



**Independent Scientific Review Panel**  
for the Northwest Power & Conservation Council  
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## MEMORANDUM

February 18, 2005

**TO:** Doug Marker, Fish and Wildlife Division Director, Northwest Power and Conservation Council

**FROM:** Rick Williams, ISRP Chair

**SUBJECT:** Step review of the *Johnson Creek Artificial Propagation Enhancement Project*, 1996-043-00. (ISRP 2005-6)

### Background

At the January 5, 2005 request of the Council, the ISRP reviewed the Nez Perce Tribes' Step 2 submittal for the *Johnson Creek Artificial Propagation Enhancement Project* (JCAPE) intended to address step review elements and conditions placed on the project over the past six years as part of project selection processes. The JCAPE project submittal proposes to annually produce and release 100,000 smolts from adult summer Chinook salmon returning to Johnson Creek. McCall Fish Hatchery will be used to rear the juvenile fish, and no additional facilities are being proposed.

The Council's most recent recommendation on the JCAPE project was made on April 2, 2002 as part of the FY 2002 Programmatic Issues for the Mountain Snake and Blue Mountain provinces. The recommendation was to conditionally fund the project at levels consistent with past Council decisions in FY 1998 and FY 2001. The Council provided four specific conditions. Conditions one and two pertained to the relationship of JCAPE to the Idaho Supplementation Study.<sup>1</sup> These conditions were addressed as part of the ISRP review<sup>2</sup> and the Council's subsequent recommendation regarding the Idaho Supplementation Study in 2003; consequently, the Council did not request the ISRP to rehash the issue of Johnson Creek's transition from a control stream in the original Idaho Supplementation Study to a treatment stream. The third and fourth conditions addressed previous issues and the future expectations that the Council had with the project.

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<sup>1</sup> Idaho Supplementation Studies (IDFG/IOSC # 1989-098-00; USFWS # 1989-098-01; NPT # 1989-098-02; and SBT # 1989-098-03).

<sup>2</sup> ISRP. 2003. Review of Idaho Supplementation Studies (ISRP 2003-8). Northwest Power Planning Council, Portland, Oregon. [www.nwcouncil.org/library/isrp/isrp2003-8.htm](http://www.nwcouncil.org/library/isrp/isrp2003-8.htm)

The third condition included scientific issues and is the focus of this review. Those conditions included:

- relationship of this project to the Council’s policies on artificial/natural production,
- final design of the project consistent with any master plan and preliminary design,
- has the project or its purpose changed in such a way to raise new scientific concerns,
- has the underlying science or the way it is understood changed so as to raise new scientific issues, and
- how technically appropriate are the monitoring and evaluation elements of the project.

The project sponsors address these issues in Attachment C (JCAPE Monitoring and Evaluation Plan), Attachment F, the Project Review Conditions, and Attachment G, the Master Plan Responses. These documents were the focus of the ISRP review. The Pacific Northwest National Laboratory Ecology Group conducted the previous step review, and the ISRP referred to that review for context. In addition, the review team contacted the project sponsors regarding results of the project to date and also contacted Chris Jordan, NOAA Fisheries, for information on the regional pilot status and trend monitoring studies and the development of standard monitoring procedures and other data collection methods.

## **Review Summary**

**Attachment F (The Project Review Conditions)**

**Attachment G (The Master Plan Responses)**

Supplementation of Chinook salmon in Johnson Creek (and the stream’s subsequent conversion from a control stream in the ISS overall study plan to a treatment stream) occurred in the middle and late 1990s after a series of very small adult chinook returns over the previous decade. The ISRP’s concerns about the change from control to treatment and how the stream should be handled within the ISS have been previously addressed (ISRP Report 2003-8), although we touch briefly on that topic again below where pertinent.

The ISRP’s primary concerns and recommendations for the proposed Johnson Creek Project are presented in this “Step 2 review.”

