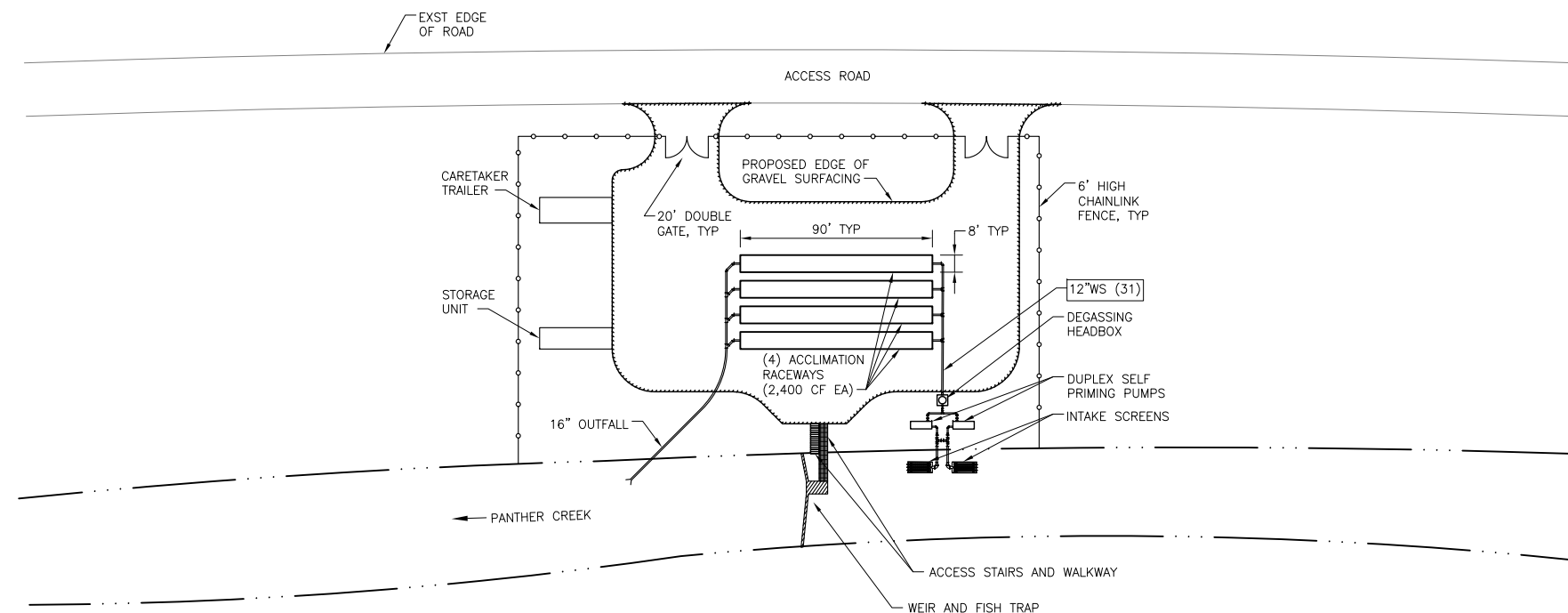
ISSUED DATE \_\_\_\_\_

DRAWING

**YF-5**

XX

SCALE: 1"=20'

[illegible]

This page is intentionally blank.

## **Appendix H**

---

### *Detailed Program Cost Estimates*

This page is intentionally blank.

### Appendix H-1: Estimated Construction Costs (Detailed) by Division – Crystal Springs Fish Hatchery

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 01 – General Requirements</b>						
Mobilization/Demobilization, Bond, Insurance, etc.	1	%	0.1	\$852,745	25.0%	\$1,065,931
<b>Division 02 – Existing Conditions</b>						
Demolition of Existing Structures	1	LS	\$20,000.00	\$20,000	25.0%	\$25,000
<b>Division 03 – Concrete</b>						
Concrete in Place – Hatchery Floor Slab – 5” thick	185	CY	\$500.00	\$92,500	10.0%	\$101,750
Concrete in Place – Wall Footings	30	CY	\$500.00	\$15,000	10.0%	\$16,500
Concrete in Place – Pond Walls	425	CY	\$850.00	\$361,250	10.0%	\$397,375
Concrete in Place – Pond Slabs	630	CY	\$500.00	\$315,000	10.0%	\$346,500
Concrete in Place – Office/Shop Building Floor Slab	60	CY	\$850.00	\$51,000	10.0%	\$56,100
Concrete in Place – Well House Floor Slabs (6)	32	CY	\$500.00	\$16,000	10.0%	\$17,600
Concrete in Place – Floor Trench	40	CY	\$850.00	\$34,000	10.0%	\$37,400
Concrete in Place – OLSB Walls	35	CY	\$850.00	\$29,750	10.0%	\$32,725
Concrete in Place – OLSB Slabs	85	CY	\$500.00	\$42,500	10.0%	\$46,750
Headbox Slab	15	CY	\$500.00	\$7,500	10.0%	\$8,250
Headbox Walls	25	CY	\$650.00	\$16,250	10.0%	\$17,875
<b>Division 04 – Masonry</b>						
Not Used						
<b>Division 05 – Metals</b>						
Metal Building – Hatchery	11,914	SF	\$100.00	\$1,191,400	25.0%	\$1,489,250
Metal Building – Office/Shop/Storage	5,040	SF	\$100.00	\$504,000	25.0%	\$630,000
Predator Net Over at Outdoor Ponds	24,000	SF	\$5.00	\$120,000	25.0%	\$150,000
Predator Fence and Gates at Raceways	1	LS	\$150,000.00	\$150,000	25.0%	\$187,500
Grating For Floor Trenches (Galv)	420	SF	\$35.00	\$14,700	25.0%	\$18,375
Rearing Trough Screens (Alum)	650	SF	\$25.00	\$16,250	25.0%	\$20,313
Hand Railing (Galv)	125	LF	\$45.00	\$5,625	25.0%	\$7,031
Pond Screens (Alum)	2,000	SF	\$20.00	\$40,000	25.0%	\$50,000
High Level Headbox (Alum)	1	LS	\$25,000.00	\$25,000	25.0%	\$31,250
48-inch Vacuum Degassers	5	EA	\$8,000.00	\$40,000	25.0%	\$50,000
Pond Screen and Stop Log Guide Embeds	1,200	LF	\$15.00	\$18,000	25.0%	\$22,500
Gratings at end of Ponds	375	SF	\$35.00	\$13,125	25.0%	\$16,406
<b>Division 06 – Wood and Plastic</b>						
Stop Logs	1	LS	\$4,000.00	\$4,000	10.0%	\$4,400

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 07 – Thermal and Moisture Protection</b>						
Insulation – Hatchery	11,914	SF	\$16.00	\$190,624	25.0%	\$238,280
Insulation – Shop/Storage	5,040	SF	\$16.00	\$80,640	25.0%	\$100,800
<b>Division 08 – Openings</b>						
Doors	30	EA	\$500.00	\$15,000	25.0%	\$18,750
Overhead Doors	4	EA	\$3,000.00	\$12,000	25.0%	\$15,000
Windows	1	LS	\$25,000.00	\$25,000	25.0%	\$31,250
Vents and Louvers	1	LS	\$12,000.00	\$12,000	25.0%	\$15,000
<b>Division 09 – Finishes</b>						
Floor Sealant	9,000	SF	\$0.20	\$1,800	25.0%	\$2,250
Interior Walls – Hatchery	2,000	SF	\$20.00	\$40,000	25.0%	\$50,000
Interior Walls – Office/Shop/Storage	4,000	SF	\$20.00	\$80,000	25.0%	\$100,000
Misc. Painting	1	LS	\$25,000.00	\$25,000	25.0%	\$31,250
<b>Division 10 – Specials</b>						
New Residences	3	EA	\$200,000.00	\$600,000	25.0%	\$750,000
Well Houses	5	EA	\$25,000.00	\$125,000	25.0%	\$156,250
<b>Division 11 – Equipment</b>						
7 to 8 cfs Well Pumps for Wells 6, 7 & 8 – 75 hp	3	EA	\$40,000.00	\$120,000	25.0%	\$150,000
3 to 4 cfs Well Pumps for Wells 1 & 5 – 40 hp	2	EA	\$30,000.00	\$60,000	25.0%	\$75,000
YCT Broodstock Holding – 6 foot Round Tanks	4	EA	\$3,000.00	\$12,000	25.0%	\$15,000
YCT – 10 foot Round Tanks	3	EA	\$6,000.00	\$18,000	25.0%	\$22,500
FRP Early Rearing Troughs	18	EA	\$8,000.00	\$144,000	10.0%	\$158,400
Marisource Incubators 4 Stake Modules	48	EA	\$800.00	\$38,400	10.0%	\$42,240
Walk-in Freezer	1	LS	\$15,000.00	\$15,000	10.0%	\$16,500
Chiller – 60 tons	2	LS	\$75,000.00	\$150,000	25.0%	\$187,500
Energy Recovery Pumps and HX	1	LS	\$25,000.00	\$25,000	25.0%	\$31,250
Flow Meters	5	EA	\$4,000.00	\$20,000	25.0%	\$25,000
Chem. Food System	1	LS	\$15,000.00	\$15,000	10.0%	\$16,500
Chem. Storage Secondary Containment	1	LS	\$2,000.00	\$2,000	10.0%	\$2,200
<b>Division 22 – Plumbing</b>						
Domestic Water Plumbing and Fixtures – Hatchery	1	LS	\$20,000.00	\$20,000	25.0%	\$25,000
Domestic Water Plumbing and Fixtures – Shop	1	LS	\$15,000.00	\$15,000	25.0%	\$18,750
Sanitary Plumbing and Fixtures – Office	1	LS	\$30,000.00	\$30,000	25.0%	\$37,500
Floor Drains – Hatchery	1	LS	\$10,000.00	\$10,000	25.0%	\$12,500



Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 23 - Heating, Ventilating and AC</b>						
Heat and Ventilate Hatchery Building	11,914	SF	\$8.00	\$95,312	25.0%	\$119,140
Office Air Conditioning	500	SF	\$4.00	\$2,000	25.0%	\$2,500
Heat and Ventilate Shop/Storage Building	5,040	SF	\$8.00	\$40,320	25.0%	\$50,400
Heat and Ventilate Well Houses	6	EA	\$2,000.00	\$12,000	25.0%	\$15,000
<b>Division 26 - Electrical</b>						
Building Power and Lighting	16,954	SF	\$8.00	\$135,632	25.0%	\$169,540
Power to Well Pumps	5	EA	\$25,000.00	\$125,000	25.0%	\$156,250
Yard Lighting	1	LS	\$20,000.00	\$20,000	25.0%	\$25,000
Emergency Generator	1	LS	\$100,000.00	\$100,000	25.0%	\$125,000
<b>Division 31 - Earthwork</b>						
Site Clearing	2.7	Acre	\$5,000.00	\$13,500	20.0%	\$16,200
Earthwork Cut and Fill	5,500	CY	\$10.00	\$55,000	20.0%	\$66,000
Structural Backfill & Compaction	3,600	CY	\$30.00	\$108,000	20.0%	\$129,600
Erosion Control Facility	1	LS	\$30,000.00	\$30,000	20.0%	\$36,000
Erosion Control Drain Line	1	LS	\$15,000.00	\$15,000	20.0%	\$18,000
Roadway Base (1-1/2" Gravel)	2,000	CY	\$16.00	\$32,000	20.0%	\$38,400
Roadway Top Fill (3/4" Gravel)	500	CY	\$25.00	\$12,500	20.0%	\$15,000
<b>Division 32 - Exterior Improvements</b>						
Bollards	8	EA	\$500.00	\$4,000	20.0%	\$4,800
3" Hot Mix Asphalt	7,700	SY	\$25.00	\$192,500	20.0%	\$231,000
Concrete Paving	20	SY	\$35.00	\$700	20.0%	\$840
<b>Division 33 - Utilities</b>						
Power Service	1	LS	\$50,000.00	\$50,000	20.0%	\$60,000
Communications	1	LS	\$15,000.00	\$15,000	20.0%	\$18,000
Water Pump, Pressure Tank and Distribution	1	LS	\$40,000.00	\$40,000	20.0%	\$48,000
Sanitary Drainfields	5	EA	\$10,000.00	\$50,000	20.0%	\$60,000
<b>Division 40 - Instrumentation and Controls</b>						
Facility Monitoring and Controls	1	LS	\$150,000.00	\$150,000	25.0%	\$187,500
<b>Division 41 - Matl. Processing &amp; Handling</b>						
Not Used						
<b>Division 42 - Process Water Systems</b>						
1" PVC, SCH 40 to Incubators	120	LF	\$10.00	\$1,200	20.0%	\$1,440
3" PVC, SCH 40 to Early Rearing Troughs	160	LF	\$15.00	\$2,400	20.0%	\$2,880
12" PVC, SCH 40 to Raceways	100	LF	\$60.00	\$6,000	20.0%	\$7,200

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
6" PVC, SCH 40 CWE to OLSB	500	LF	\$30.00	\$15,000	20.0%	\$18,000
12" PVC, SCH 40, Pond Drains	60	LF	\$60.00	\$3,600	20.0%	\$4,320
12" Incubation/Early Rearing Header	200	LF	\$72.00	\$14,400	20.0%	\$17,280
12" Hatchery Drain	60	LF	\$60.00	\$3,600	20.0%	\$4,320
12" ASTM A53 SCH 40 Well Head Pipe	100	LF	\$120.00	\$12,000	20.0%	\$14,400
12" HDPE	240	LF	\$60.00	\$14,400	20.0%	\$17,280
16" HDPE	730	LF	\$90.00	\$65,700	20.0%	\$78,840
24" HDPE	150	LF	\$144.00	\$21,600	20.0%	\$25,920
24" Degasser Header	1	LS	\$10,000.00	\$10,000	20.0%	\$12,000
30" Supply Header	240	LF	\$180.00	\$43,200	20.0%	\$51,840
30" Drain Manifold	280	LF	\$180.00	\$50,400	20.0%	\$60,480
Pipe Fittings	1	LS	\$120,000.00	\$120,000	20.0%	\$144,000
1" Ball Valves	36	EA	\$50.00	\$1,800	20.0%	\$2,160
3" Btly Valves	24	EA	\$250.00	\$6,000	20.0%	\$7,200
6" Btly Valves	2	EA	\$500.00	\$1,000	20.0%	\$1,200
12" Btly Valves	18	EA	\$1,500.00	\$27,000	20.0%	\$32,400
Well Drilling – 20-inch 200 Feet Deep	2	EA	\$100,000.00	\$200,000	20.0%	\$240,000
Pump Control Valves	5	EA	\$3,000.00	\$15,000	20.0%	\$18,000
12" Check Valves	5	EA	\$1,500.00	\$7,500	20.0%	\$9,000
Air Vac Valves	5	EA	\$1,000.00	\$5,000	20.0%	\$6,000
Truck Fill Assembly	1	LS	\$2,000.00	\$2,000	20.0%	\$2,400
Drain Manholes	2	EA	\$3,000.00	\$6,000	20.0%	\$7,200
Pipe Supports	1	LS	\$20,000.00	\$20,000	20.0%	\$24,000
<b>Project Subtotal (without Division 01)</b>						<b>\$8,527,450</b>
<b>Project Subtotal</b>						<b>\$9,593,381</b>

**Notes & Assumptions:**

- Costs shown in 2010 dollars

**Appendix H-2: Estimated Construction Costs (Detailed) by Division – Yankee Fork Adult Trapping**

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 01 – General Requirements</b>						
Mobilization/Demobilization, Bond, Insurance, etc.	1	%	0.1	\$38,437	25.0%	\$48,046
<b>Division 02 – Existing Conditions</b>						
Demolition of Existing Structures	1	LS	\$0.00	\$0	25.0%	\$0
<b>Division 03 – Concrete</b>						
Abutments	40	CY	\$1,000.00	\$40,000	10.0%	\$44,000
Jib Crane Equipment Base	6	CY	\$650.00	\$3,900	10.0%	\$4,290
<b>Division 04 – Masonry</b>						
Not Used						
<b>Division 05 – Metals</b>						
Alum. Stairs to Weir	1	LS	\$5,000.00	\$5,000	25.0%	\$6,250
Grip Strut Walkway w/ Rails to Trap Box	100	SF	\$100.00	\$10,000	25.0%	\$12,500
<b>Division 06 – Wood and Plastic</b>						
Not Used						
<b>Division 07 – Thermal and Moisture Protection</b>						
Not Used						
<b>Division 08 – Openings</b>						
Not Used						
<b>Division 09 – Finishes</b>						
Misc. Painting	1	LS	\$3,000.00	\$3,000	25.0%	\$3,750
<b>Division 10 – Specials</b>						
Storage Shed	1	EA	\$20,000.00	\$20,000	25.0%	\$25,000
Work Tables	1	LS	\$1,000.00	\$1,000	25.0%	\$1,250
Overhead Cable with Anchors	1	LS	\$10,000.00	\$10,000	25.0%	\$12,500
<b>Division 11 – Equipment</b>						
Jib Crane w/ Manual Trolley and Hoist	1	EA	\$15,000.00	\$15,000	25.0%	\$18,750
<b>Division 22 – Plumbing</b>						
Not Used						
<b>Division 23 – Heating, Ventilating and AC</b>						
Not Used						

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 26 - Electrical</b>						
Yard Lighting	1	LS	\$10,000.00	\$10,000	25.0%	\$12,500
Emergency Generator	1	LS	\$20,000.00	\$20,000	25.0%	\$25,000
<b>Division 31 - Earthwork</b>						
Site Clearing	0.25	Acre	\$5,000.00	\$1,250	20.0%	\$1,500
Earthwork Cut and Fill	500	CY	\$10.00	\$5,000	20.0%	\$6,000
Structural Backfill & Compaction	200	CY	\$30.00	\$6,000	20.0%	\$7,200
Erosion Control Facility	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
Roadway Base (1-1/2" Gravel)	700	CY	\$16.00	\$11,200	20.0%	\$13,440
Roadway Top Fill (3/4" Gravel)	250	CY	\$25.00	\$6,250	20.0%	\$7,500
Rock Sill with Chainlink Reinf. For Weir	1	LS	\$50,000.00	\$50,000	20.0%	\$60,000
<b>Division 32 - Exterior Improvements</b>						
3" Hot Mix Asphalt	2,530	SY	\$25.00	\$63,250	20.0%	\$75,900
Fencing - 6' Chainlink	280	LF	\$15.00	\$4,200	20.0%	\$5,040
<b>Division 33 - Utilities</b>						
Power Service	1	LS	\$25,000.00	\$25,000	20.0%	\$30,000
Communications	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
<b>Division 40 - Instrumentation and Controls</b>						
Facility Monitoring and Controls - At Acclimation Site	0	LS	\$20,000.00	\$20,000	25.0%	\$0
<b>Division 41 - Matl. Processing &amp; Handling</b>						
Not Used						
<b>Project Subtotal (without Division 01)</b>						<b>\$384,370</b>
<b>Project Subtotal</b>						<b>\$432,416</b>

**Notes & Assumptions:**

- Costs shown in 2010 dollars

### Appendix H-3: Estimated Construction Costs (Detailed) by Division – Panther Creek Adult Trapping

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 01 – General Requirements</b>						
Mobilization/Demobilization, Bond, Insurance, etc.	1	%	0.1	\$51,877	25.0%	\$64,846
<b>Division 02 – Existing Conditions</b>						
Demolition of Existing Structures	1	LS	\$0.00	\$0	25.0%	\$0
<b>Division 03 – Concrete</b>						
Abutments	40	CY	\$1,000.00	\$40,000	10.0%	\$44,000
Jib Crane Equipment Base	6	CY	\$650.00	\$3,900	10.0%	\$4,290
<b>Division 04 – Masonry</b>						
Not Used						
<b>Division 05 – Metals</b>						
Alum. Stairs to Weir	1	LS	\$5,000.00	\$5,000	25.0%	\$6,250
Fixed Picket Weir Assembly	1	LS	\$150,000.00	\$150,000	25.0%	\$187,500
Live Trap Box	1	LS	\$30,000.00	\$30,000	25.0%	\$37,500
Grip Strut Walkway w/ Rails to Trap Box	100	SF	\$100.00	\$10,000	25.0%	\$12,500
<b>Division 06 – Wood and Plastic</b>						
Not Used						
<b>Division 07 – Thermal and Moisture Protection</b>						
Not Used						
<b>Division 08 – Openings</b>						
Not Used						
<b>Division 09 – Finishes</b>						
Misc. Painting	1	LS	\$3,000.00	\$3,000	25.0%	\$3,750
<b>Division 10 – Specials</b>						
Storage Shed	1	EA	\$20,000.00	\$20,000	25.0%	\$25,000
Work Tables	1	LS	\$1,000.00	\$1,000	25.0%	\$1,250
Overhead Cable with Anchors	1	LS	\$10,000.00	\$10,000	25.0%	\$12,500
<b>Division 11 – Equipment</b>						
Jib Crane w/ Manual Trolley and Hoist	1	EA	\$15,000.00	\$15,000	25.0%	\$18,750
<b>Division 22 – Plumbing</b>						
Not Used						

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 23 - Heating, Ventilating and AC</b>						
Not Used						
<b>Division 26 - Electrical</b>						
Yard Lighting	1	LS	\$10,000.00	\$10,000	25.0%	\$12,500
Emergency Generator	1	LS	\$20,000.00	\$20,000	25.0%	\$25,000
<b>Division 31 - Earthwork</b>						
Site Clearing	0.25	Acre	\$5,000.00	\$1,250	20.0%	\$1,500
Earthwork Cut and Fill	500	CY	\$10.00	\$5,000	20.0%	\$6,000
Structural Backfill & Compaction	200	CY	\$30.00	\$6,000	20.0%	\$7,200
Erosion Control Facility	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
Roadway Base (1-1/2" Gravel)	200	CY	\$16.00	\$3,200	20.0%	\$3,840
Roadway Top Fill (3/4" Gravel)	80	CY	\$25.00	\$2,000	20.0%	\$2,400
Rock Sill with Chainlink Reinf. For Weir	1	LS	\$50,000.00	\$50,000	20.0%	\$60,000
<b>Division 32 - Exterior Improvements</b>						
3" Hot Mix Asphalt	0	SY	\$25.00	\$0	20.0%	\$0
Fencing - 6' Chainlink	280	LF	\$15.00	\$4,200	20.0%	\$5,040
<b>Division 33 - Utilities</b>						
Power Service	1	LS	\$25,000.00	\$25,000	20.0%	\$30,000
Communications	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
<b>Division 40 - Instrumentation and Controls</b>						
Facility Monitoring and Controls - At Acclimation Site	0	LS	\$20,000.00	\$20,000	25.0%	\$0
<b>Division 41 - Matl. Processing &amp; Handling</b>						
Not Used						
<b>Project Subtotal (without Division 01)</b>						<b>\$518,770</b>
<b>Project Subtotal</b>						<b>\$583,616</b>

