Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (2022-5) **July 14, 2022**

To: Guy Norman, Chair, Northwest Power and Conservation Council

From: Stan Gregory, ISRP Chair

Subject: Response Review of Yankee Fork Restoration Project (#2002-059-00)

Background

On May 23, 2022, the ISRP received a response and revised proposal for the Shoshone Bannock Tribes' Yankee Fork Restoration Project (#2002-059-00) submitted for the Anadromous Fish Habitat and Hatchery Review. Our review is provided below, using the same format as in our final report for the larger review (ISRP 2022-1).

200205900 - Yankee Fork Restoration Project

Links to: Original proposal | Revised proposal and response | Past reports | Past reviews

Proponent: Shoshone Bannock Tribes

Province/Subbasin: Mountain Snake/Salmon

Recommendation: Meets scientific review criteria

Final Review Comment:

This is the ISRP's final review of the Yankee Fork Restoration Project for the Anadromous Fish Habitat and Hatchery Review. After our Preliminary Review recommendation of "response requested," the Council granted an extension until May 2022 to allow the proponents time to work with third parties and seek expert assistance to revise their proposal and address the ISRP's concerns.

In our preliminary review, we requested a response on the topics listed below. The proponents responded by revising their proposal and providing a point-by-point response to our 10 concerns in *Section 9. Response to Past Council Recommendations and ISRP Reviews* (pages 37-39). We commend the proponents on preparing a greatly improved, revised proposal and for addressing both the current review and comments from the 2008 review. Below, we highlight a

few key opportunities for additional improvement. In particular, we ask that the proponents develop objectives that meet all the SMART criteria and include quantitative details and timelines, and provide these in all future annual reports and proposals. Beyond that, we request nothing further of the proponents regarding this proposal.

Our final comments based on the response and revised proposal are provided after each topic:

1. **SMART objectives**

The revised objectives are logically arranged, starting with the key objective of restoring surface flow through the Bonanza reach to allow immigration of adult salmonids and emigration of juvenile outmigrants. The ISRP was impressed with the alternative objectives developed for addressing this serious emergency of channel drying caused, in part, by the habitat restoration completed to date.

These revised objectives include many SMART elements, but most need to be more specific and quantitative so that they are measurable. For example, regarding Objective 1, later in the proposal the proponents refer to a depth of 0.4 feet as a minimum required for suitable for adult salmon upstream passage, and that 4 years is an expected time needed to achieve passage.

Given this, Objective Alternative 1a might be rewritten in SMART format as follows:

> *By 2026, restore Yankee Fork River surface flow through the Bonanza Rehabilitation Project reach in the existing channel alignment design during low river discharge (from July through October) to minimum depths of 0.4 feet considered adequate to allow upstream and downstream migration of juvenile and adult Chinook salmon by sealing the stream substrate with various and progressive adaptive management strategies.*

This renders this objective not only Specific, Achievable, and Relevant, but also Measurable and Time-bound. It might be further improved by including the maximum velocity and length of stream reach with this depth and velocity, based on the bioenergetic capabilities of the salmon and steelhead passing upstream, if these are appropriate considerations.

As another example, Objective 1c provides no specifics about how the passage problems will be mitigated. Presumably this will be accomplished by trapping and hauling adults upstream and juveniles downstream, which should be explicitly stated along with specific trapping and hauling metrics that will be measured. As with the previous example, more specifics are presented later in the proposal. Overall, many objectives need quantitative and measurable details and timelines to meet the SMART criteria.

2. Updated objectives for disrupted surface flow

Overall, the proponents did an excellent job providing a key objective for addressing the disrupted surface flow, a plan for an alternative, and a general plan for mitigating the effects while work is ongoing. However, the ISRP wondered whether trapping outmigrating salmonid juveniles and smolts using a temporary weir or Fyke net, perhaps combined with a herding technique, would be less harmful to the fish than the electrofishing proposed. Alternatively, could a trap located a bit farther upstream be the main method to gather juveniles, and electrofishing to salvage fish in drying pools near the end of flow a secondary method? Finally, the ISRP urges the proponents to collect relevant data on the fish passing upstream and downstream, including at a minimum counts by species and age/size classes.