**Recommendation 1. Provide greater resolution on the dynamic tension between the rebuilding goals and the harvest goals – goals that are potentially in conflict with one another.**

**Recommendation 2. Provide justification for estimates for smolt carrying capacity and spawner needs for the broodstock.**

**Recommendation 3. Provide defined decision points related to project outcomes. For example, if adult numbers can be increased to the point of providing a harvest, it is not clear how that can be reversed if an affect on fitness is detected.**

**Recommendation 4. Manage the Johnson Creek sub-population as a unit of the metapopulation (unless demonstrated to be isolated).**

**Recommendation 5. Examine the possibility that estimates of spawner needs and "smolt carrying capacity" have been overestimated. Density dependent effects are likely to be important considerations.**

**Recommendation 6. If fitness decreases, then modify or terminate the program, depending on whether the decrease reaches a threshold established in advance.**

### **Presentation of Program Results Needed**

The Step 2 proposal was notably deficient in presenting synthesis of ongoing results of the supplementation program thus far. The cover letter mentioned a 1:13.7 parent/progeny ratio from the 80K smolts released in year 2000, and some smolt size data were given in the body of the document, tables of data were given in the Appendix to Attachment C (the M&E Plan), however, no organized and meaningful analysis of data that would provide insights and conclusions in progress thus far were provided.

A discussion of the Johnson Creek general operating protocol (to best benefit wild fish production) for years when adult returns are high is missing and needed, especially since the number of adults allowed to spawn in Johnson Creek is largely human-controlled (weir reportedly 60% efficient). All adults of hatchery origin are automatically passed above the weir (p7 attachment G), and that might be detrimental to wild smolt production. How many wild smolts have completed rearing in Johnson Creek in the last 3 or 4 years?

**Recommendation 7. Present synthesis of current results of the supplementation program for the Step 3 Review.**

### **Supplementation Protocol, Scale, and the Need for Limits**

A positive feature of the Johnson Creek program is their use of natural-origin salmon as hatchery broodstock. We support and encourage that. Another positive is the marking of hatchery-origin fish so they can be enumerated separately from natural-origin fish on their return from the ocean. We also support and encourage that.

The ISRP has concerns about the scale of the supplementation effort in Johnson Creek. The intensity of supplementation could be defined by the broodstock mining rate, or the proportion of the naturally spawning mixture that is of hatchery origin. In this project when the number of NOR adults is between 100 and 160, project sponsors are permitted to take 50% for broodstock of each sex. This is quite high.

**Recommendation 8. The proportion of NOR adults taken for broodstock should not exceed 25%.**

There is no limit on the number (or proportion) of HORs (hatchery-origin fish) in the naturally spawning mixture.

**Recommendation 9. Project sponsors should adopt a conservation measure of not having more HORs than NORs in the naturally spawning mix.**

The sponsors may be well advised to evaluate their supplementation scheme (levels of broodstock mining and proportion of HORs on the spawning grounds) using the historic Johnson Creek productivity with Dan Goodman's model and/or the AHA model to see how they fare in staying within conservation bounds being developed by NOAA and the HSRG (Hatchery Scientific Review Group from Puget Sound).

**Attachment C: Review of the Monitoring and Evaluation Plan**

The ISRP's overall response is that the M&E Plan (Attachment C) is a good start on a working draft of a standalone Plan for the Johnson Creek Summer Chinook Salmon supplementation project. The Johnson Creek team was successful in creating a single integrated document, describing general methods and data to be collected in Johnson Creek including a combination of population status monitoring, comparative performance testing, and small-scale experiments. A generally favorable attribute of the M & E was a direct statement of the management objectives, and linking the performance measures to the management objectives.

We have major reservations with respect to: 1) lack of concrete plans for comparison of results in Johnson Creek to reference streams, 2) not all of their performance measures are necessary, and they are missing some that are required to evaluate supplementation, and 3) there are no adaptive management decision thresholds to modify or terminate supplementation if they learn that it is not working, causing harm, or the system is at carrying capacity. Contrasts of natural origin recruits (NORs) to hatchery origin recruits (HORs) within a stream with a supplementation treatment are not sufficient evaluations of supplementation.

The following biological thresholds, which must be met for supplementation to achieve the standards embedded in the RASP definition, should be presented in their document.

The RASP definition is as follows:

*Supplementation is the attempt to use artificial propagation to maintain or increase natural production while maintaining the long-term fitness of the target population, and while keeping the ecological and genetic impacts on non-target populations within specific biological limits* (RASP (Regional Assessment of Supplementation Project) 1992).

**Recommendation 10. The sponsors should link their management objectives to the RASP definition of supplementation they adopt.**

The initial biological threshold (that supplementation must exceed) is that females subtracted from the natural population for hatchery breeding must produce enough daughters, and they in-turn must reproduce and yield sufficient smolts (or adults) to replace those that the female would have produced if she had remained in the stream.