**Notes & Assumptions:**

- Costs shown in 2010 dollars

**Appendix H-4: Estimated Construction Costs (Detailed) by Division – Yankee Fork & Panther Creek Adult Holding & Juvenile Acclimation Sites**

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 01 – General Requirements</b>						
Mobilization/Demobilization, Bond, Insurance, etc.	1	%	0.1	\$67,374	25.0%	\$84,218
<b>Division 02 – Existing Conditions</b>						
Demolition of Existing Structures	1	LS	\$0.00	\$0	25.0%	\$0
<b>Division 03 – Concrete</b>						
Headbox Slab	1	CY	\$500.00	\$500	10.0%	\$550
<b>Division 04 – Masonry</b>						
Not Used						
<b>Division 05 – Metals</b>						
Intake Screen – 3 cfs Passive Type	2	LS	\$9,000.00	\$18,000	25.0%	\$22,500
Predator Barriers	1	LS	\$50,000.00	\$50,000	25.0%	\$62,500
<b>Division 06 – Wood and Plastic</b>						
Not Used						
<b>Division 07 – Thermal and Moisture Protection</b>						
Not Used						
<b>Division 08 – Openings</b>						
Not Used						
<b>Division 09 – Finishes</b>						
Misc. Painting	1	LS	\$2,000.00	\$2,000	25.0%	\$2,500
<b>Division 10 – Specials</b>						
Storage Shed	1	EA	\$20,000.00	\$20,000	25.0%	\$25,000
Trailer for On-Site Staff	1	EA	\$20,000.00	\$20,000	25.0%	\$25,000
<b>Division 11 – Equipment</b>						
River Water Pumps – 30 hp	2	EA	\$30,000.00	\$60,000	25.0%	\$75,000
8' x 90' Fiberglass Raceways	4	EA	\$40,000.00	\$160,000	25.0%	\$200,000
Flow Meters	4	EA	\$2,000.00	\$8,000	25.0%	\$10,000
Degassing Headbox	1	LS	\$15,000.00	\$15,000	10.0%	\$16,500
<b>Division 22 – Plumbing</b>						
Not Used						
<b>Division 23 – Heating, Ventilating and AC</b>						
Not Used						

Item	Quantity	Unit	Unit Cost	Subtotal	Contingency	Total Estimated Cost
<b>Division 26 - Electrical</b>						
Yard Lighting	1	LS	\$10,000.00	\$10,000	25.0%	\$12,500
Emergency Generator	1	LS	\$50,000.00	\$50,000	25.0%	\$62,500
Pump Power	1	LS	\$15,000.00	\$15,000	25.0%	\$18,750
<b>Division 31 - Earthwork</b>						
Site Clearing	0.5	Acre	\$5,000.00	\$2,500	20.0%	\$3,000
Earthwork Cut and Fill	500	CY	\$10.00	\$5,000	20.0%	\$6,000
Structural Backfill & Compaction	90	CY	\$30.00	\$2,700	20.0%	\$3,240
Erosion Control Facility	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
Roadway Base (1-1/2" Gravel)	500	CY	\$20.00	\$10,000	20.0%	\$12,000
Roadway Top Fill (3/4" Gravel)	120	CY	\$30.00	\$3,600	20.0%	\$4,320
<b>Division 32 - Exterior Improvements</b>						
Fencing - 6' Chainlink	520	LF	\$15.00	\$7,800	20.0%	\$9,360
<b>Division 33 - Utilities</b>						
Power Service	1	LS	\$10,000.00	\$10,000	20.0%	\$12,000
Communications	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
<b>Division 40 - Instrumentation and Controls</b>						
Facility Monitoring and Controls	1	LS	\$20,000.00	\$20,000	25.0%	\$25,000
<b>Division 41 - Matl. Processing &amp; Handling</b>						
Not Used						
<b>Division 42 - Process Water Systems</b>						
12-inch Pump Suction	50	LF	\$80.00	\$4,000	20.0%	\$4,800
12-inch Supply Pipe	100	LF	\$80.00	\$8,000	20.0%	\$9,600
12-inch Tank Drains	120	LF	\$80.00	\$9,600	20.0%	\$11,520
Standpipe Assemblies	2	EA	\$1,000.00	\$2,000	20.0%	\$2,400
Pipe Fittings	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
8" Check Valves	2	EA	\$250.00	\$500	20.0%	\$600
8" Btfy Valves	6	EA	\$500.00	\$3,000	20.0%	\$3,600
12" Btfy Valves	5	EA	\$1,500.00	\$7,500	20.0%	\$9,000
Pipe Supports/Anchors	1	LS	\$5,000.00	\$5,000	20.0%	\$6,000
<b>Project Subtotal (without Division 01)</b>						<b>\$673,740</b>
<b>Project Subtotal</b>						<b>\$757,958</b>

**Notes & Assumptions:**

- Costs shown in 2010 dollars



# **Appendix I**

---

## *Letters of Support*

This page is intentionally blank.

**Blackbird Mine  
Natural Resource Trustee  
Council**

**State of Idaho  
US Forest Service  
NOAA**

February 10, 2011

Nathan Small, Chairman  
Shoshone-Bannock Tribes  
P.O. Box 306  
Fort Hall, Idaho 83203

Dear Mr. Small:

We appreciate your Staff's presentation of the draft Panther Creek Salmon Options to the Blackbird Mine Trustee Council (Trustees). This has given us a better understanding of the objectives of the Shoshone-Bannock Tribes as well as information on how the conceptual plan may fit in with the requirements of Section VII of the Blackbird Mine Consent Decree, which is directed at reintroducing Chinook salmon to Panther Creek.

The conservation objective of restoring a maintained (stabilizing) population of local Spring/Summer Chinook, with potential transition to a contributing population, is consistent with our objectives and at this point we wish to express our support for the concept. We understand that the Shoshone-Bannock Tribes will be the lead on this project. As there is a potential that the Trustees could contribute some funding as the project transitions from the planning stage to implementation, we would expect to play a role in the decision making process.

At the meeting, it was mentioned that preparation of the master plan will begin in early 2011, and that the next step, which involves environmental compliance, will follow. The ability to navigate this stage will likely dictate the timing and feasibility of the various phases of the project, and determine whether it can be implemented as proposed. The Crystal Springs Hatchery is part of the American Falls subbasin and subject to Waste Load Allocations (WLA) prescribed by Idaho and implemented through a National Pollution Discharge Elimination System (NPDES) permit. We have been informed that the proposed hatchery does not have a current WLA. This means that the facility cannot discharge waste water until a WLA is assigned and incorporated into a new NPDES permit. This is an example of issues that will require resolution prior to project implementation.

Please keep us apprised of developments as they occur, and provide us with review copies of documents related to the project. It may also be useful to schedule quarterly conference calls to discuss progress, problems, or other issues that may arise.

Once again, thank you for your time and the effort assembling your Staff for our meeting.

Sincerely,



ROBERT W. ROSE  
For the Blackbird Mine Trustee Council

cc:

Chad Colter, Shoshone-Bannock Fish and Wildlife Department  
Claude Broncho, Shoshone-Bannock Fish and Wildlife Department  
Dan Stone, Shoshone-Bannock Fish and Wildlife Department



United States Department of the Interior  
FISH AND WILDLIFE SERVICE

Lower Snake River Comp Plan Office  
1387 S. Vinnell Way, Suite 343  
Boise, Idaho 83709



February 15, 2011

Northwest Power and Conservation Council and  
Members of the Independent Scientific Review Panel  
851 S.W. Sixth Avenue, Suite 1100  
Portland, Oregon 97204

Dear Colleagues,

This letter is to inform you that the U.S. Fish and Wildlife Service - Lower Snake River Compensation Plan (LSRCP) office has reviewed and supports the Shoshone-Bannock Tribes' Crystal Springs Fish Hatchery and Satellite Facilities draft Master Plan. The Shoshone-Bannock Tribes (Tribes) are cooperators with the LSRCP on a number of important projects which help protect, preserve and enhance anadromous fish resources in the Snake River basin. The proposed project at Crystal Springs is necessary to meet their production and harvest objectives in the Snake River basin and deliver non-treaty regional benefits that are otherwise not available.

Current production levels at existing LSRCP facilities are stable and at capacity; forcing managers such as the Tribes to seek new production opportunities and the commensurate funding for those facilities. In the Shoshone-Bannock Tribes' Fish Accord, a specific allocation of funding was committed for a production facility at Crystal Springs that would be designed to implement, in part, a Chinook salmon program on the Yankee Fork Salmon River and Panther Creek. The LSRCP has worked with the Tribes to develop a successful program on the Yankee Fork, since inception in 2004. Without developing the new production capacity at Crystal Springs Fish Hatchery; the LSRCP will be unable to provide long-term production space to meet the Tribes goal and objectives. The LSRCP is committed to helping the Tribes realize the production space as outlined in the draft Master Plan.

The Tribes' Fish and Wildlife Department Staff have diligently developed a scientifically sound draft Master Plan for the Crystal Springs Fish Hatchery and Satellite Facilities that considered a wide-range of reasonable and necessary production objectives for the Snake River basin. The LSRCP offers our continued support for the conceptual design (i.e., Master Plan) and looks forward to working collaboratively with the Tribes and the co-managers to ensure this new production facility becomes a success. Thank you for your consideration of this plan and this letter of support.

Sincerely,

Scott Marshall  
LSRCP Program Administrator

cc: Lytle Denny, Sho-Ban Tribe

## **Appendix J**

---

### *Genetic Analysis of the Origin of Chinook Salmon in Panther Creek, ID*

This page is intentionally blank.

# **Genetic analysis of the origin of Chinook salmon in Panther Creek, Idaho**

Draft Report Submitted

March 16, 2011

Matt Smith and Denise Hawkins  
matt\_smith@fws.gov, denise\_hawkins@fws.gov  
U.S. Fish and Wildlife Service  
Abernathy Fish Technology Center  
Conservation Genetics Program  
1440 Abernathy Creek Road  
Longview, WA 98632  
(360) 425-6072

In Collaboration with:  
Lytle Denny and Kurt Tardy  
Shoshone-Bannock Tribes  
Fish and Wildlife Department  
3<sup>rd</sup> and B Avenue  
Fort Hall, ID 83203  
(208) 239-4560

## **Summary**

One of the objectives of the Shoshone-Bannock Tribes' (Tribes) Crystal Springs Fish Hatchery is to contribute to the recovery of the threatened Snake River Spring/Summer Chinook Salmon Evolutionary Significant Unit by reintroducing and rebuilding a locally adapted population of summer-run Chinook salmon in Panther Creek, Idaho. Despite being classified as extirpated, recent information suggests that a Chinook salmon population may have become established in Panther Creek; however, the origin of these fish is unknown. Therefore, the U.S. Fish and Wildlife Service conducted a mixed stock analysis (MSA) of Chinook salmon collected in Panther Creek in 2010 to determine their likely origin. Results of this study indicate regional structuring of Chinook salmon populations within the three major sub basins of the Salmon River which correspond to the three major population groups (MPGs) delineated by the Interior Columbia-basin Technical Recovery Team: South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. Mixed stock analysis results suggest that the Chinook salmon that have recently become established in Panther Creek primarily originate from the South Fork Salmon River MPG, and are likely derived from the 2001 McCall Fish Hatchery transplants and/or strays from populations within the South Fork MPG. There is little evidence to suggest that the adults and juveniles collected in Panther Creek include an appreciable number of fish from either the Middle Fork or Upper Salmon River MPG, indicating that recolonization through natural dispersal from geographically proximate populations is not occurring.



