Northwest Power and Conservation Council

April 14, 2011

Mr. William C. Maslen
Manager, Fish and Wildlife Division
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Maslen,

On April 12, 2011 the Council approved the Master Plan (Step 1) associated with the Springfield Sockeye Hatchery Master Plan for the Snake River Sockeye Program, *Snake River Sockeye Captive Propagation*, Project #2007-402-00. The specific language of the recommendation is as follows.

- The Council approved the *Springfield Sockeye Hatchery Master Plan for the Snake River Sockeye Program* to proceed with Step 2 activities.

- The Council calls for additional information from IDFG to address the six issues raised by the independent peer review for consideration during the Step 2 review.

The background language associated with the recommendation by the Council is attached.

The Council appreciates the significant amount of effort made by the IDFG during the development of this project, and we look forward to working with you to ensure this project is successful.

Sincerely,

Tony Grover
Director, Fish and Wildlife Division

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Attachment: Specific Language Approved by Council regarding Master Plan (Step 1) associated with the Springfield Sockeye Hatchery Master Plan for the Snake River Sockeye Program, Project #2007-402-00, on April 12, 2011.

SIGNIFICANCE:
On December 12, 2010, the Idaho Department of Fish and Game (IDFG) submitted to the Council as part of the Three-Step Review Process a master plan for the *Springfield Sockeye Hatchery Master Plan for the Snake River Sockeye Program*, as part of Project 2007-402-00, *Snake River Sockeye Captive Propagation*.

The master plan proposes to implement the next phase in the Snake River Sockeye Captive Broodstock Program by constructing the Springfield Hatchery near the town of Springfield in Bingham County, Idaho. The master plan addresses the needs as directed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (*Idaho et al. 2008*) and the 2008 Memorandum of Agreement (MOA) between the State of Idaho and the FCRPS Action Agencies.

The next phase of the Snake River Sockeye Captive Broodstock Program is to construct the hatchery, which will expand the juvenile-fish production component of the program to produce between 500,000 and 1 million full-term smolts annually for release in the Upper Salmon River Subbasin in the Sawtooth basin. This production is intended to build on the captive broodstock phase and respond to population re-colonization goals in Redfish, Pettit, and Alturas lakes.

BUDGETARY/ECONOMIC IMPACTS

I. Overview of Step 1 Project Costs

The program costs presented in the Step 1 Master Plan are consistent with Council's Three Step Review Process. It is important to note that these conceptual costs are a planning baseline from which to refine future costs, evaluate alternatives as the proposed project progresses through the preliminary (Step 2) and final (Step 3) design phases, and implementation. Future cost estimates for both operations and capital construction generally follow the principals for inflation and cost escalation described by the Independent Economic Analysis Board in their white paper on Project Cost Escalation Standards (IEAB document 2007-2). IDFG intends to continue to seek input and review by Bonneville, the Council and IDFG's planning team through the Step 2 and 3 processes.

Project costs provided in the Step 1 Master Plan were based on the proposed programs and conceptual designs. IDFG is proposing to construct new facilities at the Springfield, Idaho site. Cost estimates for facility planning and design, construction, acquisition of capital equipment, environmental compliance, operations and maintenance and research, monitoring, and evaluation are presented for each of the hatchery facilities. A summary of key project expenditures (see Attachment 1) and a summary of future costs projected from Fiscal Year 2010 through Fiscal Year 2020 (see Attachment 2) are provided in the Master Plan and at the end of this document.

Capital and expense funds for the conservation hatchery development including planning, operation and maintenance, acquisition, and construction totaling $20,465,279[1] are reserved in MOA budgets between the State of Idaho and the FCRPS Action Agencies.

II. Key Expenditures by Program Area

The summary of key expenditures by step and program area (see Attachment 1) provides an approximate overview of future costs for planned programs as presented in the Step 1 Master Plan. The estimated one-time costs by program area are as follows:

- Planning & Design Step 1- $298,405 (cost to date for the Step 1 Master Plan as submitted)
- Planning & Design Step 2 - $500,000
    - Environmental Compliance Step 2 (Permitting, Environmental Assessment, Other) $136,733
- Planning & Design Step 3 - $400,000
- Construction - $13,579,929
- Capital Equipment $218,249[2]

The total budget for the conceptual planning associated with the Master Plan is about $298,405. This figure is an estimate that includes conceptual planning, engineering, and development of the Step 1 Master Plan.

The preliminary planning and design stage, intended to meet the Council's Step 2 requirements, is designed to identify any major difficulties or concerns with the program and facility designs. Step 2 design work should provide sufficient detail and specifics to ensure that the intent and scope of the Step 1 conceptual design work can be met and to refine the cost estimates further. Step 2 will include refinement of scientific information, environmental compliance, and ESA reviews. A placeholder of about $500,000 has been identified for Step 2 preliminary planning, environmental compliance, site investigations and design. Initiation of this work is proposed in Fiscal Year 2011. This budget includes costs for drilling test wells, surveying and other investigative geotechnical work.

A placeholder of about $400,000 has been identified for the Step 3 final planning and design stage. It is anticipated that this work will begin in Fiscal Year 2011. Refinement of the Step 3 budget will occur in Step 2 during development of the preliminary design.

The total estimated conceptual construction budget for the Springfield Hatchery as outlined in the master plan is $13,579,929.[3] The budget estimate used master planning guidance of +/- 35 to 50 percent and will be refined as part of the next submittals associated with Steps 2 and 3.

The operations and maintenance (O&M) budgets for the project from Fiscal Year 2007 through Fiscal Year 2010 for the ongoing phase of the program (i.e., captive broodstock phase) averaged

[1] This is for Fiscal Year 2008 - 2017 at $13,250,000 capital and $7,215,279 expense funds.
[2] Reflects costs associated with various equipment for office, laboratory and water systems.
[3] This cost does not reflect anticipated needs of the NOAA Manchester Research Station and Burley Creek fish facilities at approximately $350,000 to meet productions needs as outlined in the Master Plan and previous actions (also see Footnote #7).

$1,588,000 (combined IDFG, SBT, NOAA and ODFW)[4]. The monitoring and evaluation (M&E) budgets for the program from Fiscal Year 2007 through Fiscal Year 2010 averaged $961,000 (combined IDFG and SBT).

Future cost estimates for O&M at Springfield Hatchery is estimated to be about $769,794 annually. Related M&E expenses are estimated to be $323,019 annually. These estimates are in 2013 and 2114 dollars to reflect the anticipated construction and when these activities would be incurred, respectively. The Master Plan shows these costs escalated at 3 percent annually through 2020.

The estimated 10-year costs to operate the Springfield Hatchery from Fiscal Year 2010 through Fiscal Year 2020 are presented in Attachment 2. The estimated costs are allocated to the fiscal year in which the expense likely will occur. Costs for each program area are escalated to the year in which they are expected to occur. This estimated cost summary assumes planning and implementation of new facilities occur in 2012 through 2013. As previously noted, consistent with Step 1 of the Council's step process, cost estimates at this stage are conceptual. The IDFG will be refining these estimates during the Step 2 and Step 3 planning phases. The 10-year estimated cost summary is designed to be a planning tool and will be updated as costs are refined.