The evaluation of the survival of the hatchery fish, and their subsequent reproduction, cannot be directly measured. We can count the surviving hatchery fish, but the reproduction of those fish must be estimated by pedigree analysis of juvenile fish. This important component is in the M & E plan, but is unfunded. An alternative to evaluating the reproductive output of the hatchery fish is to contrast the abundance trends of natural origin recruits (NORs) in the supplementation stream to NOR abundance trends in reference streams.

Because of the potential for ecological interactions to also affect the results, a contrast of NORs in supplementation and reference streams is needed under any circumstance. Fitness effects should be evaluated by contrasting the productivity of the naturally spawning individuals in the supplementation treatment stream to naturally spawning individuals in reference streams after the termination of supplementation (Lynch and O’Hely 2001, ISAB 2003-3, Goodman CJAFS in press). Examples of supplementation treatment and reference streams includes NEOH using the Wenaha, Minam, and Secesh Rivers and Marsh Creek as reference locations, and the Yakima Supplementation Program using Naches River.

Measures of run timing, sex ratios, size, etc are very interesting, but they are explanatory variables, not the primary variable of interest – relative reproductive performance. If these explanatory variables change, but fitness is not decreased, then the change could be attributed to natural selection, not a deleterious effect of supplementation. In any case, the explanatory variables should also be contrasted between NORs in supplemented and reference streams, not only between NORs and HORs in Johnson Creek, or as trends. Those explanatory variables that can be measured during the enumeration of the adults should take first priority. Those that require secondary sampling should have a lower priority.

**Recommendation 11. Contrast natural history parameters for NORs in supplementation and reference streams.**

The M&E program quantifies key performance measures, which are being standardized throughout Columbia River Basin, and contributes to regional monitoring and evaluation (RM&E) efforts addressing critical uncertainties associated with supplementation and ESA listed stock status/recovery. The ISRP strongly supports these efforts. Also, we appreciate the effort that has gone into planning for M&E in the face of numerous ongoing projects, the need to meet BiOp directives, and the need to evaluate the effectiveness of the supplementation project, harvest, escapement, and spawning success. However, the plan is large and expensive, with complicated relationships to other ongoing data collection projects. The relationships of the ongoing projects to this proposed M&E must be made clear, particularly with respect to M&E plans for streams that may serve as “references” for Johnson Creek.

We continue to support the authors’ efforts to bring the modern EMAP probabilistic sampling procedures into the Columbia Basin. For example, this plan appropriately proposes a rotating panel design to balance the needs of status (more random sites) and trend (more repeat sites) monitoring of chinook population life history parameters. We strongly encourage the authors to develop the EMAP-type probabilistic sampling scheme for spawning and rearing surveys in Johnson Creek to complement plans for monitoring of status and trend of habitat and other

environmental parameters. The plan appropriately calls for probabilistic selection of ‘random’ sites outside the traditional survey areas to be surveyed for status and trend of habitat and other environmental variables. At a minimum, these sites should also receive economical reconnaissance surveys for evidence of spawning and rearing by chinook.

## **Specific Major Monitoring and Evaluation Issues**

### **Need for Reference Streams and Relationship to the ISS**

The Johnson Creek team has inappropriately attempted to distance themselves from the Idaho Supplementation Study (ISS). The ISAB/ISRP (and Council) consider the Northeast Oregon Hatchery (NEOH), Yakima, Idaho Supplementation Study (ISS), and Johnson Creek Artificial Propagation Enhancement Projects to be the most important studies in the Columbia River Basin specifically funded to test the efficacy of supplementation. These studies will also provide invaluable information on the question of whether or not hatchery populations should be included in ESUs listed under the Endangered Species Act. We accept the fact that Johnson Creek will no longer be a “control” stream or a “treatment” stream for Phase III of the ISS in the sense that supplementation will be stopped in 2005 and comparisons of life history parameters made among streams.

Unfortunately, the ISS apparently does not have the level of specificity needed to fully evaluate many hypotheses concerning the effects of supplementation on naturally spawning populations. As we understand the ISS, only one basic parameter, redds per mile, will be analyzed for the relationship of various levels of supplementation on production. It may be that additional parameters will be measured in Phase III, but those plans have not been finalized and reviewed at this time.

### **Recommendation 12. The Johnson Creek Artificial Propagation Enhancement Project should support the need for collection of additional data in Phase III of the ISS.**

Monitoring and Evaluation Objective **6a** (*Describe status and trends in adult abundance and productivity for all summer Chinook salmon populations in the South Fork Salmon River watershed*) and Monitoring and Evaluation Objective **6b** (*Monitor spawning distribution in the South Fork Salmon River Subbasin summer Chinook salmon populations*) indicate that these streams are to be used to provide some comparison data for the Johnson Creek project, but the M&E plan needs to provide more detail.