## Introduction

The Salmon River represents one of the largest sub basins in the Columbia River basin covering 36,217 square km and encompassing some of the most pristine terrestrial and freshwater ecosystems within the basin. Despite comprising only 6% of the land area of the Columbia River basin, the Salmon River provides more anadromous fish spawning area than any other sub basin (U.S. Fish & Wildlife Service 2009). Chinook salmon (*Oncorhynchus tshawytscha*) populations located within the Salmon River are a part of the Snake River Spring/Summer Chinook Salmon Evolutionary Significant Unit (ESU) which is currently listed as threatened under the U.S. Endangered Species Act (ESA). The Interior Columbia-basin Technical Recovery Team (ICTRT) identified five major population groups (MPGs) within the Snake River Spring/Summer ESU. Three of these MPGs occur within the Salmon River Basin: South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River MPG. Chinook salmon in Panther Creek were located within the Upper Salmon River MPG, but have been classified as extirpated by the ICTRT.

Despite being classified as extirpated, recent information suggests that a Chinook salmon population may have become established in Panther Creek. In 2001, Idaho Department of Fish and Game hatchery personnel transplanted and released 1,053 hatchery reserve Chinook salmon from McCall Fish Hatchery (South Fork Salmon River MPG) to Panther Creek for a consumptive fishery (McPherson et al. 2003). On September 18, 2001, the Tribes identified 43 redds, six additional test-digs, and recovered four Chinook salmon carcasses (all hatchery) (Kutchins 2001). Increasing numbers of redds have been observed in Panther Creek since this outplanting, and as many as 70 redds were observed during spawning ground surveys in 2010 (Tardy and Tsosie, pers. comm.). The origin of these Chinook salmon spawning in Panther Creek is unknown. While it is likely that spawners are derived from the 2001 McCall Fish Hatchery outplants, they may also originate from populations from another, more geographically proximate MPG (i.e. Middle Fork Salmon River or Upper Salmon River MPGs).

One of the objectives of the Shoshone-Bannock Tribes' (Tribes) Crystal Springs Fish Hatchery is to contribute to the recovery of the Snake River Spring/Summer Chinook Salmon ESU by reintroducing and rebuilding a locally adapted population of summer-run Chinook salmon in Panther Creek. Current plans involve the recolonization of Panther Creek with surplus broodstock from either the McCall Fish Hatchery (South Fork Salmon River MPG) or

Pahsimeroi Fish Hatchery (Upper Salmon River MPG), both summer-run programs. Following the initial colonization with surplus hatchery broodstock, the plan is to transition to a supplementation program where broodstock are selected from returning adults at the Panther Creek weir and smolts are raised at the Crystal Springs Hatchery. Smolts will then be transferred to and released from Panther Creek following an acclimation period.

Until the origin of the Chinook salmon that are naturally reproducing in Panther Creek is known, however, it will be difficult to determine which stock is the appropriate source for recolonization. Therefore, the U.S. Fish and Wildlife Service (USFWS) and the Tribes are collaborating to conduct an assessment of the genetic population structure of Salmon River Chinook salmon populations and to determine the likely origin of Chinook salmon recently collected from Panther Creek, Idaho.

Our specific objectives are: 1) to provide a description of the genetic relationship of Panther Creek Chinook salmon relative to fourteen baseline collections which represent the genetic diversity found within the Salmon River basin, and 2) to use mixed stock analysis (MSA) to estimate the proportion of Panther Creek fish that originate from each of the designated stock reporting groups.

## **Methods**

### *Sample Collections*

Three groups of Chinook salmon sample collections were used to address the objectives of this research: genetic baseline collections, Panther Creek collections, and a test mixture collection.

The genetic baseline collections were used to characterize the genetic diversity of populations in geographic proximity to Panther Creek. These collections include populations likely to contribute fish to Panther Creek, and therefore were selected as the genetic baseline for a mixed stock analysis of the origin of Panther Creek Chinook salmon. Baseline collections include samples from both hatchery origin (HOR) and natural origin (NOR) populations located throughout the Salmon and Snake River basin. The genetic baseline has dense representation of spawning populations with a total of 1,463 individuals from 14 collections made from 1998 to 2006, and an average sample size of 99 fish per collection (Table 1).

Panther Creek collections (N=156) included adult carcasses and juveniles of unknown origin collected from Panther Creek in 2010 (Table 1). These collections represent a potential mixture of fish from one or more MPG(s). To maximize the number of family groups represented in the sample of adults, all carcasses encountered during spawning ground surveys in 2010 were sampled. Adult tissue samples (N=36) were obtained from brood year 2005 – 07 adult carcasses in 2010. Juvenile tissue samples (N=120) were collected in 2010 using standard electrofishing procedures. To maximize the number of family groups represented in the sample of juveniles, thereby preventing family group or kinship bias, six stratified sites located throughout Panther Creek were sampled, with the goal of collecting 20 samples per site. Juvenile samples were obtained from brood year 2009 fall parr/pre-smolt. Age 1<sup>+</sup> juveniles (N=120) were collected on September 16, 2010 (N=20) and October 20, 2010 (N=100).

The test mixture collection (N=33) consisted of a mixture of adult fish collected from known spawning locations in the South Fork (N=5; 15.2%), Middle Fork (N=17; 51.5%), and Upper Salmon River (N=11; 33.3%) MPGs. The test mixture was used to evaluate the accuracy of MSA estimates by comparing known composition of the mixture based on sampling locations to MSA estimates.

### *Laboratory analysis*

Genomic DNA from Panther Creek and test mixture collections was extracted from tissue samples using DNeasy 96 Blood & Tissue Kits (QIAGEN). To reduce genotyping failure and error rates, all DNA was preamplified following the procedures described in Smith *et al.* (2011). Ninety-five single nucleotide polymorphism (SNP) loci (94 nuclear DNA and 1 mitochondrial DNA; Table 2) were assayed using 5'-nuclease methods described in Seeb *et al.* (2009). Multiplex SNP genotyping was conducted using TaqMan® SNP Genotyping Assays (Applied Biosystems, Inc.) in Fluidigm® 96.96 Dynamic Arrays. Arrays were read on a Fluidigm EP-1™ PCR System (Fluidigm®) after amplification, and multi-locus genotypes of each fish were determined using Fluidigm® SNP Genotyping Analysis software. Genotypes for the baseline collections included in the analysis were provided by the Columbia River Inter-Tribal Fish Commission (CRITFC).

Quality control measures included a replicate analysis of 10% of the individuals for all 95 SNP loci to identify laboratory errors and quantify genotyping error rates. Error rates were

calculated as the number of genotype discrepancies between the original genotypes and the replicates divided by the number of genotypes replicated. Additional quality control consisted of the removal of individuals with excessive rates of unscored loci and screening for duplicate fish. Samples with fewer than 95% of loci scored were removed to reduce MSA estimate variances caused by missing data and to exclude data from poor-quality samples which are expected to have higher genotyping error rates. Duplicate samples can occur if fish were inadvertently sampled two or more times. Duplicates were detected and removed if two or more individuals had matching genotypes at 94 of the 95 loci assayed. One discrepancy was allowed to account for genotyping error that may occur between duplicate samples.

### *Statistical analysis*

Baseline and Panther Creek collections were tested for deviations from Hardy-Weinberg (H-W) equilibrium and for evidence of linkage disequilibrium using GENEPOP v4.0 (Rousset 2008). Significance values for H-W equilibrium ( $\alpha=0.05$ ) were corrected for multiple tests using a sequential Bonferroni correction (Rice 1989). If tests for linkage disequilibrium were significant in more than one-half of the collections in which both markers were polymorphic (testable), the marker with the lowest variance in minor allele frequency among reporting groups (see Baseline evaluation and mixed stock analysis below) was removed from all further analyses.

To evaluate genetic diversity within all baseline and Panther Creek collections, observed heterozygosity ( $H_O$ ) and unbiased expected heterozygosity ( $H_E$ ) was calculated using the program GENALEX v6.41 (Peakall and Smouse 2006). Allelic richness ( $A_R$ ), or the number of alleles corrected for sample size, was also estimated using a rarefaction method implemented in HP-Rare v1.0 (Kalinowski 2005) using a sample size of 32 individuals. Large genetic samples are expected to have more alleles than small samples. Rarefaction is a statistical technique to deal with this problem which allows the number of alleles in large samples to be compared with the number of alleles in small samples.

Genetic differentiation was assessed among all baseline and Panther Creek collections. Pairwise exact tests for genetic differentiation were calculated using GENEPOP v4.0 (Rousset 2008) and P-values were corrected for multiple tests using a sequential Bonferroni correction (Rice 1989). Significant differences among collections indicate reproductive isolation and suggest that collections represent distinct populations. The overall level of genetic differentiation

among collections ( $F_{ST}$ ; Weir and Cockerham 1984) and the level of genetic differentiation between each pair of collections with associated P-values were calculated using the program FSTAT v2.9.3.2 (Goudet 1995). Pairwise  $F_{ST}$  values are a ratio of the amount of genetic variance between collections over the total genetic variance in all collections. Values that are significantly greater than zero indicate reproductive isolation between collections, with increasing values indicating higher levels of genetic differentiation.

Two methods were used to visualize population structure and infer the degree of relatedness among baseline and Panther Creek collections. First, pairwise  $F_{ST}$  values were used in a Principal Coordinate Analysis as implemented in GENALEX v6.41 to graphically represent multidimensional genetic relationships among collections and reporting groups in a two dimensional space. Second, an unrooted neighbor-joining (NJ) dendrogram was produced using the program TREEVIEW (Page 1996) from Cavalli-Sforza and Edwards (1967) chord distances calculated in POPULATIONS v1.2.14 (Langella 2001). One thousand bootstrap replicates were performed to evaluate tree topology.

#### *Baseline evaluation and mixed stock analysis*

Baseline collections were delineated into reporting groups for MSA based on their geographic location within the three MPGs in the Salmon River basin: South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), and Upper Salmon River (Upper) (Table 1). Despite being located within the South Fork Salmon River MPG, the Rapid River collection was placed into a fourth reporting group (ImRap) along with the Imnaha River collection based on genetic differences from other collections in the South Fork Salmon River MPG and a genetic similarity to the Imnaha River collection. An analysis of molecular variance (AMOVA) was performed to assess the variation within and between reporting groups in ARLEQUIN v3.5 (Excoffier and Lischer 2010). This approach hierarchically examines variance in gene frequencies due to intra-group and inter-group differences; significance of the components is determined by permuting populations within groups and populations among groups.

