Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (ISRP 2012-15) **September 28, 2012**

To: Rhonda Whiting, Chair, Northwest Power and Conservation Council

From: Rich Alldredge, ISRP Chair

Subject: Step 2 Review of the Kootenai River Native Fish Conservation Aquaculture Program (1998-064-00)

Background

In response to the Northwest Power and Conservation Council's August 9, 2012 request, the ISRP reviewed the Kootenai Tribe of Idaho's Step 2 documents for the Kootenai River Native Fish Conservation Aquaculture Program (project #1988-064-00). The program has sturgeon and burbot components. The goals of the Kootenai sturgeon aquaculture program are to prevent extinction of Kootenai sturgeon and restore a healthy age class structure to enhance demographic and genetic viability and persistence of the population. The burbot aquaculture program's goal is to re-establish a naturally producing, self-sustaining burbot population in the lower Kootenai River capable of future sustainable subsistence and sport harvest. To accomplish these goals, the Tribe proposes to expand and improve the existing Tribal Sturgeon Hatchery near Bonners Ferry and to develop a new Twin Rivers Hatchery to support burbot and additional sturgeon production.

This is an ISRP Step 2 review in the Council's Three Step Review Process. Step 1 was the feasibility stage in which all major components and elements of the project were identified. The ISRP's Step 1 review was iterative (ISRP 2010-27 and ISRP 2009-40). In the ISRP final Step 1 review, the ISRP found that the burbot and sturgeon programs met the requirements for proceeding to Step 2. However, the ISRP added three qualifications for the sturgeon component that needed to be addressed in Step 2.

Those qualifications were that the Tribe:

1. establish quantitative benchmarks (i.e. estimated population size, survival rates, adequate number of families, and age structure) and a decision pathway to adjust production goals based on monitoring data of hatchery fish in the wild,
2. refine the monitoring program to collect the necessary data to determine if benchmarks are being met or exceeded, and

3. provide additional details regarding the rationale and justification as to the need for additional hatchery capacity.

The ISRP's Step 2 review follows below organized by sturgeon and burbot, with the responses to the ISRP's qualifications on the sturgeon program considered point by point.

Recommendation

Kootenai Sturgeon: Meets Step 2 Requirements - Recommend proceeding to Step 3

Burbot: Meets Step 2 Requirements - Recommend proceeding to Step 3

The following comments, questions, and recommendations are offered for use in preparation of the Step 3 documents and do not require a response. The ISRP hopes that the items will be carefully considered in the final documents.

Comments

The sponsors did a very good job of technically justifying and detailing their sturgeon and burbot programs in Appendices A, B, and C of the Step 2 documents. The sponsors have established objectives for the focal species; appreciate the need for an ecosystem level perspective in the restoration of sturgeon and burbot; have incorporated concepts from the ISAB food web report (ISAB 2011-1) and the ISRP recommendations for modeling capacity; and designed artificial production programs of limited scale that recognize the uncertainties of restoration.

Sturgeon

> *(1) Quantitative benchmarks (i.e. estimated population size, survival rates, adequate number of families, and age structure) and a decision pathway to adjust production goals based on monitoring data of hatchery fish in the wild*

Adequate response: Sufficient information regarding quantitative benchmarks was provided in the Step 2 documents (primarily in Appendix A, Table 9). A decision framework (Appendix A, Fig. 12, p.69) and a decision pathway (Box on page 70) were also provided that presented metrics, targets, and triggers. Thresholds to guide production levels based on system capacity and density dependence need to be determined by using the Annual Program Review to aid evaluation.

The actual decision framework/tree needs further development (presumably, in the Step 3 document). In its current state the decision tree does not identify yes or no paths for the arrows, and the periodic evaluation begins with the element "natural recruitment restored." At this time, the primary decision elements should focus on the sufficiency of broodstock

collections, hatchery production, post-release survival, growth of hatchery year classes, and continued monitoring of the natural population size. The qualifications on four Kootenai subbasin proposals (1994-049-00, 2002-008-00, 2002-002-00, and 1988-065-00) from the recent Resident Fish Review regarding project integration, synthesis of ecosystem level data, development of habitat project prioritization, and adaptive management also apply to the implementation of the conservation aquaculture master plan.