Johnson Creek will continue to receive supplementation hatchery fish in the immediate future with termination criteria that are not fully developed. Chinook life history parameters in Johnson Creek should be compared to those from the ISS streams during this time to provide data for adaptive management and evaluation of criteria for termination of supplementation.

### **Recommendation 13. The treatment and control streams of the ISS (perhaps including the mainstem of the South Fork Salmon River) should be reference streams for the Johnson Creek Artificial Propagation Enhancement Project.**

The M&E Plan for Johnson Creek should annually compare life history parameters (e.g., escapement, natural production, genetics, etc.) with data from all the ISS streams, but particularly with data from Lake Creek, Secesh River, and the mainstem of the South Fork Salmon River. Without reference streams, the Johnson Creek team would have very limited ability to correctly interpret effects of their programs. Reference streams must be monitored for stock status, as well as inference to hatchery input, including straying of hatchery production fish. The need for these comparisons may be obvious to the authors, but it must be made explicit in a revised Step 2 or the forthcoming Step 3 document.

A major missing issue in the Johnson Creek M&E Plan is how complete the sampling and enumeration programs will actually be in the ISS Phase III and other monitoring projects. On May 22, 2003 the ISRP completed its latest review of the ISS (ISRP 2003-8). The ISRP recommended that the Idaho Supplementation Study be funded for one year subject to the collection of carcass data in 2003 for all the study streams. In addition, the ISRP requested additional review of the pilot analysis following the 2003 field season. This review should also include the review of the final design of the Phase III prior to the 2004 field season. The final design of the ISS Phase III project has not been received to date. The Johnson Creek M&E Plan will remain incomplete until this information on Phase III of the ISS is included to insure that adequate comparisons can be made. An alternative is that the Johnson Creek M&E Plan include an expanded discussion of reference data to be collected on Lake Creek, Secesh River, and the mainstem of the South Fork Salmon River.

**Recommendation 14. Make the Johnson Creek M&E Plan a standalone document containing complete M&E plans for the JCAPE project and reference streams.**

To be most useful, reference streams must be enumerated with the same data collection protocols used on Johnson Creek. Intensity of sampling (sample sizes) should be comparable so that differences of effect sizes are estimated with acceptable precision. If the proponents of the Johnson Creek M&E Plan are not serious about sampling these reference streams, then the Plan would have to be modified and re-evaluated. If this cannot be resolved, it would present a major issue to the ISRP.

**Assumption that all potential spawning and rearing habitat is surveyed.**

The ISRP does not believe that the current M&E plan is necessarily adequate for current survey of spawning and rearing areas, nor is it adequate for future efforts (Figure 2, Attachment C). At the least, we can hope that other areas will be used by chinook if the population size increases or if habitat improvement projects are successful. As a compromise to the proposal in Attachment C, we recommend that the probabilistic sample of sites selected for long term status and trend monitoring of habitat and other environmental surveys serve as a reconnaissance survey for spawning and rearing habitat for chinook. The reconnaissance survey should be an economical survey with minimal effort, e.g., perhaps one pass using standard methods during the spawning season every third year.

**Recommendation 15. Conduct economical reconnaissance surveys for spawning and rearing of chinook on the sites selected for long term habitat status and trend monitoring.**

Data collection method 6.b.2 calls for the development of an EMAP- type probabilistic sampling scheme for redd counts to complement current survey efforts in the South Fork Salmon River watershed. The authors propose to select twenty-five random sites outside the traditional survey areas throughout the South Fork Salmon River watershed. Each site will be 1 km in length and survey methods will be based on protocols and methods used during traditional co-manager spawning ground surveys. It is unclear if Johnson Creek is to be included in this effort.

**Recommendation 16. Include Johnson Creek in the probabilistic sampling scheme for redd counts in the South Fork Salmon River watershed.**

The ISRP judges that if economical reconnaissance spawning and rearing surveys are also conducted on all status and trend habitat monitoring sites then adequate coverage for distribution of spawning and rearing by chinook would be present. Of course, if concentrations of spawning or rearing habitat are observed in these randomly selected sites, adjustments will be necessary in the standard methods.