3. M&E matrix - support

This response issue was addressed in the larger project review process. In our preliminary review, we asked the proponents of the Upper Salmon Basin Habitat Restoration Project (2007-394-00) to summarize the linkages between implementation and monitoring projects in the Salmon River basin. We then asked the proponents of this project to assist in creating that summary by providing information about what is being monitored in this implementation project. In the response, the proponents for the Upper Salmon Basin Habitat Restoration Project stated they understood the value of an M&E matrix and agreed to help develop an M&E summary and matrix at a later date. In our final report (ISRP 2022-1), we acknowledged the response and clarified that we reviewed the M&E components of the different projects in the Upper Salmon River subbasin based solely on the information provided in their original proposals, associated documents, and any information provided as part of the response loop. We used the same approach in reviewing this revised project proposal.

In the Council's final decision on the Anadromous Fish Habitat and Hatchery Review (April 2022 decision letter to BPA), the Council acknowledged the potential value of M&E matrices but recommended that BPA, the fish and wildlife managers, and the Council should first complete an integrated habitat RM&E strategy. They suggested the M&E matrices would be most informative if they fit within the context of the RM&E strategy. The Council also offered to work with project proponents and Bonneville to develop M&E matrices and consider how to incorporate matrix development into future project reviews. When the RM&E strategy is completed, we encourage the proponents to work with the Upper Salmon Basin Habitat Restoration Project in developing the M&E matrix.

4. Population viability

Previously the ISRP (2012-10) recommended that specific quantitative objectives for the four Viable Salmonid Population (VSP) parameters (McElhany et al. 2000) be established to facilitate evaluation of restoration strategies. These four parameters are the 1) abundance, 2) productivity, 3) spatial structure, and 4) life-history and genetic diversity of each population of concern. The revised proposal includes population-level recovery criteria for two VSP

parameters (abundance and productivity) developed by NOAA (2017) for the Yankee Fork Chinook population unit (page 4 and in Figure 1). The situation for steelhead is more complicated because the Upper Salmon River population unit for which NOAA has developed corresponding criteria comprises more than just the Yankee Fork River.

In any case, trend data presented in this proposal are sufficient to indicate that Chinook salmon and steelhead abundances continue to decline in the Yankee Fork, as in other areas of the Snake River basin outside the Yankee Fork River. At present, there is no doubt about the imperiled status of these focal populations, so the lack of specific quantitative recovery criteria for the Yankee Fork should not stand in the way of implementing restoration actions to halt their decline. In their response to this point (page 37-38), the proponents also state that all of their objectives address concerns about population viability by attempting to increase (and monitor) fish occupancy of habitat in the Yankee Fork River.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of Evolutionarily Significant Units. NOAA-Fisheries, Seattle.

5. Fish population responses

The proponents provided data on redd counts and snorkel counts of juveniles through time at the various project sites in a series of graphs (Figs. 1, 3, 4, and 20 in Appendix B). Overall, these show that juvenile abundance has been mainly influenced by the low returns of adults, which the proponents suggest was caused by out-of-basin effects. In some cases, density of juvenile Chinook salmon likely increased soon after habitat enhancement or rehabilitation, but these increases were quickly erased by the overall decline.

Unfortunately, Figures 3 and 4 showing fish responses in CHaMP treatment versus control sites are difficult to interpret. Further analysis and explanation are required to clarify the effects of restoration, and to summarize overall trends in abundance in the Yankee Fork River. The proponents acknowledged this issue and added Objective 10 to focus future efforts on evaluation. Part of that effort should include reporting representative abundance and productivity indices relevant to VSP parameters for the ESA-listed populations, including relationships between adults and progeny (i.e., stock-recruit relationships). Overall, the ISRP remains uncertain about how future evaluation will be done because insufficient detail is provided in the Methods section. We urge the proponents to seek assistance from a qualified statistician for these analyses and provide results in future annual reports.