The potential of these reporting groups for MSA applications was assessed using simulations under the conditional maximum likelihood model implemented in the Statistical Program to Analyze Mixtures v3.7b (SPAM; Debevec et al. 2000). Simulations were conducted for each baseline collection with each mixture simulated (N=100) composed of 100% of the

collection. One thousand mixtures were simulated from each baseline collection. The proportion of each mixture originating from the four reporting groups was then calculated. We report the mean composition estimate and 90% confidence intervals to the reporting group from which the mixture was simulated and misallocations to all other reporting groups. A critical level of 90% correct allocation was used to determine whether the reporting groups were acceptably identifiable (e.g, Seeb et al. 2000).

As an additional evaluation of baseline performance, the composition of the test mixture collection was estimated using SPAM v3.7b and 90% confidence intervals were generated using 1,000 bootstrap replicates. The estimated proportional assignment to reporting group of origin was compared to the known composition of the mixture based on sampling location.

Composition estimates of the Panther Creek collections were then estimated using the same method described for the test mixture. The composition of the adult collection and juvenile collection was estimated independently. Proportional assignments and 90% confidence intervals are reported for each collection.

## RESULTS

### *Laboratory analysis*

A total of 184 of the 189 (97.4%) samples processed were successfully genotyped at 95% or more loci. Three adult carcass samples and two juvenile samples from Panther creek failed to amplify at more than 95% of the loci and were removed from further analyses. The genotyping error rate was 0% with no genotype discrepancies occurring in the replicated assays. No duplicate fish were detected in any of the collections.

### *Genetic variation within collections and reporting groups*

Of the 1,128 possible tests for H-W equilibrium, 54 were significant ( $P < 0.05$ ) before the adjustment for multiple tests; 56 significant tests would be expected by chance. Significant deviations from H-W equilibrium were scattered among collections and loci. The Big Creek collection was out of H-W equilibrium at eight loci, while no other collections were out of H-W equilibrium at more than 5 of the 94 loci (nuclear DNA) tested. No locus deviated from H-W equilibrium in more than three collections. Following adjustments for multiple tests, only one test remained significant and occurred in the Big Creek collection at locus *Ots\_u07-07.161*.

Genotypic disequilibrium was detected between *Ots\_FGF6A* and *Ots\_FGF6B\_1* within 16 of the 16 testable collections (collections in which both loci were polymorphic) and between *Ots\_hsc71-3'-488* and *Ots\_hsc71-5'-453* in 12 of 14 testable collections. *Ots\_FGF6A* and *Ots\_hsc71-5'-453* had the lowest minor allele frequency variance among reporting groups and they were removed from all remaining analyses. No other pairs of loci showed evidence for linkage disequilibrium within a majority of the testable collections.

Observed heterozygosity and allelic richness was on average lowest in the Middle Fork Salmon River MPG ( $H_O = 0.195$ ,  $A_R = 1.683$ ). Measures of diversity were, on average, greater in the Upper Salmon River MPG ( $H_O = 0.206$ ,  $A_R = 1.723$ ) and in the Panther Creek collections ( $H_O = 0.205$ ,  $A_R = 1.715$ ). Genetic variation measures within collections also increased downstream of the Middle Fork Salmon River. South Fork collections were on average more diverse ( $H_O = 0.203$ ,  $A_R = 1.752$ ) than Middle Fork collections, while the Rapid River and Imnaha collections demonstrated the most genetic variation ( $H_O = 0.217$ ,  $A_R = 1.775$ ) (Table 1).

#### *Genetic variation among collections and reporting groups*

Pairwise exact tests for genetic differentiation indicated significant differences in allele frequencies between all pairs of collections, indicating that collections represent unique populations. The overall level of genetic differentiation among populations ( $F_{ST}$ ) was 0.028. Pairwise  $F_{ST}$  values between all populations were significant except between the South Fork Salmon and McCall Hatchery populations (Pairwise  $F_{ST} = 0.002$ ). Pairwise estimates ranged from 0.002 between the South Fork Salmon and McCall Hatchery populations to 0.065 between the West Fork Yankee Fork River and Camas Creek populations (Table 3). The Panther Creek juvenile collection was most similar to the McCall Hatchery (Pairwise  $F_{ST} = 0.009$ ) and South Fork Salmon (Pairwise  $F_{ST} = 0.010$ ) populations. The adult collection from Panther Creek was most similar to the Panther Creek juvenile collection (Pairwise  $F_{ST} = 0.011$ ) and South Fork Salmon population (Pairwise  $F_{ST} = 0.011$ ), and also closely related to the Imnaha (Pairwise  $F_{ST} = 0.014$ ) and McCall Hatchery (Pairwise  $F_{ST} = 0.014$ ) populations.

The PCA showed populations clustering independently into the four designated reporting groups which were separated by the first two coordinates representing 28.2% and 21.0% of the total variation, respectively (Figure 1). The juvenile Panther Creek collection was in close proximity to populations within the South Fork Salmon River MPG, while the relationship of the

adult collection to a particular reporting group was not apparent. The NJ dendrogram supported the genetic structure observed in the PCA analysis and provided additional support for delineating reporting groups primarily based on geographic location for MSA (Figure 2). While populations within each of the four designated reporting groups clustered together in the NJ dendrogram, the relationships were generally weak (low bootstrap support). However, this is expected given the low overall levels of genetic variation observed in the Salmon River. The juvenile Panther Creek collection grouped with the South Fork Salmon River MPG populations in the NJ analysis, and the adult collection grouped with the Imnaha and Rapid River populations in the ImRap reporting group.

#### *Baseline evaluation and mixed stock analysis*

The analysis of molecular variance (AMOVA) indicated that 96.8% of the variation was accounted for within populations (Table 4). The remaining variation was nearly equally split among reporting groups (1.48%) and among collections within reporting groups (1.76%). These results support those of the NJ analysis which showed long branch lengths between most populations within reporting groups and low bootstrap support for separations among reporting groups.

All 14 baseline populations met the critical level of 90% correct allocation to reporting group of origin in the 100% simulation tests (Figure 3; Table 5), with correct allocations above 95% for 10 populations. Correct allocations were between 90% and 95% for the Imnaha, Big Creek, Camas, and Sawtooth simulations. The greatest misallocations in all baseline population simulations were to the South Fork Salmon River reporting group.

MSA estimates of the known test mixture indicated that there was some misallocation occurring between reporting groups (Figure 4; Table 6). Assuming the expected contributions from each reporting group based on sampling locations are correct, MSA results overestimated the proportion of ImRap, SFork, and Upper fish in the known test mixture by 4.56%, 13.16%, and 1.39%, respectively. The proportion of MFork fish in the mixture was underestimated by 19.11%. Misallocations relative to the expected proportions may be due to several factors including: a test mixture with few individuals, a tendency towards misallocation to the SFork reporting group observed in the simulations, and potential sampling errors (i.e. SFork strays present in the MFork sample). However, despite the disparity between the expected proportions



and MSA estimates, the 90% MSA confidence intervals of every reporting group included the known test mixture proportions.

MSA estimates of the Panther Creek collections indicated a difference between the composition of the adult collection and that of the juvenile collection (Figure 4; Table 6). The adult collection was comprised of fish from the SFork (55.4%) and ImRap (30.3%) reporting group, while the juvenile collection was almost entirely comprised of fish from the SFork (83.4%) reporting group with a much smaller percentage from the ImRap group (7.4%). It should be noted however, that the confidence intervals are much larger in the adult collection due in large part to a smaller sample size of the mixture. There is little evidence to suggest that either the adult or juvenile collection include an appreciable number of fish from either the MFork or Upper reporting groups. In both collections the lower 90% confidence intervals for the MFork and Upper estimates either include or nearly include 0%.

## Discussion

The results of this study indicate regional structuring of Chinook salmon within the three major sub basins of the Salmon River which correspond to the three MPGs (South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River) delineated by the Interior Columbia-basin Technical Recovery Team. In general,  $F_{ST}$  values and the neighbor-joining dendrogram indicate that populations within each of the MPGs are more genetically similar to each other than they are to populations from other MPGs. These results suggest that gene flow from natural dispersal and transplanted stocks have resulted in a stepping-stone structure characterized by increased gene flow between geographically adjacent populations relative to gene flow between distant populations

These results are concordant with previous studies using microsatellites which show a similar regional population structure in the Salmon River (Narum et al. 2010; Narum et al. 2007b). One exception to the regional structure that should be noted is the genetic similarity between the Rapid River and Imnaha population. Despite being located within the South Fork Salmon River MPG, the Rapid River Hatchery population grouped with the Imnaha River population in the neighbor-joining dendrogram and PCA. This pattern is likely a result of the transplantation history in the region. Supplementation within the South Fork MPG has been primarily with fish from local broodstock reared at McCall Hatchery (>12 million since 1976;

Narum et al. 2007), while the Imnaha River has received Rapid River Hatchery outplants (>4 million since 1984; Narum et al. 2007). This pattern is also supported by previous studies which show that areas in the Columbia River basin with a history of stock transfers usually group with the source population rather than by geographic region (Narum et al. 2007a; Narum et al. 2010).

Under the observed regional population structure and in the absence of anthropogenic influence, we would expect that the recolonization of Panther Creek would have originated from geographically proximate populations. However, the Panther Creek collections do not group with other populations from the Upper Salmon River MPG in either the neighbor-joining dendrogram or the PCA. In both analyses the adult and juvenile collections from Panther Creek group with the ImRap and SFork reporting groups, respectively.

Our results suggest that the recolonization of Panther Creek through natural dispersal from geographically proximate populations is not occurring. The Chinook salmon population that has recently become established in Panther Creek is likely derived from the 2001 McCall Fish Hatchery transplants and/or strays from the ImRap and SFork reporting groups. While it is difficult to determine if the Chinook salmon collected in Panther Creek are directly derived from the transplants from the McCall Fish Hatchery in 2001, it is unlikely that the juveniles collected in Panther Creek in 2010 were simply utilizing Panther Creek habitat, therefore, they were either derived from the original transplants that occurred in 2001 or from adult strays from the South Fork MPG in subsequent years. Although there is some genetic variation between the adult (brood year 2005 – 07) and juvenile collections (brood year 2009), bootstrap support for their separation in the neighbor-joining analysis is low and the  $F_{ST}$  value between the adult and juvenile collections is low (0.01), indicating that the two collections are not substantially different. Additionally, the MSA estimates indicate that both the adult and juvenile collections are primarily comprised of fish from the SFork reporting group.

Identifying the appropriate source population for the recolonization of an extirpated population can be complicated. This question becomes even more complicated when the extirpated population being restored is in close proximity to naturally reproducing native populations. This is primarily due to the potential for gene flow and competition between the stocked population and the natural population. The amount of gene flow following transfers, and the risk to the native population, will depend in part on the source populations used and on the amount and duration of the transfers (Eldridge and Naish 2007). Source populations can have a

homogenizing effect on the genetic structure of the native populations and swamp the adaptive genetic diversity present in the wild by interbreeding with the native populations. There is also evidence to suggest that captive-bred fish can reduce the fitness of native-bred fish due to the introgression of hatchery genes (Araki and Schmid 2010).

The current composition of the Chinook salmon population in Panther Creek suggests that fish of South Fork origin have been successfully reproducing in Panther Creek, and therefore, may be a viable option for recolonization efforts. However, the continued stocking of South Fork fish (i.e. McCall Hatchery fish) in the Upper Salmon River MPG may pose a genetic risk to the native populations in the area. Gene flow between the stocked population and the native populations may break down some of the regional population structure currently observed among MPGs in the Salmon River. This may result in a loss of genetic diversity in the native populations, thereby increasing their risk of extinction. Ideally, hatchery and natural origin populations that interact with each other reproductively should not be genetically distinct, and should tend towards the genetic composition of the natural origin population (Moberg et al. 2005). Regardless of the source population used, genetic analyses before, during, and after stocking may be used to closely monitor the reproductive contribution of stocked fish and the genetic effects of stocking on native populations.