BACKGROUND

The current run of sockeye into the Snake River is one of three remaining populations in the Columbia River Basin; the other two populations, Okanogan Lake sockeye salmon and Wenatchee Lake sockeye salmon, are located in tributaries of the upper Columbia River.

Historically, five Sawtooth Basin lakes (Redfish, Alturas, Pettit, Stanley, and Yellowbelly) in the Upper Salmon River subbasin supported sockeye salmon. Historically, it was estimated that as many as 40,000 sockeye returned to the Upper Salmon River subbasin in some years. However, by 1962, sockeye salmon were no longer returning to Stanley, Pettit, and Yellowbelly lakes. By 1990, Redfish Lake was the only historical spawning, and nursery lake still supporting a remnant anadromous run.

In response to this precipitous decline of Snake River sockeye salmon a petition was submitted in 1990 by the Shoshone-Bannock Tribes and in 1991 the sockeye were listed as endangered under the Endangered Species Act (ESA). In that same year, the IDFG initiated a captive broodstock program to maintain and prevent the extinction this species.

The conservation efforts for Idaho sockeye focus on Redfish, Alturas, and Pettit lakes in the Sawtooth Basin located within the Sawtooth National Recreation Area. The lakes are glacial-carved and range in elevation from 6,512 to 7,014 feet, receive runoff from the Sawtooth and Smoky mountains, are considered ultra-oligotrophic, and lie in the headwaters area of the Salmon River watershed. The Salmon River flows into the Snake River, which in turn flows into the Columbia River, which drains into the Pacific Ocean. The Sawtooth valley is approximately 900 river miles from the mouth of the Columbia River. Redfish Lake is the largest of the three

[4] All Snake River sockeye actions funded through the Program are addresses through Project #2007-402-00, *Snake River Sockeye Captive Propagation*.

lakes, Pettit Lake is the smallest, and Alturas Lake is intermediate in surface area. Additionally, Redfish Lake supports the species' southernmost population within its recognized range.

Snake River sockeye rearing and spawning habitat in the Sawtooth Basin is considered to be in excellent condition as it is in an area that has experienced limited human impacts. Ongoing effects are related to recreational activities such as hiking, river rafting, fishing and hunting. A number of homes have been built around Redfish, Alturas and Pettit lakes and area parks, campgrounds and boat launches are popular destinations.

At the time of the initial listing in 1991, the greatest in-basin habitat problem faced by the ESU was probably the lack of access to any of the lakes but Redfish. The fish barriers on Alturas and Pettit Lake creeks (an irrigation intake and a concrete rough fish barrier, respectively) were modified to facilitate passage of anadromous sockeye into these historical habitats in the early 1990s.

Although access to the spawning and rearing lakes is now considered functional, large portions of the migration corridor in the mainstem Salmon River may periodically reach high temperatures in July and August and negatively impact the ability of adult sockeye salmon to reach spawning locations. To evaluate this uncertainty, the USFWS and NOAA's Northwest Fisheries Science Center have proposed a multi-year study to evaluate the migration survival of adult Snake River sockeye salmon from Lower Granite Dam to the Sawtooth Basin. Information generated by this project is expected to help inform decision making about when to consider trapping and transporting adult sockeye salmon to natal spawning areas. In addition, a new project is currently being reviewed that would characterize migration and survival of juvenile Snake River sockeye salmon between the upper Salmon River and Lower Granite Dam[5]. This project will provide information to managers on the relative success of juvenile release strategies employed by the sockeye salmon captive broodstock program.

In addition, the Salmon River Subbasin Plan identifies a list of problem statements, biological objectives, and strategies. The strategies and monitoring activities outlined in the Master Plan for the Springfield Hatchery sockeye program would contribute to meeting a number of the biological objectives identified in the Salmon River Subbasin Plan.

IDFG has submitted a proposed draft Snake River Sockeye Salmon Recovery Strategy to NOAA Fisheries for consideration in recovery planning. This strategy recommends incorporating hatchery facilities, captive broodstock technology, genetic support, and a comprehensive monitoring and evaluation plan to maintain the current population and rebuild the number of naturally produced anadromous sockeye in the basin.

I. History and objectives of the Snake River Sockeye Captive Broodstock Program

The IDFG initiated the captive broodstock and research efforts in 1991 and received Fish and Wildlife Program funding that same year (Project 1991-072-00). Initially, to guard against catastrophic loss at any one brood facility, the captive broodstock component of the program was

[5] Project #2010-076-00, *Characterizing migration and survival for juvenile Snake River sockeye salmon between the upper Salmon River basin and Lower Granite Dam.*

duplicated at facilities in Idaho (IDFG Eagle Fish Hatchery) and Washington (NOAA Manchester Research Station and Burley Creek fish hatcheries) to provide eyed eggs to meet project conservation needs. The IDFG Sawtooth Hatchery and the ODFW Oxbow Fish Hatchery (near Cascade Locks, Oregon) currently provide 100 percent of the smolt production rearing space for this program. To date, broodstocks have been established from wild anadromous adults, wild residual sockeye salmon, hatchery-produced anadromous adults, and full-term hatchery-produced adults.

Current production of Snake River sockeye salmon is restricted, due to capacity, to broodstock maintenance at facilities in Idaho (IDFG Eagle hatchery) and Washington (NOAA facilities); insufficient incubation and rearing space continues to limit production of a necessary full-term smolt program. This limitation has prevented the current program from growing beyond the conservation phase (Table 1).

Table 1. Annual distribution of SR sockeye eggs under *current* operations.

Facility (Strategy)	**Current Number of Eyed Eggs**
IDFG Eagle (Replacement Brood)	1,000
NOAA Facilities (Replacement Brood)	500
NOAA Facilities (Adult Release)	500
Basin Lakes (Egg-Boxes)	50,000
IDFG Sawtooth (Pre-Smolt Releases)	80,000
ODFW Oxbow (Smolt Releases)	100,000
IDFG (Smolt Releases)	120,000
Total	**352,000**

Coordination of recovery efforts is carried out under the guidance of the Stanley Basin Sockeye Technical Oversight Committee (SBSTOC), a team of technical experts representing the IDFG, NOAA Fisheries, and the Shoshone-Bannock Tribes. Further coordination takes place at the federal level through the ESA Section 10 permitting process. The Bonneville Power Administration provides coordination for the SBSTOC process.

Since 1995, the Shoshone Bannock Tribes have been supplementing nitrogen and phosphorus, and controlling non-native kokanee salmon competitors (i.e., for food resources) in the Sawtooth Basin lakes. Based on annual water quality criteria and biological sampling, this management strategy appears to be increasing the carrying capacities of the lakes for rearing juvenile Snake River sockeye salmon as part of the recovery effort.

In 1999, the first hatchery-produced anadromous sockeye salmon returned to the program. In that year, seven age-3 adults (six males and one female) were trapped at weirs in the Sawtooth subbasin. In 2000, the program experienced its first significant return of hatchery-produced adults when 257 sockeye salmon returned to collection facilities on Redfish Lake Creek and the upper Salmon River at the IDFG Sawtooth Fish Hatchery. Between 2001 and 2010, over 2,929 hatchery-produced sockeye salmon adults returned to the Sawtooth Basin (Table 2).

Table 2. Hatchery and natural sockeye returns to Redfish Lake, 1999-2010.