Figure 20 in Appendix B shows that the side channels created in the Pond Series 2, 3, and Preachers Cove projects were used by juvenile Chinook salmon and steelhead during winter, as hoped. However, the density measures (fish/100 m) cannot be compared to those in Figures 3 and 4 (fish/m^2). We assume that measures of stream width were recorded so that the former measure (fish/100 m) can be converted to areal density (fish/m^2), allowing this comparison.

The snorkel surveys are based on methods by Crawford and Tetra Tech (2011). The ISRP would like to know whether these counts have been validated against estimates of true abundance, such as by depletion electrofishing or mark-recapture methods, or whether they are an index of relative abundance. If the latter is true, then this adds additional variation that will need to be accounted for when analyzing the data using the MBACI design.

6. Modified BACI design

The description of this statistical design is now clear. However, given that the full design was not developed at every site (e.g., some lacked pre-treatment data), a qualified statistician should be enlisted to help the proponents determine how best to analyze responses for each project. The proposed analytical approach should be documented in a future annual report.

The ISRP notes that the key determinant that increases statistical power of these comparisons is the number of years of pre-treatment data collected (see ISAB 2018-1, section 4.2.4). For example, adding one year of pre-treatment data increases the statistical power to detect differences more than including up to 100 years of post-treatment data (O'Neal et al. 2016). These investigators reported that increasing pre-treatment data from even 1 year to 2 years improved power by about 30%, and 5 years of data before and after treatments appeared optimal. Additional information on statistical power to detect trends in fisheries data is provided in Dauwalter et al. (2009) and Wagner et al. (2013). Thus, if further habitat rehabilitation is anticipated, the ISRP encourages the proponents to plan well in advance to allow increasing the number of years of pre-treatment data collected.

Dauwalter, D.C., F.J. Rahel, and K.G. Gerow. 2009. Temporal variation in trout populations: implications for monitoring and trend detection. Transactions of the American Fisheries Society 138:38-51.

ISAB. 2018. Review of Spring Chinook Salmon in the Upper Columbia River. Northwest Power and Conservation Council, Independent Science Advisory Board 2018-1, Portland, OR.

O'Neal J.S., P. Roni, B. Crawford, A. Ritchie, and A. Shelly. 2016. Comparing stream restoration project effectiveness using a programmatic evaluation of salmonid habitat and fish response. North American Journal of Fisheries Management 36:681-703.

Wagner, T., B.J. Irwin, J.R. Bence, and D.B. Hayes. 2013. Detecting temporal trends in freshwater fisheries surveys: statistical power and the important linkages between management questions and monitoring objectives. Fisheries 38:309-319.

7. Water quality parameters measured

The ISRP requested that the proponents explain what water quality parameters (e.g., temperature, river discharge, turbidity) will be measured and at what intervals, not only to evaluate project actions but also to provide data to evaluate ongoing climate change. The

proponents propose to work with other cooperators to repeat monitoring of mercury and selenium, a useful objective to address long-term effects of past mining and the subsequent rehabilitation. In future reports and proposals, the ISRP would like to see a table consolidating the water quantity and water quality parameters measured, to help clarify the geographic scope and timelines for water quality monitoring and provide an easily read summary.

8. Nutrient restoration priority

The ISRP regrets failing to realize that nutrient restoration is monitored closely by the Salmon River Basin Nutrient Enhancement Project (2008-904-00), and thanks the proponents for making us aware of this.

9. Description of methods

Overall, the description of methods was much improved and with a few exceptions (noted above and here) were adequate to allow the ISRP to evaluate the proposal.

First, it was not clear when or how the Yankee Fork Restoration Interdisciplinary Team will decide on several possible options or strategies to: a) move the river from the uppermost engineered channel back to its previous location (Objective 1B, page 23); b) lower the inlet to Pond Series 2 (Objective 4, page 25); and c) replace substrate under Pond Series 1 (Objective 5, page 25).

Second, as described above, for both effectiveness monitoring and long-term monitoring under Objective 10, few details are provided to indicate how the proponents will compare results between control and treatment sites, and who will conduct this analysis.