## **Acknowledgements**

Funding for this project was provided by the Shoshone-Bannock Tribes. We thank Andrew Matala (Columbia River Inter-Tribal Fish Commission) for providing genotypes for the baseline collections included in the analyses. We also thank biologists from the Shoshone-Bannock Tribes for collecting genetic samples used in this study, and Patty Crandell for providing reviews of an earlier draft of this report. The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

Table 1. Collection data for Chinook salmon sampled from spawning sites in the Salmon and Snake Rivers used to determine the origin of Chinook salmon from Panther Creek, Idaho. Collection year, reporting group delineation, and hatchery (HOR) or natural (NOR) origin for each collection is shown. Estimates of genetic variation include: unbiased expected heterozygosity ( $H_E$ ), observed heterozygosity ( $H_O$ ), and allelic richness ( $A_R$ ).

ID	Population	Collection year	n	Reporting group <sup>a</sup>	Origin	$H_E$	$H_O$	$A_R$
1	Imnaha River	1998	91	ImRap	NOR	0.218	0.220	1.79
2	Rapid River	1999	93	ImRap	HOR	0.216	0.215	1.76
3	South Fork Salmon	2000-2002	274	SFork	NOR	0.208	0.206	1.79
4	McCall Hatchery	2000-2002	129	SFork	HOR	0.205	0.208	1.79
5	Secesh River	2001	78	SFork	NOR	0.200	0.197	1.73
6	Johnson Creek	2002	84	SFork	HOR	0.202	0.204	1.72
7	Johnson Creek	2002	92	SFork	NOR	0.202	0.202	1.73
8	Big Creek	2001	88	MFork	NOR	0.200	0.202	1.70
9	Camas Creek	2006	46	MFork	NOR	0.190	0.195	1.65
10	Capehorn Creek	2005	83	MFork	NOR	0.192	0.188	1.70
11	East Fork Salmon River	n/a	86	Upper	NOR	0.204	0.209	1.73
12	Pahsimeroi River	2004	83	Upper	HOR/NOR	0.206	0.212	1.71
13	Sawtooth Hatchery	2003	90	Upper	HOR	0.203	0.204	1.74
14	West Fork Yankee Fork River	2005	75	Upper	NOR	0.203	0.200	1.71
15	Panther Creek (juveniles)	2010	118	n/a	Unknown	0.196	0.201	1.73
16	Panther Creek (adults)	2010	33	n/a	Unknown	0.200	0.209	1.70

<sup>a</sup> Reporting groups used for mixed stock analysis: Imnaha/Rapid River (ImRap), South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), and the Upper Salmon River (Upper).

Table 2. The 95 Chinook salmon single nucleotide polymorphism markers (94 nuclear DNA and 1 mitochondrial DNA) assayed for this project.  $F_{ST}$  for all baseline and Panther Creek collections and references for each marker are shown.

Locus	$F_{ST}$	Reference <sup>a</sup>
Ots_102414-395	0.039	E
Ots_105105-613	0.013	E
Ots_106747-239	0.049	E
Ots_110064-383	0.010	E
Ots_113242-216	0.018	E
Ots_113457-40R	0.012	E
Ots_123048-521	0.021	E
Ots_128757-61R	0.023	E
Ots_94857-232R	0.022	E
Ots_94903-99R	0.012	E
Ots_96222-525	0.039	E
Ots_96500-180	0.023	E
Ots_96899-357R	0.012	E
Ots_97077-179R	0.009	E
Ots_AldB1-122	0.006	E
Ots_aldb-177M	0.015	A
Ots_ARNT	0.037	E
Ots_arp-436	<0.001	E
Ots_AsnRS-60	0.022	B
Ots_aspat-196	<0.001	A
Ots_C3N3 <sup>b</sup>	0.032	C
Ots_Cath_D141	0.019	E
Ots_CCR7	monomorphic	E
Ots_CD59-2	0.019	E
Ots_CD63	0.005	E
Ots_cox1-241	0.023	A
Ots_CRB211	<0.001	E
Ots_E2-275	0.025	B
Ots_EndoRB1-486	0.013	E
Ots_EP-529	0.010	E
Ots_ETIF1A	0.015	E

Table 2. Continued

Locus	F <sub>ST</sub>	Reference <sup>a</sup>
Ots_FARSLA-220	0.015	D
Ots_FGF6A	0.021	E
Ots_FGF6B_1	0.025	E
Ots_GDH-81x	0.026	A
Ots_GH2	0.006	C
Ots_GnRH-271	0.034	B
Ots_GPDH-338	<0.001	B
Ots_GPH-318	0.026	D
Ots_GST-207	0.006	E
Ots_GST-375	<0.001	D
Ots_GTH2B-550	0.020	E
Ots_hsc71-3'-488	0.006	E
Ots_hsc71-5'-453	0.007	E
Ots_hsp27b-150	0.033	E
Ots_HSP90B-100	0.026	D
Ots_IGF-I.1-76	0.024	B
Ots_Ikaros-250	0.013	B
Ots_IL11	0.033	E
Ots_IL8R_C8	0.023	E
Ots_LWSop-638	<0.001	B
Ots_mapK-3'-309	0.031	E
Ots_mapKpr-151	0.041	E
Ots_MHC1	0.015	C
Ots_MHC2	0.124	C
Ots_mybp-85	0.019	E
Ots_Myc-366	monomorphic	E
Ots_myo1a-384	0.012	A
Ots_myoD-364	0.023	A
Ots_nkef-192	0.032	A
Ots_NOD1	0.041	E
Ots_nramp-321	0.002	A
Ots_Ots311-101x	<0.001	A
Ots_P450	0.005	C

Table 2. Continued

Locus	F <sub>ST</sub>	Reference <sup>a</sup>
Ots_P53	0.026	C
Ots_PGK-54	0.006	E
Ots_Prl2	0.026	C
Ots_RAG3	0.019	E
Ots_RAS1	monomorphic	E
Ots_RFC2-558	0.011	B
Ots_S7-1	0.031	E
Ots_SClkF2R2-135	0.038	B
Ots_SL	0.022	C
Ots_SWS1op-182	0.033	B
Ots_TAPBP	0.086	E
Ots_TGFB	0.009	E
Ots_TLR3	0.050	E
Ots_TNF	monomorphic	E
Ots_Tnsf	0.038	C
Ots_u07-07.161	0.011	E
Ots_u07-17.135	0.016	E
Ots_u07-18.378	0.012	E
Ots_u07-20.332	monomorphic	E
Ots_u07-25.325	0.023	E
Ots_u07-49.290	0.019	E
Ots_u07-53.133	0.012	E
Ots_u07-57.120	0.002	E
Ots_u07-64.221	0.006	E
Ots_u202-161	0.015	B
Ots_u211-85	0.015	B
Ots_u4-92	0.008	B
Ots_u6-75	0.020	B
Ots_unk526	0.021	E
Ots_zP3b-215	monomorphic	B
Ots_ZR-575	0.018	E

<sup>a</sup> (A) Campbell and Narum 2008; (B) Smith et al. 2005; (C) Smith et al. 2005; (D) Smith et al. 2007; (E) unpublished

<sup>b</sup> mtDNA locus

Table 3. Pairwise estimates of genetic variation ( $F_{ST}$ ) among sixteen Salmon and Snake River Chinook salmon collections used to examine genetic relationships and to determine the origin of Chinook salmon from Panther Creek, Idaho.

	Imnaha	Rapid	SF-Salmon	McCall	Secesh	Johnson-HOR	Johnson-NOR	Big	Camas	Capehorn	EF-Salmon	Pahsimeroi	Sawtooth	WF-Yankee	PantherJ
Rapid	0.013	--													
SF-Salmon	0.018	0.033	--												
McCall	0.023	0.038	0.002	--											
Secesh	0.044	0.061	0.011	0.010	--										
Johnson-HOR	0.037	0.046	0.017	0.015	0.021	--									
Johnson-NOR	0.028	0.038	0.012	0.011	0.019	0.008	--								
Big	0.036	0.047	0.021	0.023	0.033	0.034	0.026	--							
Camas	0.044	0.049	0.035	0.041	0.050	0.040	0.037	0.031	--						
Capehorn	0.041	0.048	0.028	0.032	0.042	0.044	0.032	0.036	0.045	--					
EF-Salmon	0.033	0.036	0.027	0.024	0.042	0.041	0.032	0.038	0.051	0.054	--				
Pahsimeroi	0.027	0.040	0.024	0.020	0.036	0.041	0.031	0.040	0.044	0.046	0.021	--			
Sawtooth	0.023	0.032	0.018	0.014	0.034	0.029	0.026	0.030	0.042	0.038	0.013	0.013	--		
WF-Yankee	0.041	0.037	0.033	0.029	0.053	0.042	0.040	0.041	0.065	0.060	0.033	0.039	0.020	--	
PantherJ	0.021	0.032	0.010	0.009	0.027	0.028	0.023	0.037	0.051	0.035	0.037	0.024	0.023	0.042	--
PantherA	0.014	0.021	0.011	0.014	0.033	0.024	0.024	0.032	0.041	0.028	0.031	0.023	0.020	0.025	0.011



Table 4. Analysis of molecular variance (AMOVA) as applied to populations partitioned into reporting groups used to examine genetic relationships and to determine the origin of Chinook salmon from Panther Creek, Idaho (\*P < 0.001).

Source of Variation	df	Sum of squares	Variance components	Percentage of variation
Among reporting groups	3	405.12	0.1448	1.48*
Among populations within reporting groups	10	428.13	0.1724	1.76*
Within populations	2770	26305.53	9.4966	96.77*
Total	2783	27138.78	9.8138	

Table 5. Percentage allocation of 100% simulations (n=100) from each population to reporting group of origin averaged over 1000 simulated mixtures. Correct allocation to reporting group of origin is shown in bold.

	Reporting groups <sup>a</sup>			
	ImRap	SFork	MFork	Upper
Imnaha	<b>93.1%</b>	4.3%	0.4%	1.8%
Rapid-River	<b>95.9%</b>	2.6%	0.3%	0.9%
Upper_SF SR	1.0%	<b>96.8%</b>	0.8%	1.2%
McCall_stock	0.6%	<b>96.2%</b>	0.7%	2.1%
Secesh	0.1%	<b>99.0%</b>	0.5%	0.4%
Johnson(supp)	0.3%	<b>98.6%</b>	0.4%	0.7%
Johnson(Weir)	0.5%	<b>97.1%</b>	1.1%	1.2%
Big-Creek	0.5%	3.8%	<b>94.9%</b>	0.9%
Camas	1.3%	3.4%	<b>93.7%</b>	1.7%
CapeHorn	0.2%	3.2%	<b>96.0%</b>	0.6%
EF-Salmon	0.6%	2.9%	0.4%	<b>96.1%</b>
Pahsimeroi	1.1%	2.5%	0.6%	<b>95.8%</b>
Sawtooth	1.3%	4.3%	0.7%	<b>93.0%</b>
WF-Yankee	0.9%	3.1%	0.3%	<b>95.6%</b>

<sup>a</sup> Reporting groups used for mixed stock analysis: Imnaha/Rapid River (ImRap), South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), and the Upper Salmon River (Upper).