Return Year	Total Return	Natural Return[6]	Hatchery Return	Observed (Not Trapped)	Naturals Kept for Broodstock	Hatchery Kept for Broodstock
1999	7	0	7	0	0	7
2000	257	10	233	14	4	39
2001	26	4	19	3	0	9
2002	22	6	9	7	0	0
2003	3	0	2	1	0	2
2004	27	4	20	3	4	20
2005	6	2	4	0	2	4
2006	3	1	2	0	1	2
2007	4	3	1	0	3	1
2008	650	142	457	51	25	48
2009	833	85	732	16	63	84
2010	1,355	178	1,144	33	84	13

The existing captive broodstock program has stabilized the population and prevented an almost certain extinction of this species in Idaho. The adoption of state-of-the-art artificial propagation techniques for the conservation of endangered stocks allowed the program to produce large numbers of spawnable fish in the first generation and rapidly increase the abundance of offspring available for restoration releases in the Sawtooth Valley lakes.

II. Springfield Sockeye Hatchery Master Plan for the Snake River Sockeye Program

To date, the Snake River sockeye program's goal has been to conserve and slow the loss of the genetic diversity and prevent extinction. In fact, program genetic protocols have maintained over 93 percent of the original genetic diversity of the founding populations. As outlined above, the program is supported by a variety of facilities in three states. Adult collection facilities are in the upper Salmon River watershed; incubation and rearing facilities are at Eagle and Sawtooth hatcheries in Idaho, at the Manchester Research Station and Burley Creek Hatchery in Washington, and at Oxbow Hatchery in Oregon.

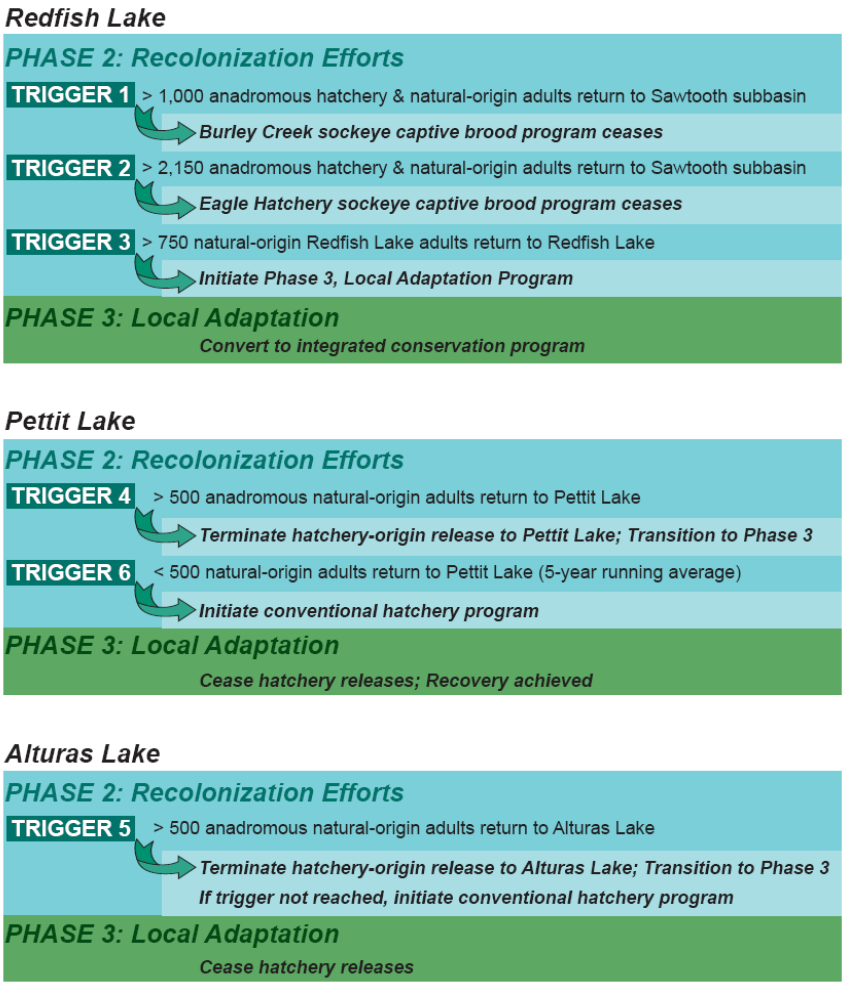
The Springfield Hatchery Master Plan addresses the next phase in the Snake River Sockeye Captive Brood Program through construction of a new sockeye smolt production hatchery and implementation of associated program management goals. The first phase of the program, the captive broodstock phase, has achieved sufficient success that the IDFG is proposing to initiate the next phase of population re-colonization. To address this next phase in recovery, increased production capacity is required to accomplish re-colonization of Sawtooth Basin lakes. The proposed Springfield Hatchery will not only centralize the production of sockeye, but also provide the needed flexibility to meet the capacity needs of the recovery effort.

[6] Adult returns from natural production from Redfish, Alturas and Pettit lakes.

The biological goal described in the Master Plan is to increase the number of adults spawning naturally in the basin. The survival boost afforded by sockeye smolt releases from the proposed Springfield Hatchery is expected to produce adults in excess to the broodstock needs that would be used for this purpose. Currently, NOAA-Fisheries' interim delisting criteria for this population is 2,000 naturally produced sockeye over at least two consecutive generations. To meet NOAA Fisheries' recovery criteria, 1,000 of these fish must be produced in Redfish Lake and 500 each in two additional lakes. In the long term, the IDFG goal is to re-establish a natural population (i.e., local adaption phase) that can be de-listed and even provide treaty and sport harvest opportunities.

The phased approach designed by IDFG is based on key criteria and escapement triggers that are built on the success of the current captive broodstock phase. The next phase outlined in the Master Plan is the local adaption phase based on the production potential of the three key nursery lakes. The rationale behind this approach will ensure that the critical life history diversity and past efforts are respected (Figure 1).

Figure 1. Program Management Triggers.



In the re-colonization phase, the existing captive broodstock program will be transitioned to conventional hatchery production that uses anadromous adults as broodstock. Sufficient numbers

of anadromous adults have been returning to begin developing this conventional hatchery program. The primary objectives of re-colonization will be for gene banking and generating anadromous adults to re-colonize available habitat. Adequate and consistent returns of anadromous adults will allow managers to eventually phase out the use of Redfish Lake captive broodstock (starting with the NOAA activities). Following success in Redfish Lake, re-colonization efforts will expand into Pettit and Alturas lakes.

Sockeye production will increase up to 1 million smolts (at 10-20 fish per pound). All fish released from the program will be marked by removal of the adipose fin. A subset of the release will be tagged with a coded-wire tag (250,000) and PIT tag (50,000). These tags will allow managers to calculate harvest rates in fisheries and determine adult and juvenile survival rates through the FCRPS.

The 1 million sockeye smolts required for the re-colonization phase will be produced at the proposed Springfield Hatchery. Although this site is many miles from the Sawtooth Basin, it offers a number of advantages, such as having a high quality and available source of groundwater. In addition, hatchery effluent will not discharge to waters that support anadromous fish production, preventing potential viral and bacterial pathogens from hatchery operations entering streams that support ESA-listed populations. The preferred collection point for re-colonization-phase broodstock will initially be the Redfish Lake weir. Collecting fish here would prevent the program from collecting adults bound for Pettit and Alturas lakes. The re-colonization phase may also include the collection of anadromous adults at Lower Granite Dam; this strategy is currently being evaluated as one possible means to increase the total number of potential spawners returning to the Sawtooth Basin.

