Independent Scientific Review Panel
for the Northwest Power & Conservation Council
851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204
www.nwcouncil.org/fw/isrp

Memorandum (ISRP 2010-1) **January 6, 2010**

To: W. Bill Booth, Chair, Northwest Power and Conservation Council

From: Eric Loudenslager, ISRP Chair

Subject: Step-Three Review of the Chief Joseph Dam Hatchery Program, Project #2003-023-00, Monitoring and Evaluation Plan

Background

At the Council's November 17, 2009 request, the ISRP reviewed the Colville Confederated Tribes' monitoring and evaluation (M&E) plans for the Chief Joseph Dam Hatchery Program (CJHP), project #2003-023-00. The M&E plans were submitted to meet the requirements of Step Three of the Council's Three Step Review Process. This final step review is the seventh review over the past six years that the ISRP has conducted for this project, either through the project selection or the Step-Review process.[1] In anticipation of the review, on November 5, 2009, the Colville Tribes briefed the ISRP and Council staff on the Tribes' draft monitoring and evaluation (M&E) plan for the CJHP. These past reviews, responses, and briefings have resulted in a healthy and constructive scientific dialogue with evidence of progress at each step for this complex and ambitious hatchery program.

The CJHP's M&E plans have summer/fall Chinook and spring Chinook components that are intended to comprehensively address hatchery production, harvest, and natural production in concert with the Tribes' ongoing Okanogan Basin Monitoring and Evaluation Program. In addition to being designed as a framework for gathering critical monitoring information, the plans are intended to describe a detailed process for annual review and application of M&E information to the Tribes' conservation and fisheries management goals for each of the Chinook runs.

In our latest review of April 17, 2009 (ISRP 2009-12), we provided the following comments on the Colville Tribes' initial, proposed approach to M&E for the CJHP:

> The general data and derived metrics to be gathered for monitoring and evaluation appear sufficient for this program. The Colville Tribes identify 10 items that monitoring and evaluation will be conducted for (page 19), and 8 hypothesis (page 20) that will be tested as part of the Chief

[1] For a comprehensive description of the past reviews, see ISRP 2009-2: Response Requested – Step Two Review of the Chief Joseph Dam Hatchery Program, Project # 2003-023-00 (www.nwcouncil.org/library/isrp/isrp2009-2.pdf).

> Joseph Hatchery Program. These elements cover the data the ISRP identified as needed for "primary management decisions" and the "primary and secondary biological attributes" (page 4 and 5 of our January 2009 review). The ISRP anticipates reviewing an explicitly detailed monitoring and evaluation plan in Step Three. In particular, we will be looking for a robust design, based on the selective harvest pilot studies now underway to address key programmatic assumptions on issues such as the efficiency of selective fishing, survival of retained broodstock and released adult fish, and related information needed to support and adaptively manage the project, as well as the critical inputs to simulation studies central to the decision framework and analytical tools. Developing the field protocols to estimate important salmon abundance and survival rates with sufficient precision is necessary to the use of the decision framework to adaptively manage the program. The ISRP recommends that the initiation of proposed hatchery production must be conditional not only on explicit refinement of the monitoring and evaluation plan but also on its rigorous implementation.

Our evaluation of Colville Tribes' M&E plans, submitted for Step Three review, follows below.

Recommendation

Meets Scientific Review Criteria

Specific Comments

The Colville Tribes have developed a two part M&E plan (one for summer/fall and one for spring Chinook salmon) to manage the Chief Joseph Hatchery Program that is consistent with the Master Plan and Fish and Wildlife Program adaptive management. The essential features of the M&E plans are decision frameworks for the scale of artificial production based on the abundance of natural-origin summer/fall Chinook (or spring Chinook for the reintroduction program) with constraints on the number/proportion of hatchery-origin salmon that can mix with natural-origin fish on the spawning grounds. This framework is consistent with best management practices for artificial production as developed by the Hatchery Scientific Review Group (HSRG) and other science groups that have contemplated guidelines for co-managing natural and hatchery populations for harvest and conservation.

While the current focus on decision procedures and genetic risk assessment in the CJHP's M&E plans is appropriate, future M&E would be improved by development and application of comparable protocols to evaluate ecological risks (e.g., Kostow 2009: Factors that contribute to the ecological risks of salmon and steelhead hatchery programs and some mitigating strategies. Rev. Fish Biol. Fisheries 19:9-31) and Mantua et al. (2009: The salmon MALBEC Project: A North Pacific-scale study to support salmon conservation planning. N. Pac. Anadr. Fish Comm. Bull 5: 333–354, available at www.npafc.org).

The Colville Tribes state that the CJHP's associated Decision Tree is now based on the best available scientific information, applies state-of-the-art analytical tools, and reflects the scientific principals and standards as articulated by the Council's Program and the HSRG. The ISRP concurs. A healthy and helpful exchange between the proponents and ISRP has resulted in useful adaptations in the Chief Joseph Dam Hatchery Master Plan Three-Step process.

A positive aspect of this plan is that estimates of parameters used in decision making will be reviewed each year to better inform the decision-making process. The M&E plan identifies the information needed to be updated and applied to the Decision Rules and describes data collection to derive this information in general terms. Implementing the decision framework requires collecting information on abundance, productivity, harvest, natural origin (NOR) and hatchery origin (HOR) numbers in spawning mixtures, and such. The data that need to be collected are generally outlined in the M&E plan. The plan includes PIT tagging up to 25,000 HOR and 25,000 NOR (when available) juvenile summer/fall Chinook salmon to assess many of the vital statistics required by the decision framework. However, there does not appear to be a consideration of whether this number of tagged fish would provide adequate precision. In general, the ISRP recommends that the project proponent evaluate precision of estimates generated from tagging incorporated during implementation and as a part of the annual review that is anticipated to execute the decision framework.