The in-season management tool and Annual Program Review are important program components for integrating conservation aquaculture into subbasin level adaptive management. Updating the core program assumptions is likely to require extensive discussion and evaluations by co-managers. For example, re-evaluating the size of the adult sturgeon population and annual survival rates will be challenging as earlier investigations underestimated population abundance and overestimated mortality.

Monitoring in other projects identified on pages 30 and 31 should be developed in an overall restoration context to ensure the metrics are all needed. It is not clear how all the data from various projects are actually being used in decision making.

Attachment 1 – The Carrying Capacity Estimation presented at end of Appendix A is a good addition. The discussion of the levels of food availability that would support a range of sturgeon population levels, based on other reported sturgeon population standing crop levels in the CRB, is valuable. Based on the information in the attachment, evaluation of carrying capacity with growth and survival seems preferable to developing a carrying capacity model. However, the question remains about what would be done to increase carrying capacity, if it is exceeded.

The late age at maturity of females seems to be a bottleneck. There may be value in finding areas where sub-adults could be reared under conditions where maturation could be accelerated if not already accelerated in the new thermal regime of the river. Even though in other areas female white sturgeon have a maturation age of 25 years, it is not necessarily the case that they will mature at the same time in the Kootenai. A modeling exercise using overall annual water temperatures as an index of likely metabolic rate and maturation age could be useful. Actual maturation may be slower or faster now because the Kootenai is warmer in winter and colder in summer than historically.

> *(2) Monitoring program to collect the necessary data to determine if benchmarks are being met*

Adequate response: Details have been added in Appendix B to describe the population monitoring program. The population monitoring program has been very well thought out with detailed in-season management procedures and annual project reviews. Table 2 on page 10 nicely summarizes the monitoring and evaluation (M&E) program in a condensed manner. The genetic monitoring is also very well developed, as shown on pages 34-35 of Appendix A. This is a strong team applying a good approach to a long term monitoring plan with set trigger points to adjust production levels as necessary. In the Step 3 document, it would be instructive to give

one or more examples of how these adjustments in hatchery production levels would be made when trigger values are reached.

The sponsors state that the carrying capacity of the Kootenai River system for an increased sturgeon population is going to be addressed through an adaptive management scenario, which will require detailed monitoring. The sponsors are not confident that trophodynamic models will provide reliable forecasting. However the basic underpinning of the habitat restoration program, which is primarily designed to increase said capacity, is based on the trophodynamic analysis of Synder and Minshall (2005).

A concern is that feeding ecology of sturgeon will again be deferred to the future (p.51, Appendix A). Given the importance of this topic in any adaptive management, it is unclear why feeding ecology is not considered a priority now.

The Step 2 documents do not give details on the required habitat monitoring program. Presumably this is the large, five component program that the Council gave approval via the Resident Fish Review, with the following instructions: "Sponsors to develop a synthesis report for Kootenai River projects (1988-065-00, 1994-049-00, 2002-002-00, 2002-008-00, 2002-011-00) as described by the ISRP. By the end of calendar year 2012, sponsor was to submit a timeline and plan to the Council for the development of the synthesis report."

Although it would be worthwhile to review the synthesis for the five Kootenai River projects before a final decision is made on this Step 2 review for the aquaculture program, the timing argues against that. Nevertheless, a description of the updated aquaculture program should be included in the synthesis report, even if just for context.

Reference

Snyder, E.B., and G.W. Minshall. 2005. An energy budget for the Kootenai River, Idaho (USA), with application for management of the Kootenai white sturgeon, *Acipenser transmontanus.* Aquatic Sciences 67:472-485.