10. Evidence for restoration effectiveness

The proponents provide an impressive and detailed plan for evaluating fish population responses to past projects in Objective 10. To date this has been hampered by the elimination of the CHaMP/ISEMP project. The ISRP suggests that the proponents enlist the help of an expert statistician to analyze not only the effects of treatments compared to controls, but also the rate and extent of the long-term decline in juvenile salmon across sites. In addition, steelhead and bull trout are rarely mentioned, even though steelhead abundances appear substantial in some locations of the Pond Series 2 and 3 and Preachers Cove sites (see Fig. 20, Appendix B). Hence the responses of steelhead should also be analyzed. Results of these analyses should be documented in future reports or manuscripts.

Preliminary ISRP report comments: Response Requested *(Provided as a record of the review process. The proponents addressed the ISRP's questions; see response link and final review above.)*

Overall comment:

The ISRP appreciates how much the Shoshone Bannock Tribe (SBT) values the Chinook salmon and steelhead in the Yankee Fork, and the role of harvest opportunities for these fish in reviving SBT salmon-based cultures. The ISRP is offering advice based on western science for improving efforts to restore fish habitat and monitoring the results, which can be integrated with SBT Traditional Ecological Knowledge in hopes of sustaining and increasing these fish populations for use by the SBT.

The proponents are commended for planning and completing eight comprehensive habitat restoration projects during 2012 to 2020. The ISRP was impressed by their timely response with partners to the emergency created by loss of surface flow after restoration in the Bonanza reach (Gregory et al. 2021), and the project evaluation and adjustment diagram (Figure 5.1 in the proposal) of steps planned to address this problem in 2021 and 2022.

Unfortunately, the current proposal is not sufficiently organized or detailed to allow the ISRP to conduct a full evaluation. Much effort was required to review many past documents and reports, which were not adequately summarized in the proposal, and further questions arose from review of these documents. A revised proposal is necessary to allow the ISRP to understand the SBT's objectives for future work in the watershed and how the work will be evaluated. In addition, certain questions from previous reviews have not been adequately addressed.

Given the complex nature of this project and its history of reviews, the ISRP encourages the proponents to engage their full planning and restoration team, or seek other expert assistance, in revising the proposal and developing the response.

The ISRP requests the SBT to address the following in a revised proposal and include a brief point-by-point response to the ISRP referencing where and summarizing how the issues were addressed in that document. In addition, we request that this project participate in the development of the M&E matrix as described below:

1. **SMART objectives.** Provide a set of clear physical and biological objectives, and corresponding implementation objectives in SMART format (see proposal instructions) for work to be accomplished during the 2023-2027 phase.
2. **Updated objectives for disrupted surface flow.** Provide an updated set of objectives, and description of the project evaluation and adjustment process, for responding to the emergency of disrupted surface flow in the Bonanza Reach after habitat restoration.
3. **M&E matrix - support.** As habitat projects and monitoring projects are not presented as part of an integrated proposal or plan, the need for a crosswalk to identify the linkages

between implementation and monitoring is extremely important for basins or geographic areas. The ISRP is requesting a response from the Upper Salmon Basin Habitat Restoration Project (200739400) to summarize the linkages between implementation and monitoring projects in the Salmon River basin. We ask this project to assist them in creating the summary and provide information to them about what is being monitored for this implementation project and where and when the monitoring occurs. A map or maps of locations of monitoring actions would be helpful in this regard.

4. **Population viability.** Provide a response to the ISRP request (ISRP 2013-9) to develop biological objectives for focal species (Chinook salmon, steelhead, and bull trout) that address Viable Salmonid Population (VSP) parameters and the NOAA Population Viability criteria for Chinook salmon.
5. **Fish population responses.** Provide a response to the ISRP request (ISRP 2013-9) to explain what fish population responses were collected under the CHaMP protocol for the 55 sites sampled during 2013-2018, and a plan for analyzing and reporting these data.
6. **Modified BACI design.** Provide a description of the modified BACI design (reported in Markham et al. 2019, p. 17) used to evaluate responses of fish habitat and fish populations to restoration.
7. **Water quality parameters measured.** Provide an explanation of what water quality parameters (e.g., water temperature, river discharge) will be measured and at what intervals, to evaluate the ongoing changes owing to climate change.
8. **Nutrient restoration priority.** Provide an explanation of the priority placed on nutrient restoration, a key future strategy presented in the Yankee Fork Habitat Restoration Plan (Gregory and Galloway 2019; Table 3), and identify what partners plan to pursue this objective.
9. **Description of methods.** Provide a description of methods used to complete the planned objectives, in sufficient detail for ISRP to evaluate their scientific merit.
10. **Evidence for restoration effectiveness.** Provide an explanation of the evidence for statements about restoration causing improvements at the reach scale, and at the watershed scale by 2017, based on publications that were not available to the ISRP for review (Bouwes et al. 2016; Bouwes and Heitke 2018). The ISRP requests access to these publications.