Facilities

The proposed sequencing of the Snake River sockeye program from a captive broodstock program to the re-colonization phase and finally to the local adaptation phase in available habitats will require increasing the available rearing space for smolt production. The proposed method for this transition is to produce significant numbers of adults in excess to broodstock needs. The proposed smolt program at the Springfield Hatchery would be capable of meeting the 500,000 to 1 million smolt goal identified in the FCRPS Biological Opinion and in the Idaho Fish Accord.

Program expansion at the Eagle Fish Hatchery was completed (2009) and modifications are currently underway at NOAA facilities to accommodate the increased number of captive spawners needed to source a Springfield smolt production program[7]. Captive broodstock rearing would be increased to approximately 1,000 – 1,200 adults annually to provide the estimated 1,300,000 eyed eggs needed to source both Springfield and existing in-basin release strategies.

[7] On June 14, 2006 and August 14, 2007 the Council approved within-year requests for Eagle Fish Hatchery and ODFW Oxbow Hatchery modifications to meet the expectations of the FCRPS BiOp and the UPA for the Redfish Lake sockeye salmon. NOAA modifications were addressed as part of the process that consolidated the projects and addressed the UPA needs in 2008.

As proposed in the *Springfield Sockeye Hatchery Master Plan*, new facilities required to accomplish this include a new hatchery building with egg incubation stacks, 18 indoor early rearing troughs, 24 outdoor raceways, and all supporting facilities including three new residences for operators. Key attributes of the Springfield site are sufficient high quality groundwater, full isolation from other salmonids, adequate space to develop sockeye-appropriate facilities, and an already permitted land use type[8].

As the number of returning anadromous adults increase over time in the re-colonization phase operations, captive broodstock production would decrease as spawning protocols begin to incorporate a greater number of anadromous spawners (ultimately transition to a "conventional" hatchery program using anadromous adults as broodstock). As this transition occurs, the existing brood facilities would be transitioned from NOAA facilities first, then the captive broodstocking efforts at Eagle Fish Hatchery; all captive broodstocking activities could potentially be eliminated when the five-year running average of hatchery- and natural-origin anadromous adults to the Sawtooth Basin exceeds 2,150 adults.

III. Major Project Review (The Three-Step Process)

On December 12, 2010 the Council received a Master Plan from Idaho Department of Fish and Game intended to initiate the review process (i.e., Major Project Review) associated with a proposed hatchery master plan. The Master Plan (Step 1- conceptual phase) was titled *Springfield Sockeye Hatchery Master Plan for the Snake River Sockeye Program* and is a component of Project 2007-402-00, *Snake River Sockeye Captive Propagation*.

On December 22, 2010 the Master Plan and the associated support documents were submitted to the Independent Scientific Review Panel (ISRP) for review, and on February 7, 2011 the ISRP provided its review summary and recommendation (ISRP Document 2011-2). The ISRP found that the master plan met scientific review criteria "qualified."

The ISRP found the Master Plan to be well written and addressed a challenging situation in the recovery of these endangered species. Though the ISRP found the master plan met review requirements for proceeding to Step 2 (progress review/preliminary phase) the panel requested responses to six qualifying issues during the Step 2 review:

> 1. Clarify the plan for using anadromous hatchery, natural, and captive-reared adults for escapement and production at Springfield Hatchery during the transition from the proposed conservation phase to the re-colonization phase.
>
> 2. Provide a comparison of the program with release goals and explain the justification for the preferred alternative in terms of achieving the recovery and restoration goals of the anticipated Snake River sockeye recovery plan.
>
> 3. Discuss the characteristics ("quality") of the smolts to be produced and what will constitute a smolt with survival capability in terms of ecological fit?

[8] In addition, IDFG proposes to adopt a design/build approach following completion of the Step 2 (progress review/preliminary phase) review. IDFG would like to competitively solicit a construction firm to work in partnership with the design engineers and fish culturists to develop the Step 3 final design.

4. Additional detail and understanding is needed to justify a plan for natural escapement when hatchery and natural adults are in the range of 800 to 1,200 fish.

5. Develop an experimental management plan, with sufficient monitoring, to evaluate lake carrying capacity. This should be incorporated into the trigger points and decision framework for determining smolt release numbers, natural escapement targets, and PNI.

6. The ISRP recommends that other species not be reared in the facility, in order to restrict opportunities for disease transmission.

ANALYSIS

The IDFG provided a master plan that adequately defended the need for actions to transition the Snake River sockeye salmon program from the current conservation phase to a program that is intended to initiate the recovery of this endangered species. The Council has contributed, since 1992, to a program that has prevented a species from going extinct. This has not been an easy task and the IDFG, NOAA and the SBSTOC need to be recognized for this effort. The opportunity now exists to initiate the next phase and the submitted master plan has provided the necessary detail so that the ISRP has recommended that it move forward to the progress review/preliminary phase (Step 2) step.

The proposed new Springfield facilities will include a hatchery building with egg incubation stacks, 18 indoor early-rearing troughs, 24 outdoor raceways, and all supporting facilities including three new residences for operators. The Springfield site is desirable because of the quantity and quality of groundwater, full isolation from other anadromous salmonids, and because it provides an opportunity to use an existing permitted land use type.

The ISRP recognizes the need to proceed toward establishing a self-sustaining hatchery population as outlined and reviewed in the master plan, and supports this program moving to Step 2 activities (e.g., preliminary design and environmental review). This recommendation from the ISRP is made with the understanding that the IDFG will address the six issues raised by the ISRP in the Step 2 submittal.

Based on the ISRP review, the Council approved the *Springfield Sockeye Hatchery Master Plan for the Snake River Sockeye Program* to proceed with Step 2 activities. This recommendation is subject to the requirement that the IDFG addresses the six issues raised by the ISRP as part of the Step 2 submittal.

Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Review of the

Master Plan for the Snake River Sockeye Program: Springfield Hatchery

(BPA Project #2007-402-00)

Step One of the Northwest Power and Conservation Council's Three-Step Review Process

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ISRP 2011-2

ISRP Review of the Master Plan for the Snake River Sockeye Program: Springfield Hatchery

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ISRP Review of the Master Plan for the Snake River Sockeye Program: Springfield Hatchery

Background

At the Northwest Power and Conservation Council's December 22, 2010 request, the ISRP reviewed the Idaho Department of Fish and Game's Master Plan for the Snake River Sockeye Program (#2007-402-00). This is a Step 1 review in the Council's Three Step Review Process. Step 1 is the feasibility stage, and all major components and elements of a project should be identified. This review focuses on the IDFG's responses to the Step 1 scientific review elements specified by the Council. Although this is a Step 1 review, the ISRP has reviewed Snake River Sockeye Program proposals multiple times over the past 14 years, including in the recent Categorical Review of Research, Monitoring, and Evaluation and Artificial Production projects for the Fish and Wildlife Program (ISRP 2010-44b).