Table 6. Mixed stock analysis estimates (including 90% confidence intervals) by reporting group from a known test mixture (expected proportions shown) used to evaluate the accuracy of MSA estimates and from Chinook salmon collections from Panther Creek, Idaho.

Mixture		Reporting groups <sup>a</sup>			
		ImRap	SFork	MFork	Upper
Test mixture n=33	Proportion	4.56%	28.31%	32.41%	34.72%
	Lower 90% CI	0.00%	5.90%	14.16%	13.81%
	Upper 90% CI	17.98%	53.14%	52.41%	55.49%
	Expected proportion	0.00%	15.15%	51.52%	33.33%
Panther Creek (adults) n=33	Proportion	30.28%	55.36%	0.25%	14.11%
	Lower 90% CI	7.97%	32.05%	0.00%	0.02%
	Upper 90% CI	55.92%	79.53%	1.49%	34.04%
Panther Creek (juveniles) n=118	Proportion	7.36%	83.44%	3.96%	5.24%
	Lower 90% CI	0.89%	72.95%	0.00%	0.01%
	Upper 90% CI	15.67%	92.50%	9.52%	11.95%

<sup>a</sup> Reporting groups used for mixed stock analysis: Imnaha/Rapid River (ImRap), South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), and the Upper Salmon River (Upper).

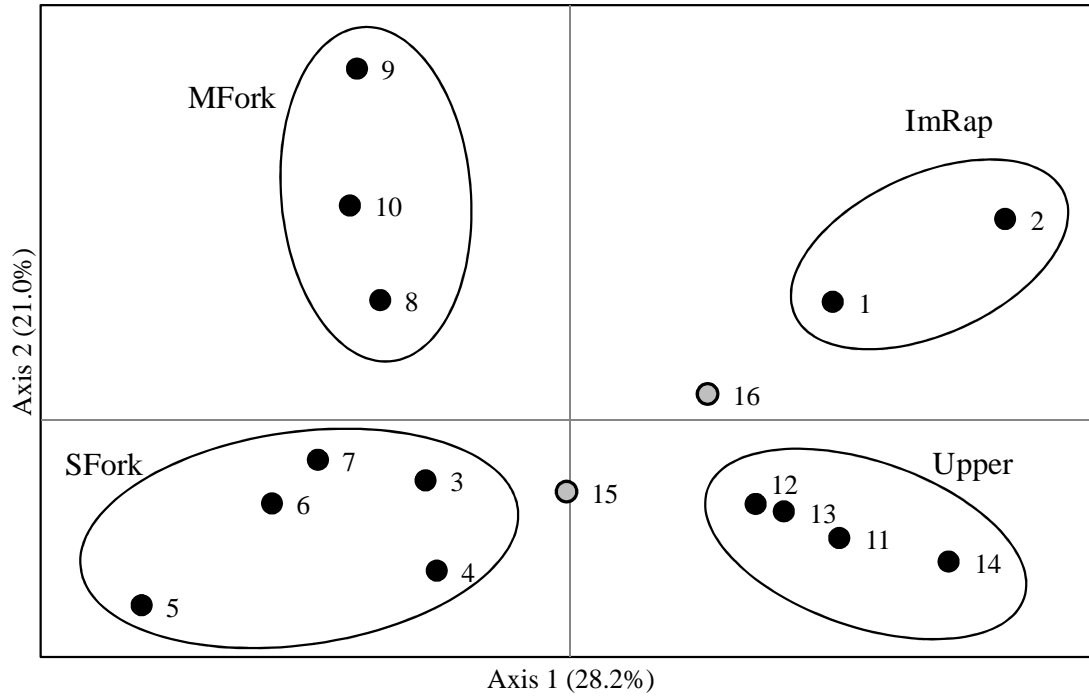


Figure 1. Principal Coordinate Analysis (PCA) of pairwise  $F_{ST}$  values between Chinook salmon populations from the Salmon and Snake River. Numbers correspond to collection IDs shown in Table 1. Ellipses indicate reporting group delineations: South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), Upper Salmon River (Upper), Imnaha/Rapid River (ImRap). Panther Creek collections are shown in grey.

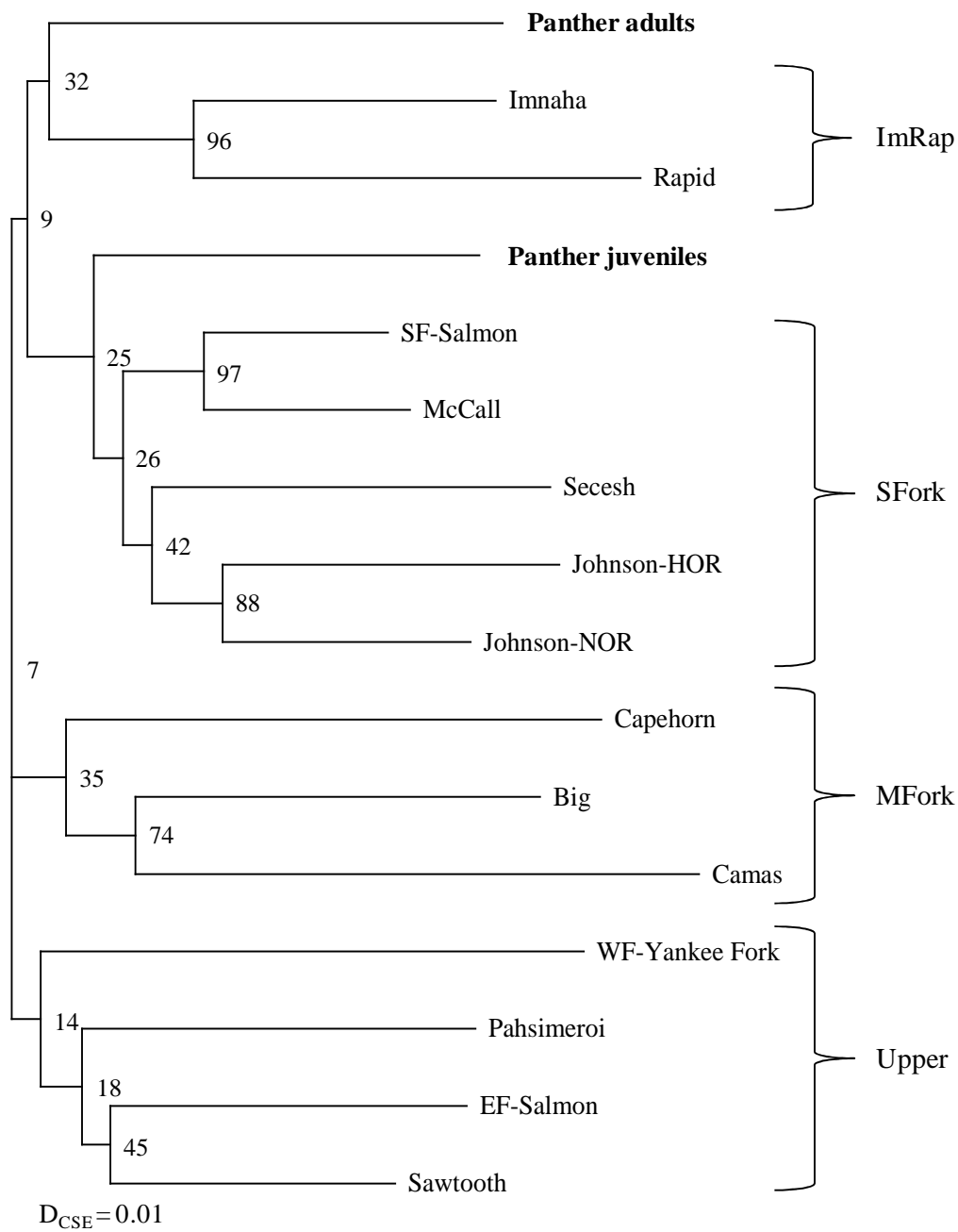


Figure 2. Unrooted neighbor-joining (NJ) dendrogram of Chinook salmon collections from the Salmon and Snake River using Cavalli-Sforza and Edwards (1967) chord distance to display genetic relationships among collections. One thousand bootstrap replicates were performed to evaluate tree topology (percentage bootstrap support is shown). Reporting group delineations are shown on the right: Imnaha/Rapid River (ImRap), South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), and Upper Salmon River (Upper).

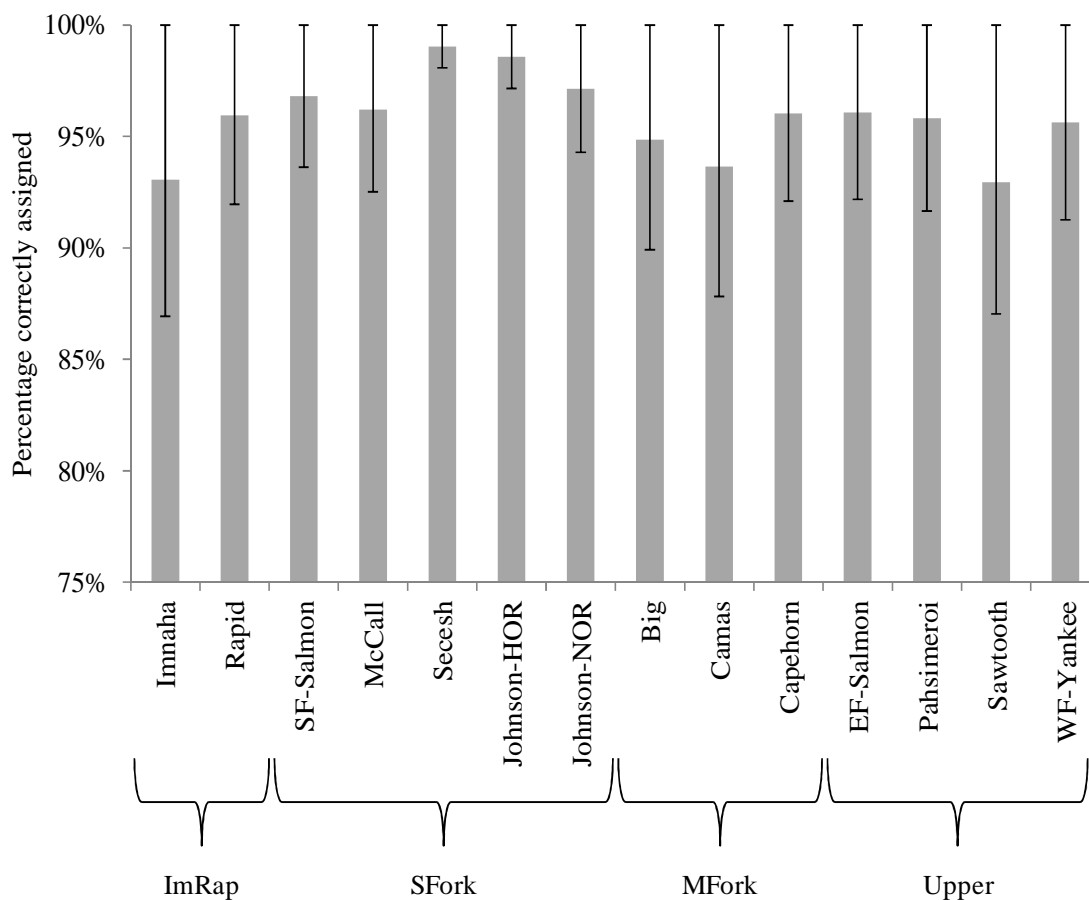


Figure 3. Percent of fish from each collection correctly assigned to designated reporting groups averaged over 1000 simulated mixtures (100 individuals each) and including 90% confidence intervals. Reporting groups include: Innaha/Rapid River (ImRap), South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), and Upper Salmon River (Upper).