Q1: Clearly defined objectives and outcomes

The proposal presents a primary goal of restoring harvest opportunities to revive SBT salmon-based cultures, which the SBT hopes to accomplish by restoring habitat for Chinook salmon and steelhead trout. However, no quantitative physical and biological objectives, nor implementation objectives to achieve these, were presented, nor were objectives provided in the SMART format (i.e., Specific, Measurable, Achievable, Relevant and Time Bound; see the Proposal Guidelines).

For example, the proponents present a table of prioritized future projects in the Timeline section, which is duplicated from the most recent Yankee Fork Habitat Restoration Plan (Table 3 in Gregory and Galloway 2019), but no details are presented. A timeline for the different projects and a map showing their locations is needed. Below is an example of the types of statements needed to achieve the SMART format [Note: these are only examples with placeholders (letter symbols) for the specific quantities that should be included.]

Physical objective: Increase instream complexity and opportunities for overbank flooding onto the floodplain at the Pole Flat and Upper Pole Flat sites.

Implementation objective: By 2027 install R pieces of large wood, each at least S m long and T cm diameter, in a series of U jams over the V-meter segment and remove dredge spoils from W hectares of floodplain adjacent to the reach to encourage overbank flooding and side channel formation.

The loss of surface flow through the Bonanza restoration reach in 2020 following habitat restoration efforts created an emergency requiring the SBT and its partners to trap and haul migrating fish past the barrier (Gregory et al. 2021). The proposal includes a highly useful diagram (Fig. 5.1) showing a plan for project evaluation and adjustment in 2021 and future years to address this crisis. This work should be stated as the first objective of the proposal, to continue evaluation and adjustment to address this crisis in 2023 through 2027.

Past ISRP reviews (ISRP 2013-9) requested the SBT to develop biological objectives for focal species (Chinook salmon, steelhead, and bull trout) that address Viable Salmonid Population (VSP) parameters and the NOAA Population Viability criteria for Chinook salmon, but these were not presented in the proposal. They were discussed in the Yankee Fork Habitat Restoration Plan (Gregory and Galloway 2019) and should be summarized in the proposal.

Past ISRP reviews (2013-9) also requested monitoring of the fish population response to the habitat restoration. The final report on monitoring of water quality (Markham et al. 2019) includes a section (p. 17 of the report) describing a rotating panel of 55 sites in which fish habitat was measured and snorkel surveys of fish were completed by the SBT during 2013-2018 based on a design planned by Watershed Solutions (2013) using the CHaMP protocol. In the Response to Past Council Recommendations and ISRP Reviews, the proposal reported that over 20 years of fisheries data have been collected but apparently have not been analyzed. The ISRP requests a summary of these data and a plan for analysis and reporting of them. The most recent summary of fisheries data found is reported in Gregory and Wood (2013). The ISRP understands that discontinuing CHaMP and ISEMP by BPA created problems for these efforts but needs to understand the current status of the work, data, analysis, and reporting.

In addition, the proponents reported that a modified BACI (Before-After-Control-Impact) design would be used to evaluate the responses of fish habitat and fish populations to the restoration, but the design of this study was never presented. The ISRP requests basic information on

whether the design laid out in Watershed Solutions (2013) will be continued, and specifically what fish population responses will be measured.

The ISRP understands that other partners may be measuring some characteristics of habitat and fish populations. If this is the case, we request the proponents present a table or matrix identifying what partners will be measuring which characteristics, so it is clear to the ISRP review team.