As described in the Master Plan:

> The Springfield Hatchery Master Plan addresses the next phase in the Snake River Sockeye Captive Brood Program through construction of a new sockeye smolt production hatchery and implementation of associated program management goals. The first phase of the program, the captive broodstock phase, has achieved sufficient success that the Idaho Department of Fish and Game is proposing to initiate Phase 2, population re-colonization. The increased production capacity required to accomplish recolonization of Sawtooth basin lakes would be achieved at a hatchery complex proposed in Bingham County, Idaho. Dedicated to production of Snake River sockeye smolts, the resulting adult returns from fish produced at this facility would provide sufficient broodstock to meet re-colonization goals in Redfish, Pettit and Alturas lakes.
>
> The Springfield Hatchery would be developed at the site of an abandoned trout hatchery that was purchased by the Idaho Department of Fish and Game. Functioning artesian wells would supply the quality and quantity of groundwater necessary to meet sockeye production objectives. Isolated from other anadromous populations, the site also allows implementation of critical best management practices for disease control during sockeye production. All sockeye smolts produced at Springfield would be transported to the Sawtooth basin for release in targeted recolonization areas.
>
> As described in this Master Plan, implementing a self-sustaining anadromous hatchery program for Snake River sockeye is expected to achieve the recruit-per-spawner levels, and therefore adult return levels, needed to facilitate population recovery. The production capabilities of the proposed Springfield Hatchery are a key component to achieving this recovery objective. As more locally-adapted sockeye adults return to Sawtooth basin, it is expected that natural selection and local adaptation will increase the productivity of the population. The Springfield Hatchery program would then transition to Phase 3, implementing a sliding-scale model that integrates broodstock and escapement management driven by natural production.

> The Snake River sockeye program focuses first and foremost on population conservation. In the short term, the goal has been to slow the loss of critical population genetic diversity and prevent species extinction. The biological goal described in this Master Plan is to increase the number of adults spawning naturally in the system. The survival boost afforded by sockeye smolt releases from the proposed Springfield Hatchery is expected to produce adults surplus to broodstock needs that would be used for this purpose. Over time, the objective is to have an average adult escapement of 2,000 fish over two generations. To meet NOAA Fisheries recovery criteria, 1,000 of these fish must be produced in Redfish Lake and 500 each in two additional lakes. The program proposes to achieve the 500 adult fish escapement target in Pettit and Alturas lakes. In the long term, the goal is to re-establish a natural population that can be de-listed and even provide treaty and sport harvest opportunities.

Our review of the Master Plan follows below.

Review Summary and Recommendations

Meets Scientific Review Criteria (Qualified)

The ISRP requests responses to the issues below during Step 2.

1. Please clarify the plan for using anadromous hatchery, natural, and captive-reared adults for escapement to Redfish Lake, captive rearing, and Phase 2 production at Springfield Hatchery during the initiation of Springfield production. The Master Plan does not indicate how the transition from captive rearing to anadromous-based production will be executed.

2. Provide a comparison of the program with release goals across a range from the current 150,000 smolt to the 1,000,000 smolt preferred alternative, and explain the justification for the preferred alternative in terms of achieving the recovery and restoration goals of the anticipated Snake River sockeye recovery plan.

3. Discuss the characteristics ("quality") of the smolts to be produced. The end-product is 400,000 to 1,000,000 smolts in the range of 10 to 20 fish per pound, but beyond that little is mentioned. What will constitute a smolt with survival capability in terms of ecological fit? The Master Plan intends to "mimic" natural sockeye in the hatchery to the extent possible (e.g. run timing, age composition selected for hatchery brood stock), but it fails to do so by releasing exceptionally large smolts (10-20 fish per pound or ~23-45 g; Table 5-4). The proposed age-1 hatchery smolt size is undoubtedly bigger than age-1 or age-2 natural smolts produced in Redfish Lake. Enhanced growth of hatchery sockeye salmon could lead to earlier age-at-maturation and potentially alter other fitness characteristics that may be important when the hatchery fish return to spawn and interbreed with natural origin fish in the lakes, or even salmon that residualize in freshwater, estuary, or nearshore ocean habitats.

4. Currently anadromous-hatchery and natural-origin adults are released to spawn in Redfish Lake. Recent return numbers are actually at or below the minimum run sizes in Table 5-3 (page 69) for allocating any escapement into Redfish Lake. It does not seem to be justified to collect all

the returning adults (hatchery and natural) and use them in culture with no natural escapement. Consequently, some discussion is needed to elaborate and justify a plan for natural escapement when hatchery and natural adults are in the range of 800 to 1200 fish.

5. Develop an experimental management plan, with sufficient monitoring, to evaluate lake carrying capacity. This should be incorporated into the trigger points and decision framework for determining smolt release numbers, natural escapement targets, and PNI.

6. The Master Plan does not explicitly state that the Springfield Hatchery will be exclusively used for Snake River sockeye salmon production. The ISRP recommends that other species not be reared in the facility to restrict opportunities for disease transmission.

Summary comment: The Master Plan is well written and addresses a challenging situation. Currently Snake River sockeye salmon are under full-lifecycle captive culture, and the ISRP has recognized that a step toward establishing a self-sustaining natural population is likely to include first establishing a self-sustaining anadromous hatchery program. The current program uses Lower Snake River Compensation Plan hatchery facilities, and it is understandable from a variety of standpoints that a facility dedicated to Snake River sockeye salmon is desirable.

The proposed Springfield Hatchery represents Phase 2 of a three-phase effort to recover Snake River sockeye salmon. The Master Plan adequately explains the goals and objectives of the Springfield Hatchery and identifies general limitations of the overall program in terms of sockeye population recovery, e.g., the need to improve survival of salmon downstream of the lakes. The Master Plan states that these factors are beyond its control. Nevertheless, the Master Plan is intended by regional managers as a key step in the recovery of Snake River sockeye salmon. The overall framework of the Master Plan, using trigger points to transition from Phase 1, to Phase 2, to Phase 3, and recognizing that environmental conditions outside of the hatchery will determine the success of the program is a logical approach. Below, the ISRP provides constructive suggestions for consideration in developing responses in Step 2 of the planning process.

The proposed program may provide additional resilience to extirpation (or extinction) of this ESU by improving total adult abundance, if successful, but it will still be necessary to provide substantial improvements in lake productivity (smolts per spawner) and/or migration corridor survival to achieve a self-sustaining natural population. A self-sustaining natural population is required as an ultimate goal to be consistent with the Fish and Wildlife Program and delisting under the ESA. Therefore, the Master Plan should incorporate a thorough analysis to evaluate whether or not the ultimate goal of a self-sustaining <u>natural</u> population of sockeye salmon (along with some limited harvest) is reasonably possible. ISRP inspection of the available data suggest that a self-sustaining <u>natural</u> sockeye population is unlikely (survival rates and fecundity are too low). If a self-sustaining natural sockeye run is not likely given the existing habitat, survival conditions, sockeye fecundity, and a larger natural spawning population after hatchery supplementation (as proposed), then the analysis should estimate what survival conditions are necessary to achieve these goals for natural sockeye salmon. This analysis is different from simply stating a SAR goal of 4%, which is an unrealistic goal for natural (and hatchery) sockeye salmon at present (see Aquatic Objective 1A, P. 56). These estimated values could be used as

targets for rehabilitation programs. Furthermore, the analysis could be used to inform the Council as to whether a self-sustaining natural sockeye salmon population is reasonably possible or if the three phase sockeye recovery program will likely be stuck indefinitely with Phase 2 hatchery supplementation.

