



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

Memorandum (ISRP 2009-18)

May 22, 2009

To: W. Bill Booth, Council Chair

From: Eric Loudenslager, ISRP Chair

Subject: Review of Accord proposal, Sockeye Studies (2008-503-00)

Background

At the Council's April 28, 2009 request, the ISRP reviewed the Columbia River Inter-Tribal Fish Commission's (CRITFC) Sockeye Studies proposal (2008-503-00) developed to implement the Columbia River Fish Accords. This proposal is to evaluate factors limiting the abundance of Okanagan¹ and Wenatchee sockeye salmon.

Recommendation

Meets Scientific Review Criteria (Qualified)

The information generated by the proposed PIT and acoustic tagging of Wenatchee and Okanagan sockeye salmon has the potential to contribute to management of these resources. However, the ISRP identifies a number of important challenges, listed below, that should be considered concurrent with implementation. These can be addressed in the development of a final statement of work and study design and reported in future proposals.

Summary Comments

This project could provide valuable information about the sockeye salmon in the upper Columbia River. An improved knowledge of the locations where adult mortality rates are high could be very useful in designing and prioritizing future habitat restoration efforts. Improved estimates of smolt populations in Lake Wenatchee will be critical to better understanding the factors influencing the performance of this population. However, the project's potential value would be much more apparent if the issues highlighted below had been addressed by the project sponsors. These issues include:

- 1) Thoroughly consider the possible factors that may be contributing to adult sockeye mortality between Wells Dam and Skaha Lake;

¹ Okanagan is the Canadian spelling. Okanogan is the U.S. spelling. CRITFC uses the Okanagan spelling in its proposal so we do as well.

- 2) Fully consider the methods by which mortality rates will be associated with water quality and other habitat conditions and the availability of water quality and habitat data on which to base these analyses;
- 3) Before implementing the projects already planned for the Okanagan River, develop a sufficient rationale as to why these projects should proceed prior to identifying key limiting factors for this population;
- 4) Undertake a more complete consideration of the role that hatchery sockeye may be playing in the poor performance of the Wenatchee stock;
- 5) In future proposals, provide more details on the acoustic tagging methods and more thorough description of facilities and equipment.

ISRP Comments by Proposal Section

1. Technical Justification, Program Significance and Consistency, and Project Relationships (sections B-D)

This project will examine factors limiting production of the two major (but greatly diminished) sockeye salmon stocks that remain in the Columbia River system: the Okanagan and Wenatchee stocks. The proposal is clearly written and the study design is generally appropriate for the project objectives. Justification and program significance are well presented.

The project will initially focus on the survival of adult migrants of the Okanagan stock upstream of Wells Dam using acoustic and PIT tag detection – an expansion of an existing program. Detectors would be deployed to enable partition of survival estimates among parts of the migration route, including reaches of the Okanagan River mainstem, major basins of Osoyoos Lake, and some tributaries of the Okanagan River.

The proposal states that this initial focus on the Okanagan stock is due, in part, to the fact that there are a number of projects ready for implementation. These projects are never described. But given that a primary objective of this project is to identify factors that are limiting sockeye production in the Okanagan watershed, does it make sense to implement these projects before this information is available? Are the planned projects addressing the critical limiting factors? Clarification as to what these near-term projects are and how they align with the proposed study needs to be developed.

Given the fact that relatively little is known about the spatial distribution of mortality above Rock Island Dam, the proposed tagging effort for the Okanagan River stock could provide information that is very useful in designing future restoration plans. However, the usefulness of this information will depend upon the ability of the project to identify the factors causing mortality. The proposed system of PIT and acoustic tag readers will identify locations with high mortality rates. But the cause of the mortality cannot be determined without data on habitat

conditions. Little discussion of what is currently known about factors contributing to adult sockeye mortality was included in the proposal. High temperature and low dissolved oxygen in Lake Osoyoos are indicated as possible factors, based on recent research. Is it possible that factors other than these could be contributing to sockeye mortality? Have factors such as chemical contamination, illegal fishing, predation, or other potential mortality factors in the study reach been examined thoroughly enough to eliminate them as significant contributors to sockeye mortality?

The ability of this project to identify factors responsible for mortality will depend upon the availability of site-specific information on water quality and habitat condition. The proposal provides little information about the availability of such data. The proposal indicates that water quality data is collected at Osoyoos Lake. However, it is not clear whether or not such information is available for the Okanagan River above and below Osoyoos Lake. Interpreting the survival data for Okanagan River sockeye would be much enhanced if comprehensive data on water quality and flow from Wells Dam to Skaha Lake were available. This information should be provided in the proposal. If there are other studies that are collecting these data, this information should be provided, in some detail, in the section describing relationship to other projects.

A minor point relates to the sponsor's claim that this research will provide information that will inform one of the critical uncertainties listed in the ISRP and ISAB Example Summary Research Plan: "*4. What are the optimal temperature and water quality regimes for salmonid survival in tributary and mainstem reaches affected by dams, and are there options for hydrosystem operations that would enable these optimal water quality characteristics to be achieved? What would be the effects of such changes in operations and environment on anadromous and resident fishes, shoreline and riparian habitat, and wildlife?*" The proposed research cannot provide information about optimum conditions for sockeye. The tagging and tracking will indicate where mortality occurs and, if sufficient water quality information is available, could generate information on water quality/quantity conditions that are associated with high mortality rates. But a much different design than that proposed would be required to gain any insight into optimum conditions for sockeye.