The M&E plan calls for relative reproductive success (RSS) studies for HOR and NOR summer/fall and spring Chinook. This information is relevant to interpreting interactions between hatchery- and natural-origin Chinook salmon, but also needs to be considered with respect to basinwide requirements for M&E. That is, collecting this information should be complementary to the other efforts to obtain RSS information basinwide. For the needs of the Chief Joseph Hatchery Program, collecting information on adult and juvenile abundance, harvest, incidental mortality, and such, is a higher priority than information on relative reproductive performance of HOR and NOR adults.

The Tribes propose to do a power analysis of juvenile production data over time to determine the probability that the data are adequate to detect a significant change in juvenile abundance. The ISRP recommends that it would be more appropriate to focus an assessment of power for detecting a specified trend (the rate of change in abundance) over time with a specified probability level.

The summer/fall Chinook M&E plan notes that primary purposes are to assess program goals of sustaining a natural spawning escapement greater than 800 adults under prevailing conditions, increasing the productivity of the natural population by reducing the influence of hatchery fish on the spawning grounds, and managing natural spawning escapement and hatchery broodstock in the terminal areas to meet HSRG guidelines. The ISRP suggests that for evaluation of ecological risks, biomass of adult salmon would be an appropriate measure of NOR salmon production to complement the estimates of the numbers of adult salmon. This is because ecological interactions may alter salmon growth but not the number of adults.

The plan includes an important procedure to review and reaffirm the decision rules to assure that the management and operation personnel follow these rules and understand their importance.

The M&E plans for summer/fall and spring Chinook salmon have several positive aspects and a few outstanding issues, largely recognized by the Colville Tribes.

1. The Program is designed to be adaptive to new information and transparent so long as decisions follow the data. Based on monitoring, if parameter performance (reference

points) cannot be achieved, the Program adjusts downward in the take of natural-origin adults as broodstock (to zero if escapement of summer/fall Chinook salmon is <800 NOR). We continue to support this conservation initiative. However, the plans would be further improved if a minimum biomass threshold that accounted for diversity in size and age structure of adult NOR fish on the spawning grounds was established.

2. Success in monitoring and selective harvest will likely be highly dependent on the employment of a yet-to-be designed and constructed full-system weir. It is likely the Program would fail if it relied solely on success in selective harvest with nets without such a trapping facility. Nonetheless, impacts to NOR fish (mortality, delayed migration) will remain a challenge.
3. In the first phase, a key assumption of the M&E plan is that a selective harvest rate of 50% of returning hatchery-origin adults will be possible. The ISRP notes that this premise – critical to the program's success – remains to be seen. The plan would be improved by inclusion of an evaluation of the results of selective-harvest experiments to date (e.g., Columbia Basin Bull., Feb. 6, 2009: Colville Tribes' selective fishing gear tests show low wild summer Chinook mortality.)
4. A key assumption for NOR production of spring Chinook salmon is a twofold increase in smolt to adult survival during Phase 2 (Table 5, p. 9). The ISRP considers this to be an unrealistic assumption given the current expectations for climate change effects on ocean survival of Columbia River Basin salmon (ISAB 2007-2: Climate change impacts on Columbia River Basin Fish and Wildlife). A shortcoming of both M&E plans is that they do not directly account for the effects of environmental variation.
5. The decision control parameters (Table 2, Summer/fall Chinook M&E Plan) include a threshold NOR of 800 fish. It is not established that this provides for adequate distribution or other biological characteristics (e.g., body size and age structure) of fish on the spawning grounds.
6. The HSRG (2009) recommended that managers implement a bacterial kidney disease (BKD) control strategy for Okanogan spring and summer/fall Chinook salmon hatchery programs. While the M&E plans have general statements about monitoring and disease control, the plans would be improved if specific metrics for disease control and thresholds for culling of eggs/progeny from infected brood fish were included in the list of variables to be monitored at the hatchery.
7. Overall, the M&E plans for both summer/fall and spring Chinook salmon would be improved by incorporation of a more detailed rationale, including reference lists, for all key assumptions.

There are many operational and research questions that will arise as the Program unfolds. Some of these were presented as hypotheses (pg. 18, Summer/fall Chinook M&E Plan). A key ecological-risk hypothesis not addressed in the current plan is whether increased hatchery production will result in density-dependent changes over time in freshwater and ocean growth and size-at-age of adult NOR summer/fall and spring Chinook salmon. Other examples include models and measurement of the contribution that habitat improvement may yield as improved smolt production capacity, the points noted above, and fitness loss of 50% on wild fish due to hatchery influence. Another key hypothesis not addressed in the current plan concerns how stress will affect NOR fish that are captured and released during selective harvest or weir sampling. Stress from capture and release may result in physiological responses that can affect

reproduction, as well as the performance (behavior, growth, disease resistance, and possibly survival) of progeny (e.g., Schreck 2009: Stress and fish reproduction: The roles of allostasis and hormesis. General and Comparative Endocrinology doi:10.1016/j.ygcen.2009.07.004). The ISRP anticipates a continued integration of an increasingly refined and comprehensive M&E approach in guiding the Colville Tribes' project submissions and Master Plan implementation.