**Cooperation with other M&E projects.**

The ISRP understands that the BPA project no. 200301700 for Pilot Status and Trend Monitoring Program for Salmonids and their Habitat in the Wenatchee, John Day, and Upper Salmon is currently in the process of selecting a study site in the Upper Salmon River (contact Chris Jordan, e-mail [chris.jordan@noaa.gov](mailto:chris.jordan@noaa.gov), as a source of reports and plans). One of the two sites under consideration in the upper Salmon River is the South Fork of the Salmon River that could include Johnson Creek and appropriate reference streams for the JCAPE. The M&E plan in Attachment C is very compatible with the overall objectives of the funded BPA project no. 200301700; particularly with respect to monitoring for status and trend of habitat (see Merritt 2005 and BPA Project no. 200301700). Significant cost savings should be possible if Project no. 200301700 were to be coordinated with the JCAPE. Scientific value of Project no. 200301700 would be enhanced if data from this pilot M&E project were available to help evaluate the JCAPE and efficiency of supplementation.

**Recommendation 17. The JCAPE project should support the selection of the South Fork of the Salmon River as a study site for BPA project no. 200301700. The ISRP further recommends that the Council support the cooperation of these two projects.**

We further support coordination of JCAPE with the relatively recent efforts to coordinate and standardize M&E efforts in the Pacific Northwest by the ad hoc group of fisheries scientists under the banner of the “Pacific Northwest Aquatic Monitoring Partnership (PNAMP).” We believe that this point in time is a unique and possibly limited opportunity to accomplish better coordination of M&E activities throughout the Tribal Lands, States, Provinces, the Columbia Basin, and the Pacific Northwest. The benefits of consistent, coordinated monitoring are indisputable. The issues are related to how to best achieve the benefits.



### **Prioritization of M&E Activities**

The document constitutes a detailed plan, and, as stated above, constitutes a working draft from which to discuss, debate, and hone the final Step 3 Plan that will be implemented. However, the plan is large and expensive, with complicated relationships to other ongoing data collection projects. A useful addition would be a flow chart of the projects, related tasks, and data needed for groups of the objectives. All projects that will collect M&E data for use in this plan should be included in the flow chart(s).

#### **Recommendation 18. Include flow charts showing relationships of ongoing projects that will provide data for the M&E component of the JCAPE project.**

A major concern of the ISRP is the lack of priority ranking of ongoing M&E efforts in Johnson Creek and ‘unfunded’ sections of the current draft plan, such as the genetic pedigree analysis needed to estimate survival and reproductive contribution of hatchery-origin fish. The ISRP disagrees with the implicit ranking that all “unfunded” pieces of the M&E plan should be below currently funded projects. Full prioritization of ongoing M&E and potential reallocation of funds among activities is an important task to complete in case funding is not adequate for the full program. Cost remains to be considered as the Plan is completed, and co-managers will want to weigh this carefully as they choose their priority metrics and finalize details of experimental design and implementation.

#### **Recommendation 19. Propose prioritization of all M&E in the Step 3 submittal, including priority of ongoing M&E activities.**

The ISRP judges that the top priority for monitoring should be adult abundance by NOR and HOR, with tagging and scale reading so each fish can be assigned to a cohort. Abundance should not be tracked on a yearly basis only; track adult-to-adult production in a cohort analysis should also be tracked. Collect explanatory data – run timing, size, fecundity, as time permits. Concentrate on thorough enumeration of the adults in the treatment and reference streams. The second priority would be juvenile monitoring. This is entirely explanatory in value and does not itself contribute to the evaluation of supplementation. The third priority would be pedigree analysis of juvenile fish. Regardless of whether funding can be secured for this task, both the success of maintaining abundance and the fitness evaluation should involve contrasts of reference to treatment streams. The final priority would be habitat monitoring. This likely has major value to the long-term success of fish populations in Johnson Creek, but is ancillary to evaluating the supplementation project. With cooperation, it would be possible for BPA project no. 200301700 to provide this needed information.

### **Relationship of the JCAPE program to other species**

Johnson Creek supports many species of anadromous and resident fish in both lake and stream habitats including summer Chinook salmon, summer steelhead trout, rainbow trout, cutthroat trout, bull trout, brook trout, mountain whitefish, longnose dace, and sculpin. Monitoring efforts

for the other species in Johnson Creek are provided in the M&E plan. Projects should be listed to ensure that potential effects of the JCAPE on other species will be determined.