The size of the proposed program is not well justified in the Master Plan, and should be further developed in Step 2. It is not clear to the ISRP why 400,000 to 1,000,000 smolts are needed to achieve the rebuilding anticipated in the plan.

Although the Master Plan intends to "mimic" natural sockeye in the hatchery to the extent possible (e.g., run timing, age composition selected for hatchery brood stock), it fails to do so by releasing exceptionally large smolts (10-20 fish per pound or ~23-45 g; Table 5-4). The proposed age-1 hatchery smolt size is undoubtedly bigger than age-1 or age-2 natural smolts produced in Redfish Lake. For example, age-1 and age-2 sockeye smolts in oligotrophic lakes of Bristol Bay, Alaska, average approximately 6-10 g and 10-14 g, respectively, depending on stock. Enhanced growth of hatchery sockeye salmon could lead to earlier age-at-maturation and potentially alter other fitness characteristics that may be important when the hatchery fish return to spawn and interbreed with natural origin fish in the lakes. The Master Plan should discuss and reconcile these differences, relative to its goal of "mimicking" natural sockeye life cycle and smolt attributes.

The Master Plan recognizes the potential for density dependent interactions between the release of about one million hatchery sockeye salmon smolts and naturally produced sockeye salmon in the lakes. These interactions could include competition for food and space, or predation if the large hatchery release attracts predators that also consume naturally produced sockeye. An experimental release approach should be planned as a means to evaluate lake capacity and modify release strategy as needed. The spawner to recruitment relationship in oligotrophic lakes for shore-spawning sockeye has not received a great deal of attention in the formal fisheries literature, but it very likely mimics the Ricker curve, and not the Beverton-Holt curve. Thus, a limited number of adults may be required to fill available spawning sites to capacity, after which recruitment declines. That limit was not well defined in the Master Plan, nor was it clear that Ricker recruitment was considered in the plan or in the AHA modeling. It is necessary to learn at what abundance the further addition of hatchery spawners decreases the future recruitment of wild spawners to the lake.

Determining a recruitment function for the Sawtooth system may prove difficult. The addition of mysid shrimp, kokanee, rainbow trout, nutrients, and perhaps other factors complicate the analyses. Consequently, modelling of the limnological conditions as well as the life-stage recruitment is recommended to explore the range of effects from the addition of hatchery spawners. Given the anticipated climate change effects on conditions in the lake, the migration corridor, and the ocean, impacts of the program on other species in freshwater, and inter- and intra-specific interactions with natural-origin salmon need to be considered.

Marking and/or tagging of all hatchery sockeye salmon is important for evaluating production of natural origin sockeye salmon, and it is good that essentially all hatchery sockeye will be marked. However, juvenile sockeye salmon are much more susceptible to handling stress and

descaling compared with coho, Chinook, and steelhead; therefore, special care will be needed to externally mark these fish while minimizing mortality.

The Master Plan restates NOAA Fisheries' identification of major factors limiting survival of Snake River sockeye salmon, i.e., migration through the federal hydropower system, reduced tributary flows, and high water temperatures experienced by both outmigrating juveniles and returning adults (P. 58). Mortality of sockeye salmon smolts is reportedly very high between the Salmon River and Lower Granite Dam (49-73%, P. 60). Although the NOAA 2008 Biological Opinion suggests improvements in sockeye survival rates in the hydropower system are likely to be less than 10% (P. 60), the Phase 2 Master Plan should consider what is needed to improve survival upstream of the dams. Is it possible to sufficiently improve survival within this reach where mortality seems to be high so that a self-sustaining natural run might be achieved?

Adult returns of sockeye salmon throughout the Columbia Basin have been relatively high in recent years. The 2010 return to the Snake River was the highest in many years. High survival rates should not be expected to persist into the coming years. The Master Plan provided abundance triggers for various actions, but it should explicitly consider what happens to the Phase 2 hatchery if it is completed in a year or time period when relatively few adults return.

ISRP Comments on Step 1 Review Elements

A. All Projects

Does the Snake River Sockeye Master Plan:

1) address the relationship and consistencies of the proposed project to the eight scientific principles (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section B.2) (Step 1)?

The eight Scientific Principles:
1. The abundance, productivity, and diversity of organisms are integrally linked to the characteristics of their ecosystem.
2. Ecosystems are dynamic, resilient and develop over time.
3. Biological systems operate on various spatial and time scales that can be organized hierarchically.
4. Habitats develop, and are maintained, by physical and biological processes.
5. Species play key roles in developing and maintaining ecological conditions.
6. Biological diversity allows ecosystems to persist in the face of environmental variation.
7. Ecological management is adaptive and experimental.
8. Ecosystem function, habitat structure and biological performance are affected by human actions.

The Master Plan's Section 3.2. addresses each of the eight scientific principles. IDFG appears to understand the risks and uncertainties associated with employing an artificial production program to recover Snake River sockeye salmon. In the discussion of the eight principles the Master Plan focuses primarily on artificial production risks and anticipated benefits. However, the Master Plan does not sufficiently extend beyond the goals of the hatchery program and

describe how specific changes in habitat, especially in the migration corridor, might contribute to recovery of a self-sustaining population of sockeye salmon. More attention during development of an adaptive monitoring and evaluation (M&E) program in Step 2 needs to be directed toward learning about reintroduction limitations and lake productivity owing to alteration of the lake ecosystems from introduced kokanee, and loss of marine derived nutrients. The Master Plan does not appear to fully consider the difficulty that is likely to be encountered in achieving an historical level of capacity for sockeye in the Sawtooth lakes. Throughout the Master Plan there is recognition that recovery (a self-sustaining natural population) will not be achieved by actions proposed in this project. Improved migration and ocean survival are needed and cannot be substituted by improved survival during juvenile life-stages.

2) describe the link of the proposal to other projects and activities in the subbasin and the desired end-state condition for the target subbasin (Step 1)?

Other associated projects are identified but not discussed in a detailed manner. A statement is made that lake spawning and stream rearing habitat in the upper basin is of high quality, even "pristine" condition but this is followed by lists of habitat projects. The ISRP is skeptical of the claim of pristine lake and stream habitat. Why would lake and stream habitat restoration be needed if habitat is pristine?

The increased production from this effort is likely to lead to increased abundance of hatchery-origin adult sockeye, and perhaps increased abundance of natural-origin sockeye. Any recovery is contingent upon the capacity for Sawtooth lakes to produce more smolts than are currently produced. The project is unlikely to improve productivity (smolts per spawner or adult-to-adult replacement). Productivity improvement is required for recovery of Snake River sockeye salmon. It is not clear how the time to recovery will be improved by this project if habitat issues are not addressed. Without habitat improvements the project cannot lead to recovery. It may permit establishment of a self-sustaining (that is, non-captive maintained) anadromous hatchery population.