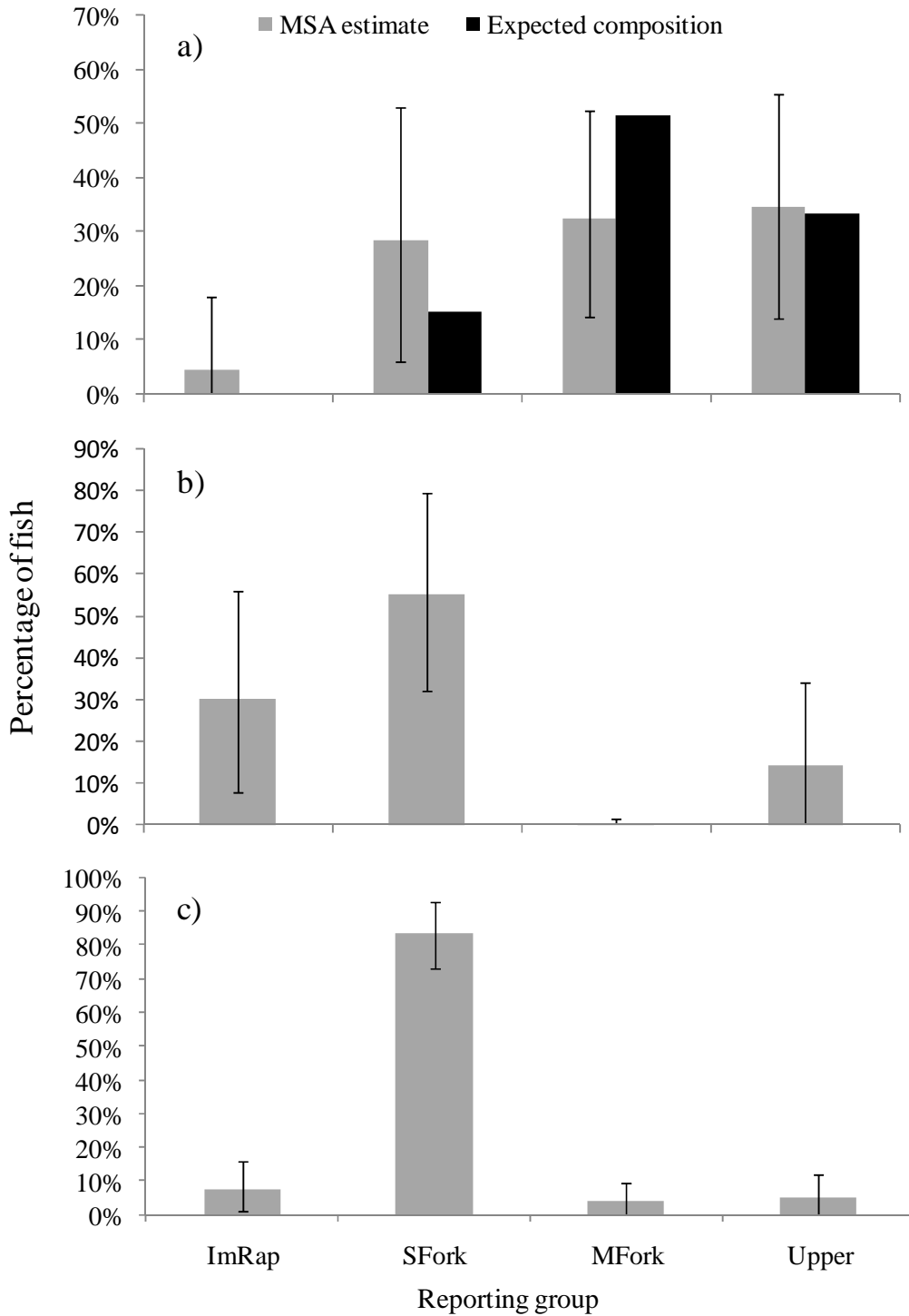


Figure 4. Mixed stock analysis estimates (including 90% confidence intervals) of the percentage of Chinook salmon by reporting group contributing to a) the test mixture collection (expected proportions shown, n=33), b) the Panther Creek adult collection (n=33), and c) the Panther Creek juvenile collection (n=118). Reporting groups include: Imnaha/Rapid River (ImRap), South Fork Salmon River (SFork), Middle Fork Salmon River (MFork), and Upper Salmon River (Upper).

- Araki, H., and C. Schmid. 2010. Is hatchery stocking a help or harm?: Evidence, limitations and future directions in ecological and genetic surveys. *Aquaculture* 308(Supplement 1):S2-S11.
- Campbell, N. R., and S. R. Narum. 2008. Identification of novel single-nucleotide polymorphisms in Chinook salmon and variation among life history types. *Transactions of the American Fisheries Society* 137(1):96-106.
- Cavalli-Sforza, L., and A. W. F. Edwards. 1967. Phylogenetic analysis: models and estimation procedures. *Evolution* 21(3):550-570.
- Debevec, E. M., R. B. Gates, M. Masuda, J. Pella, J. Reynolds, and L. W. Seeb. 2000. SPAM (Version 3.2): Statistics program for analyzing mixtures. *Journal of Heredity* 91(6):509-510.
- Eldridge, W. H., and K. A. Naish. 2007. Long-term effects of translocation and release numbers on fine-scale population structure among coho salmon (*Oncorhynchus kisutch*). *Molecular Ecology* 16(12):2407-2421.
- Excoffier, L., and H. E. L. Lischer. 2010. Arlequin suite ver 3.5: A new series of programs to perform population genetics analyses under Linux and Windows. *Molecular Ecology Resources* 10:564-567.
- Goudet, J. 1995. FSTAT (Version 1.2): A computer program to calculate F-statistics. *Journal of Heredity* 86(6):485-486.
- Kalinowski, S. T. 2005. HP-RARE 1.0: a computer program for performing rarefaction on measures of allelic richness. *Molecular Ecology Notes* 5(1):187-189.
- Kutchins, K. 2001. Memorandum. Subject: Panther Creek Chinook Salmon Spawning Ground Survey. Shoshone-Bannock Tribes.
- Langella, O. 2001. Populations: population genetic structure (individuals or populations distances, phylogenetic trees). Available: <http://bioinformatics.org/~tryphon/populations/> (February 2011).
- McPherson, D. E., S. Kammeyer, J. Patterson, and D. Munson. 2003. McCall Fish Hatchery 2001 Summer Chinook Salmon Brood Year Report. Idaho Department of Fish and Game, Boise.
- Mobrand, L. E., J. Barr, L. Blankenship, D. E. Campton, T. T. P. Evelyn, T. A. Flagg, C. V. W. Mahnken, L. W. Seeb, P. R. Seidel, and W. W. Smoker. 2005. Hatchery Reform in Washington State -- Principles and Emerging Issues. *Fisheries* 30(6):11 - 23.
- Narum, S., W. Arnsberg, A. Talbot, and M. Powell. 2007a. Reproductive isolation following reintroduction of Chinook salmon with alternative life histories. *Conservation Genetics* 8(5):1123-1132.
- Narum, S. R., J. E. Hess, and A. P. Matala. 2010. Examining Genetic Lineages of Chinook Salmon in the Columbia River Basin. *Transactions of the American Fisheries Society* 139(5):1465-1477.
- Narum, S. R., J. J. Stephenson, and M. R. Campbell. 2007b. Genetic Variation and Structure of Chinook Salmon Life History Types in the Snake River. *Transactions of the American Fisheries Society* 136(5):1252-1262.
- Page, R. D. M. 1996. TreeView: An application to display phylogenetic trees on personal computers. *Computer Applications in the Biosciences* 12(4):357-358.

- Peakall, R., and P. E. Smouse. 2006. GENALEX 6: genetic analysis in Excel. Population genetic software for teaching and research. *Molecular Ecology Notes* 6(1):288-295.
- Rice, W. R. 1989. Analyzing tables of statistical tests. *Evolution* 43(1):223-225.
- Rousset, F. 2008. GENEPOP '007: a complete re-implementation of the GENEPOP software for Windows and Linux. *Molecular Ecology Resources* 8(1):103-106.
- Seeb, J. E., C. E. Pascal, R. Ramakrishnan, and L. W. Seeb. 2009. SNP genotyping by the 5'-nuclease reaction: advances in high-throughput genotyping with non-model organisms. Pages 277-929 in A. A. Komar, editor. *Single Nucleotide Polymorphisms, Methods in Molecular Biology*. Humana Press, Totowa, NJ.
- Seeb, L. W., C. Habicht, W. D. Templin, K. E. Tarbox, R. Z. Davis, L. K. Brannian, and J. E. Seeb. 2000. Genetic diversity of sockeye salmon of Cook Inlet, Alaska, and its application to management of populations affected by the Exxon Valdez oil spill. *Transactions of the American Fisheries Society* 129(6):1223-1249.
- Smith, C. T., A. Antonovich, W. D. Templin, C. M. Elfstrom, S. R. Narum, and L. W. Seeb. 2007. Impacts of marker class bias relative to locus-specific variability on population inferences in Chinook salmon: A comparison of single-nucleotide polymorphisms with short tandem repeats and allozymes. *Transactions of the American Fisheries Society* 136(6):1674-1687.
- Smith, C. T., C. M. Elfstrom, L. W. Seeb, and J. E. Seeb. 2005a. Use of sequence data from rainbow trout and Atlantic salmon for SNP detection in Pacific salmon. *Molecular Ecology* 14(13):4193-4203.
- Smith, C. T., J. E. Seeb, P. Schwenke, and L. W. Seeb. 2005b. Use of the 5'-nuclease reaction for single nucleotide polymorphism genotyping in Chinook salmon. *Transactions of the American Fisheries Society* 134(1):207-217.
- Smith, M. J., C. E. Pascal, Z. A. C. Grauvogel, C. Habicht, J. E. Seeb, and L. W. Seeb. 2011. Multiplex preamplification PCR and microsatellite validation enables accurate single nucleotide polymorphism genotyping of historical fish scales. *Molecular Ecology Resources* 11:268-277.
- U.S. Fish & Wildlife Service. 2009. Clearwater, Magic Valley, McCall, and Sawtooth Fish Hatcheries Assessments and Recommendations. Columbia Basin Hatchery Review Team. Idaho Lower Snake River Compensation Plan. Draft Report. [http://www.fws.gov/pacific/Fisheries/Hatcheryreview/Reports/snakeriver/IdahoLSRCPRreviewDraftReport\\_24Apr2009\\_Public.pdf](http://www.fws.gov/pacific/Fisheries/Hatcheryreview/Reports/snakeriver/IdahoLSRCPRreviewDraftReport_24Apr2009_Public.pdf).
- Weir, B. S., and C. C. Cockerham. 1984. Estimating F-statistics for the analysis of population structure. *Evolution* 38(6):1358-1370.



This page is intentionally blank.

The Shoshone-Bannock Tribes, March 2011

**Crystal Springs Fish Hatchery and Programs  
for Snake River Chinook Salmon  
and Yellowstone Cutthroat Trout  
MASTER PLAN**