### **Levels of Precision, Scale, and Data Collection**

As in the NEOH Step 2 M&E Plan, the authors of the Johnson Creek M&E plan continue to emphasize testing of null hypotheses for statistical analyses as in the following quote:

*“We will test at 5% Type I error (i.e.  $\alpha = 0.05$ ), and show the p-value of test statistic. If the p-value is less than the level of Type I error, we will reject null hypothesis.”*

In so far as possible, M&E plans of this type should drop the use of these formal tests of hypotheses and instead emphasize estimation of parameters and report precision of the estimates, e.g., the half width of confidence intervals. We cannot imagine that major decisions in the spirit of adaptive management will be made on the basis that a test statistic was not statistically significant at the  $p = 5.1\%$  level and the opposite decision would have been made if the test had a significance level of  $p = 4.9\%$ .

As an example related to supplementation: Blouin (2003) studying Hood River winter steelhead supplementation has detected no significant difference between the relative reproductive success of NORs and HORs that are first generation from the wild. However, in 5 of the 6 contrasts the HORs had lower performance (although not statistically significant). The NOAA Fisheries Recovery Science Review Panel (RSRP) has analyzed those data with a delta method to generate an approximate standard error, and employ a fixed-effect meta-analysis that yielded a 0.897 relative reproductive success of the HORs with a standard error of 0.054. They conclude that this is “reasonably strong evidence for a loss of fitness after only one generation” (RSRP 2004).

This point continues to merit discussion in the Johnson Creek M&E Plan, but is not likely to change the activities, only the intensity of sampling, associated costs, and some statistical results. The plan continues to use the 95% confidence interval that is commonly used in statistical analyses. However, in biological and field programs, achieving this level of precision can be very expensive, if it is even a realistic goal. Accepting a lower level of precision may provide adequate information for decision-making and allow funds to be used for other aspects of the program.

The authors frequently comment that something is a point estimate and/or that there is no precision that can be estimated. However, with the intensity of sampling and data collected, the authors should be able to empirically estimate variances by using multiple re-sampling algorithms (for example bootstrapping) in order to provide an estimate of precision. This is an issue on which they should consult a statistician with expertise in these methods.

### **Recommendation 20. Emphasize estimation of parameters, and report precision of the estimates.**

Primary analysis methods for data collected in M&E Plans will include correlation and regression analyses for evaluating measures of improvement and recovery in fish populations (e.g., survival, abundance, presence/absence, escapement, etc.) and freshwater habitat conditions

(e.g., temperature, sediment, cover, water quality, flow, etc.). The utilities of both empirical (statistical) and mechanistic models are greatly enhanced by co-location of data collection on common study sites in the field. We strongly encourage the co-location of data collection efforts while recognizing the need to avoid too much activity on study sites.

**Recommendation 21. Co-locate field data collection on common study sites.**

Probabilistic sampling as defined in the following quote is Tier II monitoring as defined by the Action Agencies in their RME Plan and NOAA Fisheries in the 2000 BiOp. “Probabilistic sampling will be applied specifically for spatial distribution of adult spawning and physical habitat. This level of monitoring supports Tier I evaluations.”

Mark/recapture data for closed population data should be analyzed using the latest methods as programmed in Program MARK (Gary White, Colorado State University).

**Need for Standardization of Redd Count Procedures**

Current redd surveys are considered to be deterministic counts with no variance when in fact there are potential biases and variance involved due to less than 100% detection of redds. There is a strong need for standardization of procedures for redd counts within spawning areas using “double sampling with capture/recapture” analyses to account for redds missed and to yield estimates of the variance of estimated numbers of redds. Perhaps it would be possible to use two independent observers. In the simplest form, the first observer “marks” redds, perhaps using a GPS, and the second observer “recaptures” some the redds. Environmental variables affecting the probability of detection of a redd can be used in more complex adjustments for numbers of redds missed. Also, with the addition of surveys of probabilistic selected sites outside the “known” spawning areas, sampling variance will also be introduced to the procedures.

**Recommendation 22. Develop and test “double sampling” procedures for estimation of bias and precision in redd surveys.**

**Supplementation as “Experiments”**

The Independent Science Review Panel (ISRP) wishes to clarify that the ongoing large supplementation projects in the Columbia Basin are mensurative experiments (observational studies). They do involve manipulation of the ecosystems, but are not manipulative “true” experiments allowing hard conclusions concerning the cause and effects of supplementation (Hurlbert 1984). There is no randomization of treatment (supplementation) to streams. Tests of hypotheses and other statistical analyses of supplementation as a rebuilding and recovery tool apply only to Johnson Creek and the unique environmental conditions present during the study period.