The Master Plan describes the overall goals of the three phase program to recover Snake River sockeye salmon but does not provide sufficient information and analysis to infer whether recovery is eventually possible. In brief, the Master Plan seems to conclude that the lake habitats are relatively pristine and that the key factors limiting the survival of sockeye salmon are downstream and out of control of the IDFG Master Plan. However, the Master Plan should be a key document in the overall recovery of natural sockeye salmon. Key factors affecting sockeye survival should be addressed in detail, including approaches to improve survival throughout the sockeye life cycle. Additionally, available data should be analyzed to describe what level of survival increase is needed during each stage in order to have a self-sustaining natural population. In other words, the Master Plan could be improved if it was written from the perspective of what is needed to recover the natural run of sockeye salmon. The proposed hatchery is an important step in this process, but additional details of the overall recovery plan could be incorporated into the plan.

3) define the biological objectives (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section C.2 (1) and (2), and Technical Appendix) with measurable attributes that define progress, provide accountability and track changes through time associated with this project (Step 1)?

General statements are provided in Section 3.3.2 – Biological objectives with measurable attributes (page 23). "The primary goal of this program is the conservation of Snake River sockeye salmon.…The proposed Springfield Hatchery will contribute significantly toward achieving this biological goal by first, establishing a self-sustaining anadromous brood hatchery program.…Second, the program will provide surplus anadromous captive adults for direct planting into Redfish and Pettit Lakes.…Finally, surplus captive brood Redfish Lake adults will be used to recolonize Alturas Lake."

The actual quantitative expectations, and a timeframe, from the Springfield Hatchery program are not stated in the defined Biological Objectives.

4) define expected project benefits (e.g. preservation of biological diversity, fishery enhancement, water optimization, and habitat protection) (Step 1)?

Section 3.3.3 – Expected Project Benefits (page 23) appears inconsistent with the preceding section on biological objectives with measurable attributes. Section 3.3.3 states: "Biologically, the project would restore sockeye populations in Pettit and Alturas lakes and expand ongoing population restoration efforts in Redfish Lake."

If the SARs used for planning purposes, which have been realized since 2006 releases (2008, 2009, and 2010 adult returns), continue it is likely a self-sustaining anadromous hatchery program can be established. However, as identified later in Section 5, this will not lead to restoration of Snake River sockeye unless there are substantial additional improvements in either SAR or in Adult-to-Smolt yield. From first principles, restoration of sockeye requires a self-sustaining natural population. The habitat improvements necessary to achieve survival for a self-sustaining population are entirely independent from any artificial production efforts. The artificial production program may provide additional time, and some resilience, and in that way contribute toward restoration.

5) describe the implementation strategies (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.2) as they relate to the current conditions and restoration potential of the habitat for the target species and the life stage of interest (Step 1)?

This section of the Master Plan is not adequate. The statement that the Master Plan focuses on hatchery actions required to achieve Snake River sockeye recovery objectives appears consistent with the biological objectives and expected project benefits, but the very brief remainder of this section does not sufficiently address current conditions and restoration potential. For the artificial production strategies to contribute to achieving the Snake River sockeye salmon recovery goals

there needs to be consideration of the current life-stage survival as the cause of the decline of this species and elaboration on how that life-stage survival needs to be improved (and can be improved) for any benefit to accrue from hatchery smolt production. It appears to the ISRP that if SARs decline to levels seen during the 1990s and 2000s, then achieving a transition from captive rearing to anadromous hatchery production is unlikely. If SARs do not improve further, then transition from Phase 2 reintroduction/anadromous hatchery program to Phase 3 local adaptation is also unlikely. According to the Master Plan (page 66 table 5.1) Phase 2 anticipates an SAR of 1% for natural smolts and 0.4% for hatchery smolts. Assumptions for the Phase 3 local-adaptation (integrated conservation program: table 5.6. page 75) are SAR for natural smolts of 2% and SAR of hatchery smolts of 0.83%. The plan does not discuss sufficiently the likely hydrosystem (FCRPS), harvest, or predator reduction actions that may lead to these improvements in smolt to adult survival. Although some habitat issues were briefly described, the Master Plan has not described the extent to which each rehabilitation activity might enhance survival of natural sockeye salmon at each life stage. The Master Plan did not describe the level of survival increase needed at each life stage in order to achieve recovery of natural sockeye salmon.

6) address the relationship to the habitat strategies (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.3) (Step 1)?

The Master Plan does not articulate an experimental framework consistent with the habitat strategies in the Fish and Wildlife Program; language from the Fish and Wildlife Program is cited in the Master Plan: “Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat and restore the population of the target species up to the sustainable capacity of the habitat.”

In the case of the Snake River sockeye, on page 24, proponents argue that “sockeye spawning and rearing habitat in the Sawtooth basin is mainly intact and of high quality.” Elsewhere proponents conclude that production of juvenile kokanee and sockeye is limited by lake nutrient levels and zooplankton production, and that the capacity of the lakes is currently unknown. The lakes have undergone changes in the species assemblage with the introduction of kokanee, and have purportedly lost marine derived nutrients with the reduction of anadromous adults. An experimental approach to adult escapement for spawning needs to be developed to learn what the likely contemporary capacity limits are.

The Master Plan noted that high mortality of smolts occurs between the Salmon River and Lower Granite Dam. It also noted that high water temperature was a problem, but it did not fully describe the extent to which rehabilitation efforts in the migratory corridor upstream of dams might improve sockeye survival.

Three alternatives (maintain status quo, rely on natural production, and recover five lakes) are considered in a cursory manner, with a few sentences. The statement is made that the strategy selected by IDFG for the next phase of the sockeye program focuses primarily on hatchery production because alternatives are for the most part outside of their direct control. The ISRP

thinks that statement is debatable, when survival of smolts to date is poor and highly variable (range 27-51%). How does that survival compare with other populations and other species? Also, it is stated elsewhere in the Master Plan (page 60) that the possibility of collection of adults at Lower Granite Dam "may be considered" to increase escapement. Why is that considered along with the other three alternatives?

7) ensure that cost-effective alternate measures are not overlooked and include descriptions of alternatives for resolving the resource problem, including a description of other management activities in the subbasin, province and basin (Step 1)?

The alternative considered should be expanded to more fully consider options with less than 1,000,000 smolt releases. It is reasonable to develop a program that phases out the captive rearing and employs a traditional anadromous hatchery program. However, the Master Plan does not adequately justify how the 1,000,000 smolt program is likely achieve management objectives sooner than a program with fewer smolts. This deficiency could be explored in Step 2 in an experimental management and M&E program document.

8) provide the historical and current status of anadromous and resident fish and wildlife in the subbasin most relevant to the proposed project (Step 1)?

Adequate. A brief summary was provided. Predators of sockeye salmon smolts could have been described in more detail. More details on the characteristics of natural sockeye salmon could have been provided, e.g., smolt length-at-age, smolts per spawner.

9) describe current and planned management of anadromous and resident fish and wildlife in the subbasin (Step 1)?

A brief summary was provided. It is noteworthy that attempts will be made to eliminate or reduce abundance of non-native kokanee. Results of the competition study involving hatchery rainbow trout and sockeye in Pettit Lake (page 17) should be described and the findings should be used to decide whether the trout hatchery program should be terminated. Are hatchery trout consuming sockeye fry?

The proposed hatchery strategy (sec 5.4) is the keystone of the document and appears to be well and thoroughly thought through. Appropriately, the stocking of life stages other than smolts will be discontinued, as they have not performed well in the past. Specific triggers that would help shape management decisions such as progressing to Phase 3 of the program are very nicely developed and clearly presented. The overall approach is to keep the existing program in place and gradually shrink those efforts as Phase 2 increases.