(3) Justification for additional hatchery capacity

Adequate response: The sponsors provided detailed, specific comments on all ISRP comments, and specifically on the factors that result in insufficient current capacity and the need for new capacity. First, hatchery broodstock capacity of 24 adult fish is determined by the "lack of space and tanks for holding broodstock, segregating sexes, and isolating ready females, and a limited ability to regulate water temperature to control maturation of individual fish" (p.3). Additional broodstock could be collected and used if facilities were available. The Step 1 documents clearly indicated that in terms of absolute numbers of fish, juvenile rearing capacity had not been attained. However, the argument presented in the response is that existing facilities limit the

number of families rather than total fish capacity *per se*. The need to rear families separately is related to providing "genetic and demographic accountability," that is, to "limit the potential for hatchery selection for some families at the expense of others." In theory, this argument makes sense in that if the mortality of families that might be intermixed in rearing would differ greatly, it could apply some "inadvertent hatchery selection for some families at the expense of others." As the program progresses, the ISRP encourages the sponsors to conduct experiments to determine if fish from different families can be reared together. Currently, no evidence is provided to support the idea that rearing members of two or more families in the same vessel creates differences, or causes differential mortality, among fish originating from different families. Even if family-specific differences are found in growth and condition their effect on post-release performance may not be biologically meaningful. The sponsors found that the size and condition of hatchery fish recovered in the wild several years after being released was not related to their size and condition at release. Additionally, the sponsors discovered that the growth rates of fish within the same families could be quite variable. It would increase the capacity and flexibility of the hatchery program if juvenile sturgeon of approximately the same size, but from different families, could be reared in the same vessel.

The major challenge in combining fish from the different families into a single rearing vessel is being able to assign fish back to their original families. Two methods, PIT tags and selective removal of lateral scutes, have been successfully used to identify the origin of juvenile sturgeon. However, these methods are typically applied to individuals weighing approximately 30 g or more. The target release size for the project's juvenile sturgeon is 30 grams, and therefore these methods may not be suitable due to the small size of the fish being reared. Applying coded wire tags to different body locations might be an alternative tagging method that could be used to identify different families.

Current facilities can only raise 12-18 full or half sib families per year to rear fish of the needed minimum sizes. Space and water limitations also limit flexibility to "grade fish and manage portions of families" for overall survival, growth and health. The proposed facility will increase the number of families from 12-18 up to 30 and the number of broodstock up to 45 from the current 24. Both increases will improve the capability of the program in terms of demographics and genetic diversity. The benefits to the next generation in terms of effective population size are also laid out in Figure 3, page 33 of the Appendix. Ironically, the proposed smaller number of fish per family, adequately justified on pages 36 and 37 of the appendices, will result in no more total fish being raised than the current capacity. The sponsors note that the additional space, water volume, and temperature regulation will enable lower density rearing to reduce stress, disease, and mortality. Overall total production would increase by only about 7,500 released fish per year.

In addition, pheromones from a new hatchery facility upriver may also aid in attracting breeding adults further upriver, where presumably better spawning habitat is located. Also some imprinting experiments may be possible, thereby using some adaptive management approaches.

Burbot

Adequate response: The sponsors addressed the ISRP comments and questions in the Step 1 review in Appendix C. Information specific to address the ISRP questions included: (1) added information regarding the role of burbot as an apex species in the Kootenai River, (2) good information concerning the potential of the population(s) in Moyie Lake for providing broodstock for the Kootenai system, and (3) sound plans for communication and coordination with the various burbot experts in the region. The annual workshop in January seems like a good idea, and the joint development of decision guidelines is a worthwhile approach.

Other Review Comments

Hatchery Design

The ISRP appreciates the inclusion of the 30% hatchery design drawings in the Step 2 documents. The utility plan drawings provided a useful overview of how the hatchery design will use available space for expanded capacity. However, it is not clear if in developing designs responsive to hatchery limitations whether the possibility of increasing use of vertical space has been fully considered. Use of vertical space could provide a solution to the limitation on the number of tanks needed to raise a desired number of fish families.