## Comments on Project Sponsor Response to Council's Condition 3, Attachment F

### *A. What is the relationship of this project to the Council's policies on artificial/natural production?*

**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 Response:** Elements 1-3 and 8 are central to continuing reviewer concerns regarding risks to wild stocks from straying, juvenile hatchery-wild interactions, etc.

1. The purpose and use of artificial production must be considered in the context of the ecological environment in which it will be used.

**ISRP Response:** The purpose and use of artificial production is being considered in the context of the ecological environment of Johnson Creek, however to be properly evaluated, comparisons to reference streams must be made.

2. 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.

**ISRP Response:** There is no discussion of what will cause an adaptive management response. If egg to smolt survival is found to decline compared to reference(s) [unidentified], what will management do? Management is already doing what has been recommended in the literature to help reduce impacts on survival and fitness. Because more fish are likely to be produced (via supplementation) even if the natural component were to lose fitness, will the decision be to stop the supplementation? Does such an action require some threshold of compromised fitness to be exceeded? If so, what is that threshold? If the benefits in terms of adult fish are more important than production from the natural habitat, is there any strong reason to continue much of the monitoring program?

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

**ISRP Response:** The South Fork Salmon River salmon were identified as a metapopulation with three sub-populations. Much of the discussion in these documents regarding effective population size and recovery goals, however, seemed to treat the Johnson Creek population as an isolated group. The needs of Johnson Creek fish should be viewed and developed within context of the metapopulation.

8. Appropriate risk management needs to be maintained in using the tool of artificial propagation.

**ISRP Response:** Data from Table 6 Part C show that maximum adult offspring production occurred at about 600 spawners. Something greater than 1600 spawners is identified in these documents as a spawner goal. Density-dependent impacts on growth and survival are unaccounted risks at these high levels.

9. 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.

**ISRP Response:** Element 9, harvest, was not an issue in the late 1990s and Attachment G describes harvest of Johnson Creek salmon as being “functionally eliminated.” However, recent strong runs have changed that, and assessing harvest is a major M&E component. But nowhere in the Master Plan is the proposed impact of that harvest on wild fish recovery discussed. This is a major omission.

10. Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed.

See the 2000 FWP for details on Wild Salmon Refuges, Harvest and Restoration Hatcheries, and Experimental Approach.

***B. Is the final design of the project consistent with any master plan and preliminary design?***

**ISRP Response:** Not applicable in this review

***C. Has the project or its purpose changed in such a way to raise new scientific concerns?***

**ISRP Response:** Yes, with respect to the ISS as the treatment/control stream design is now changed, but not since the initiation of supplementation efforts.

***D. Has the underlying science or the way it is understood changed so as to raise new scientific issues?***

**ISRP Response:** The sponsors may be well advised to evaluate their supplementation scheme (levels of broodstock mixing and proportion of HORs on the spawning grounds) using the historic Johnson Creek productivity with Dan Goodman’s model and/or the All H Analyzer (AHA) to see how the project is staying within conservation bounds being developed by NOAA and the HSRG.

***E. How technically appropriate are the monitoring and evaluation elements of the project?***

**ISRP Response:** See comments above on the M&E plan, Attachment C. There doesn't seem to be any reference condition as a basis to assess results of the monitoring. If the trend is to declining survival from egg to smolt, is it a result of the supplementation or some other condition? Absent reference(s), sufficient learning will not occur to support the adaptive management strategy.

Comments on the Master Plan Responses, Attachment G

• ***project goals:***

**ISRP Response:** The goals should be specific enough to determine the relationship between the run enhancement and conservation elements. Is the run-strength element the top priority that takes precedence over the conservation elements? For example, will supplementation cease if fitness is reduced? Placing emphasis on a harvest goal could potentially compromise the rebuilding and fitness goals.

• ***measurable and time-limited objectives:***

**ISRP Response:** What will happen if a loss in fitness of the Johnson Creek fish occurs within the first 5 years? Will the supplementation stop? Is there a threshold that must be exceeded? If so, what is the basis for the threshold? Alternatively, the project is planned for a 25-year duration. If the program objectives were reached (e.g., Johnson Creek is fully seeded) and appeared sustainable by year 10-15, are decision points and protocols in place to terminate the supplementation at that point?

• ***factors limiting production of the target species:***

**ISRP Response:** Earlier comments (Attachment F) regarding carrying capacity and metapopulation dynamics are appropriate here.

• ***expected project benefits (e.g., gene conservation, preservation of biological diversity, fishery enhancement and/or new information):***

**ISRP Response:** This sub-population should be managed as part of the South Fork Salmon metapopulation. Are any strays from other segments of the metapopulation included in the population of spawners? If not, why not? If so, explain the basis for the number included.