The Okanagan stock's adult escapement (wholly wild fish according to on-line info) has generally trended upward since 1969—greatly so in 2008. The project sponsors did not speculate as to why the 2008 run was exceptionally high. If the cause of such an occurrence could be identified, this information could yield an important clue as to the factors governing sockeye population dynamics in the Okanagan River.

The Wenatchee stock will receive secondary emphasis during the initial phase of the study with the only planned activity annual hydroacoustic surveys of smolts in Lake Wenatchee. There appears to be a sound rationale for the addition of acoustic trawl surveys to Lake Wenatchee. Implementing a consistent method in Osoyoos Lake and Lake Wenatchee would standardize smolt abundance estimation between the two stocks and enable a more accurate comparison of the performance of these two sockeye stocks from egg through smolt. These data also should improve smolt-to-adult survival (SAR) calculations for the Wenatchee stock. The potential value of a comparison of the sockeye populations in the two lakes is enhanced due to the

presence of hatchery fish only within Wenatchee system, the interaction of kokanee and sockeye juveniles, and the impending climate and human development changes expected in this area of the Columbia.

But perhaps more significantly, better quantification of sockeye smolts in Lake Wenatchee will help in the identification of factors limiting productivity of this stock. The proposal mentions that hypotheses for the Wenatchee stock's decline include "increasing winter rain on snow events resulting in floods that scour redds, an increase in predatory bull trout in Lake Wenatchee, a decrease in survival through the hydrosystem . . . , changing lake conditions, and competition in Lake Wenatchee from juvenile sockeye salmon raised in a hatchery program." The proposal also mentions that the Wenatchee Basin Subbasin Plan considers inadequate nutrients to be a limiting factor in Lake Wenatchee, an oligotrophic lake. The plan suggests that nutrients be introduced into the lake by "an increase in spawning salmon upstream of the lake or by artificial means" and that "investigations regarding increased nutrient loads in Lake Wenatchee should be undertaken to determine the benefits and potential risks of this management . . ." However, few data exist to support or refute any of these hypotheses. Accurate estimates of smolt abundance in the lake will be critical information in any effort to identify and treat factors that are limiting productivity of Wenatchee River sockeye.

Missing from the proposal's list of potential factors limiting production of Wenatchee River sockeye is the possibility that interbreeding of hatchery-origin and wild sockeye may be decreasing the fitness of the naturally reproducing population. There is recent literature on this phenomenon in other salmonids. In view of the fact that hatchery influence is an apparent major difference between the Wenatchee and Okanagan sockeye stocks, it would be worthwhile for this project to compare reproductive fitness and compare SARs for hatchery and wild components of the Wenatchee stock. This should be included at least as part of the proposed development the Wenatchee sockeye research plan, just as the Lake Wenatchee nutrient levels seems to be an implied consideration for future study.

2. Objectives, Work Elements, and Methods (section F)

The objectives and work elements are related to tagging and the acoustic trawl surveys are appropriate for this project. The PIT and telemetry monitoring arrays should be sufficient to estimate reach survival and migratory timing in the proposed study area. A minor concern is the lack of detail on some of the tagging methods. The PIT tagging details are sufficient but not enough detail is provided on the acoustic tagging methodology. Some discussion of the specifics on the capture and tagging methods (including sample sizes) at Wells Dam would address this issue. Another concern that is not covered in the proposal is the potential of a significant handling effect from tagging fish at Wells Dam. Wells Dam is a long way upstream and the fish may be in relatively poor condition when they arrive. Researchers at the University of Idaho have had such problems when tagging sockeye at Lower Granite Dam in the past.

Determining the relationship between habitat conditions and mortality for the Okanagan stock sockeye should be included as an objective. An understanding of this relationship is fundamental to designing actions that will improve conditions at locations where high mortality rates are identified. Only work element 2.3 provides any discussion of this relationship, which

mentions a conceptual model of the interaction between flow, temperature and oxygen. If this is the primary tool that will be used to identify the specific factors causing survival “bottlenecks” a description of this model and the data that will be used to parameterize it should have been included in the proposal. The ISRP believes that demographic and habitat-based simulation modeling can be very useful to better direct research towards information gaps and to guide habitat-based rehabilitation efforts. Such modeling should include the complete life history within and out of the basin. As indicated above, more information in the proposal on the availability of data on water quality, flow, and habitat conditions would greatly improve the proposal. Work Element 2.3 also provides the only mention of the statistical analyses that will be used. Other than mentioning that they will “likely use ANOVA” this discussion is vague.

3. M&E (section G, and F)

This entire project is essentially an M&E effort. The design of the tagging and detection effort and the acoustic trawl surveys are well described in the proposal. More information is required on the availability of flow, temperature, oxygen, and other water quality and habitat data in the study area. A more complete description is needed of the analytical approach that will be used to relate these parameters to sockeye survival. It would be helpful if section G, which deals with facilities and equipment, were expanded. Dr. Fryer’s CV is shown, but Dr. Hyatt’s is not. Dr. Hyatt’s qualifications are well known and indicated by the literature cited in the proposal. Nonetheless, the proposal would be more complete if the qualifications of both principle investigators were included.