Extensive sampling and analysis of water quality characteristics was conducted during 2006 to 2018, which showed that water quality in the Yankee Fork met IDEQ criteria and was excellent overall. During the presentation, Ms. Galloway reported that there were no plans to continue this work. However, ongoing climate change is likely to alter water temperature and perhaps flow and other characteristics. In addition, past ISRP reviews have requested information on toxic chemicals such as mercury (used in extracting gold) or heavy metals, but it's unclear to what extent water samples have been analyzed. The ISRP requests information on plans by SBT or a partner agency to continue monitoring temperature and flow to address future climate change and the status of measurements of chemicals potentially toxic to fish and other aquatic life.

In the Yankee Fork Habitat Restoration Plan, one long-term strategy presented is nutrient restoration (see Table 3 in Gregory and Galloway 2019). The ISRP requests information about whether this strategy is being implemented by SBT or a partner.

Q2: Methods

Detailed methods are provided in annual reports for monitoring water quality, and methods for other restoration actions are described in variable detail in some of the annual reports and in the Yankee Fork Habitat Restoration Plan (Gregory and Galloway 2019). However, the methods are not summarized in the proposal nor linked to the proposal in a way that facilitates evaluation, especially with respect to continued monitoring. Please provide these summaries and linkages.

Only a very general description of methods is included in the proposal, and because specific objectives were not provided, these methods do not follow logically from planned objectives. Please make these linkages clear in the revised proposal.

Q3: Provisions for M&E

As described above under Objectives, it is unclear what monitoring data were collected for habitat or fish populations by SBT under the CHaMP sampling protocol described in Watershed Solutions (2013). This should be explained, and a plan presented for future monitoring, analysis, and reporting of these data.

The ISRP (2013-9) requested monitoring to assess whether the overwinter cover for juvenile fish created in Pond Series 3 project, and other projects in this series, were actually used by fish. Was this monitoring completed? If so, the results should be reported in the proposal.

Q4: Results – benefits to fish and wildlife

The proponents are commended for planning and completing eight habitat restoration projects during 2012 to 2020, as described in Table 1 of the Yankee Fork Habitat Restoration Plan (Gregory and Galloway 2019). In several reports they state that these actions resulted in immediate improvements to fish habitat at the reach scale, with evidence of habitat improvement actions at the watershed scale by 2017 (Bouwes et al. 2016; Bouwes and Heitke 2018). Unfortunately, these references were not listed, nor provided. The ISRP requests links to these reports and information about the evidence used to draw these conclusions.

References

Bouwes, B., J. Heitke, and G. O'Brian. 2016. Yankee Fork River status, trend and effectiveness monitoring: 2013 – 2015 results. Report by Watershed Solutions Inc. (Boise, ID) to the Shoshone Bannock Tribes, Ft. Hall, ID.

Bouwes, B., and J. Heitke. 2018. Yankee Fork River status, trend and effectiveness monitoring 2013 – 2017 results. Report by Watershed Solutions Inc. (Boise, ID) to the Shoshone Bannock Tribes, Ft. Hall, ID.

Gregory, J.S., and E. Galloway. 2019. Yankee Fork Habitat Restoration Plan Yankee Fork Salmon River, Idaho. Report to Yankee Fork Interdisciplinary Team.

Gregory, J., M. Knutson, and E. Lyon. 2021. Bonanza City floodplain restoration project fish migration impacts mitigation plan for 2021. Report from Lost River Fish Ecology and U.S. Bureau of Reclamation.

Gregory, J.S., and C.L. Wood. 2013. Yankee Fork drainage fisheries summary and analysis. Report to U.S. Bureau of Reclamation, Boise, ID.

Markham, J., J. Gable, and E. Galloway. 2019. Yankee Fork Restoration Project: Baseline water quality data--Yankee Fork Salmon River, February 1, 2018-January 31, 2019. Report to Bonneville Power Administration from the Shoshone Bannock Tribes, Fort Hall, ID.

Watershed Solutions Inc. 2013. Fish habitat monitoring plan for the Yankee Fork watershed: status, trend and effectiveness monitoring. Report to the Shoshone Bannock Tribes.