- *alternatives for resolving the resource problem:*

**ISRP Response:** Given the metapopulation structure described, we don't believe the case was made that Johnson Creek fish would go extinct without supplementation.

- *rationale for the proposed project:*

**ISRP Response:** It would be helpful to see statements regarding what will happen if a decrease in survival is detected.

- *how the proposed production project will maintain or sustain increases in production:*

**ISRP Response:** Addition of 100,000 smolts to the system each year should result in a greater adult return run than could be expected from the natural productivity alone.

- *the historical and current status of anadromous and resident fish in the sub basin:*

**ISRP Response:** Consideration of resident fish was limited to assessment (not described) of any influence of the weir on their movements. Spawner and redd counts for several decades were provided to show the declining trend in chinook salmon.

- *the current (and planned) management of anadromous and resident fish in the sub basin:*

**ISRP Response:** Sponsors contend that out-of-basin conditions are the primary reason for the decline of the anadromous species. Conditions and needs of resident fishes are not considered in the program (in the materials reviewed).

- *consistency of proposed project with Council policies, National Marine Fisheries Service recovery plans, other fishery management plans, watershed plans and activities:*

**ISRP Response:** Sponsors provided a table linking this program to other programs in the Basin.

- *potential impact of other recovery activities on project outcome:*

**ISRP Response:** Sponsor pointed out that any action taken to improve juvenile survival during migration would benefit this project as well; however, habitat rehabilitation activities needed to improve natural rearing survival are not described.

- *production objectives, methods and strategies:*

**ISRP Response:** Rear smolts at McCall and release back into Johnson Creek.

- *brood stock selection and acquisition strategies:*

**ISRP Response:** They take brood fish from weir to McCall for spawning and rearing. Do the sponsors use precocious males in the spawn? Have they considered that removal of BKD infected fish may be selective breeding?

- *rationale for the number and life-history stage of the fish to be stocked, particularly as they relate to the carrying capacity of the target stream and potential impact on other species:*

**ISRP Response:** No consideration of other species is presented.

- *production profiles and release strategies:*

**ISRP Response:** They are evaluating single (or few) release sites. This could be a problem for natural fish, if they have to go to a broad-scale release.

- *production policies and procedures:*

**ISRP Response:** Using existing facilities.

- *production management structure and process:*

**ISRP Response:** Standard hatchery practices.

- *related harvest plans:*

**ISRP Response:** No immediate plans.

- *constraints and uncertainties, including genetic and ecological risk assessments and cumulative impacts:*

**ISRP Response:** Genetic risk is addressed and practices recommended in literature are being followed. Ecological risks are not described (elsewhere?).



- *monitoring and evaluation plans, including a genetics Monitoring program:*

**ISRP Response:** See comments on Attachment C above. Continuing pursuit of several program elements seems to depend on whether or not supplementation will continue if an affect on fitness is detected in the population.

- *conceptual design of the proposed production and monitoring facilities, including an assessment of the availability and utility of existing facilities:*

**ISRP Response:** Using existing facilities.

- *cost estimates for various components, such as fish culture, facility design and construction, monitoring and evaluation, and operation and maintenance:*

**ISRP Response:** No comment.

## Literature Cited

Blouin, M. 2003. Relative reproductive success of hatchery and wild steelhead in the Hood River. Report to Bonneville Power Administration. Project #: 1988-053-12.

Independent Scientific Advisory Board. 2003. Review of Idaho supplementation studies. Northwest Power Planning Council. 2003-8. Portland, OR.  
[www.nwcouncil.org/library/isab/isab2003-3.htm](http://www.nwcouncil.org/library/isab/isab2003-3.htm).

Lynch, M., and M. O'Hely. 2001. Supplementation and the genetic fitness of natural populations. Conservation Genetics 2: 363-378.

Merritt, G. 2005. Integrated Status and Effectiveness Monitoring in the Wenatchee Subbasin: 2004 Annual Report for Washington Department of Ecology Habitat Characterization.

RASP (Regional Assessment of Supplementation Project). 1992. Supplementation in the Columbia basin. Bonneville Power Administration. Report, Contract DE-AC06-75L01830. Portland, Oregon.

RSRP (Salmon Recovery Science Review Panel). 2004. Report for the meeting held August 30-September 2, 2004, Northwest Fisheries Science Center, National Marine Fisheries Service, Seattle, WA.