The Master Plan states that collection of adults at Lower Granite Dam "may be considered" to increase escapement. Why was this not considered earlier? What criteria would be used? What could be gained or lost? How is this related to one of the three proposed alternatives?

The proposed outplanting of adults to Alturas and Pettit lakes to "jumpstart" them will only be successful if a number of things occur (like successful spawning-hatching-rearing). No discussion was presented, and it is critically needed.

Absent from the Master Plan is a discussion of the characteristics ("quality") of the smolts to be produced. The end-product is 400,000 to 1,000,000 smolts in the range of 10 to 20 fish per pound, but beyond that little is mentioned except the indication that fish should be released at the "correct" size and time. Section 1 of the Plan indicates that smolts seen to date are either age 1 or 2, the percentage of each varies from 2-98% respectively, and fork lengths range from 45-120+ mm. What is the "correct" size and time? What will constitute a smolt with survival capability in terms of ecological fit? Lacking is a discussion that includes a review of these issues for sockeye elsewhere. Further, what is the likelihood that pre-smolts that have been growing at a very rapid rate in the Springfield hatchery (and very different than those in the Sawtooth Valley) will then, after release, residualize or minijack at high rates as seen for Chinook elsewhere?

10) demonstrate consistency of the proposed project with NOAA Fisheries recovery plans and other fishery management and watershed plans (Step 1)?

Adequate.

11) describe the status of the comprehensive environmental assessment (Step 1 and 2)?

Adequate.

12) describe the monitoring and evaluation plan (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.9) (Step 1, 2 and 3)?

Inadequate. The Snake River sockeye program has been well run, and past monitoring data has been properly collected, analyzed, and reported. The monitoring and evaluation program is reasonable for the hatchery component, but a plan needs to be developed to evaluate the effects on natural sockeye salmon of releasing one million hatchery smolts (e.g., competition and increased predation caused by attracting predators that consume natural sockeye salmon). The ISRP believes that an experimental framework for adult spawning escapement and hatchery smolt releases should be developed. Over time, the data will provide important information on capacity limits in the spawning/nursery lakes and the migration corridor.

Since the ultimate goal of this project is to recover natural origin sockeye salmon returning to the Snake River Basin, additional details are needed for natural sockeye salmon beyond those listed in Table 6.1. The table should have indicated that abundance, size, and age of natural juvenile sockeye would be collected, so that natural smolts per spawner could be estimated.

13) describe and provide specific items and cost estimates for ten fiscal years for planning and design (i.e. conceptual, preliminary and final), construction, operation and maintenance and monitoring and evaluation (Step 1, 2 and 3)?

Adequate.

B. Artificial Production Initiatives

Does the Snake River Sockeye Master Plan:

1) address the relation and link to the artificial production policies and strategies (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.4 and Technical Appendix) (Step 1)?

Primary strategy: Artificial production can be used, under the proper conditions, to 1) complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish, and 2) replace lost salmon and steelhead in blocked areas.

The APR standards: [ISRP note: Most of these elements are covered by questions in the template above, but the two elements in italics are not as redundant.]

- The purpose and use of artificial production must be considered in the context of the ecological environment in which it will be used. (See A.1 and A.6)
- Artificial production must be implemented within an experimental, adaptive management design that includes an aggressive program to evaluate the risks and benefits and address scientific uncertainties. (See A.12)
- Hatcheries must be operated in a manner that recognizes that they exist within ecological systems whose behavior is constrained by larger-scale basin, regional and global factors. (See A.1)
- A diversity of life history types and species needs to be maintained in order to sustain a system of populations in the face of environmental variation. (See A.1)
- *Naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological characteristics.*
- The entities authorizing or managing an artificial production facility or program should explicitly identify whether the artificial propagation product is intended for the purpose of augmentation, mitigation, restoration, preservation, research, or some combination of those purposes for each population of fish addressed. (See A.3)
- Decisions on the use of the artificial production tool need to be made in the context of deciding on fish and wildlife goals, objectives and strategies at the subbasin and province levels. (See A.2)
- *Appropriate risk management needs to be maintained in using the tool of artificial propagation.*
- Production for harvest is a legitimate management objective of artificial production, but to minimize adverse impacts on natural populations associated with harvest management of artificially produced populations, harvest rates and practices must be dictated by the requirements to sustain naturally spawning populations. (see B.3)

- Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed. (See A.10)

The response to the artificial production policy guidance is not specific enough for critical review. That said, the ongoing Snake River sockeye salmon captive propagation program is well monitored, implemented within an experimental framework (different release strategies), and recognizes risks, and uses protocols to preserve the genetic diversity in the collection of individuals used to establish the captive population. The Master Plan does not appear to contain elements that would obviously conflict with the Council Artificial Production policies.

The Master Plan adequately justifies the need for transitioning from a captive brood stock program to an anadromous production based hatchery as a means to eventually recover natural Snake River sockeye. In general, the hatchery protocols seem appropriate for rebuilding the sockeye population (but see comment on hatchery smolt size). However, as noted above, additional analysis should be conducted to evaluate whether a self-sustaining run of sockeye salmon is possible given current conditions or those implemented under recent Biological Opinion and habitat rehabilitation. Although the data time series is brief, some data currently exist and they should be used to determine the level at which survival of natural sockeye needs to increase, including the life stage where such improvements might be most probable. For example, high mortality reportedly occurs during the smolt phase from Salmon River to Lower Granite Dam, whereas habitat conditions in the lake basins were considered relatively pristine except for the presence of non-native kokanee (competitors).

2) provide a completed Hatchery and Genetic Management Plan (HGMP) for the target population (s) (Step 1)?

Adequate.

3) describe the harvest plan (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.5) (Step 1)?

Yes. The plan recognizes that directed harvest is likely many years away. The plan could comment on the likelihood of whether Snake River sockeye will ever produce significant harvests. Brief analysis involving fecundity of Snake River sockeye and sockeye survival rates suggests directed harvests are likely to be quite minimal even in the future simply because the productivity of this unique population is so low.

No mention was made of how the 5-7% harvest currently occurring by treaty fisheries is expected to change (or not change) if Snake River sockeye numbers increase. What are the possibilities of reducing that harvest and what is likelihood of it increasing prior to species recovery?

4) provide a conceptual design of the proposed facilities, including an assessment of the availability and utility of existing facilities (Step 1)?

This was very thoroughly presented, with a few exceptions. Is the hatchery to be used to produce other species as well as sockeye? What are anticipated rearing (pond) densities?

The possibility of using "natural" rearing methods is very tersely rejected. Why? It would seem that this "new" hatchery could just as well have been built 50 years ago – are there no innovations?

Several typos exist in the HGMP: Table 7-2, total flow for June; Figure 3 has no label on Y axis, Table 25 gives no units for average size.

5) provide a preliminary design of the proposed facilities (Step 2)?

Not applicable for this review; this is a Step 2 issue.

6) provide a final design of the proposed facilities, including appropriate value engineering review, consistent with previous submittal documents and preliminary design (Step 3)?

Not applicable for this review; this is a Step 3 issue.

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