Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (2021-2) **March 9, 2021**

To: Richard Devlin, Chair, Northwest Power and Conservation Council

From: Stan Gregory, ISRP Chair

Subject: Follow-up Review of Coeur d'Alene Tribes' Habitat Restoration Projects for Hangman Creek (#2001-033-00 and #2001-032-00)

Background

On January 26, 2021, the Northwest Power and Conservation Council asked the ISRP to review responses from the Coeur d'Alene Tribe for Project #2001-032-00, *Coeur d'Alene Fisheries Enhancement-Hangman Creek*, and Project #2001-033-00, *Hangman Creek Fish & Wildlife Restoration*. The responses address the conditions placed on the projects by the Council as part of the *Resident Fish and Sturgeon Project Review* in October 2020. The two projects received the following recommendation from the Council:

> "*Manager address ISRP review conditions in a revised proposal for the project. Additional budget request dependent and linked to the revised proposal. Revised proposal due no later than January 29, 2020*"

The Council received the following response documents:

- Project #2001-032-00, *Coeur D'Alene Fisheries Enhancement-Hangman Creek*
  - Cover Letter (Word), dated January 25, 2021 (please note - cover letter serves to direct reviewers to specific parts of the revised proposal where responses can be found)
  - Revised proposal template (Word)

- Project #2001-033-00, *Hangman Creek Fish & Wildlife Restoration*
  - Revised proposal template (pdf) (please note all changes, to original template, are in a blue font)

The ISRP review below considers these projects in two parts: 1. Project #2001-032-00, *Coeur d'Alene Fisheries Enhancement-Hangman Creek*; and 2. Project #2001-033-00, *Hangman Creek Fish & Wildlife Restoration*. The ISRP's conditions for the projects are described in the ISRP's *Final Report: Category Review of Resident Fish and Sturgeon Projects* (ISRP 2020-8; pages 250-267). The topics of the ISRP's conditions are listed below for each project, and the ISRP addresses these conditions point-by-point.

Conditions for Project #2001-032-00, *Coeur d'Alene Fisheries Enhancement-Hangman Creek* (ISRP 2020-8; pages 257-267):

Condition 1. Detection of changes in redband trout and westslope cutthroat trout populations
Condition 2. Quantitative assessment of responses to restoration treatments
Condition 3. Quantitative implementation objectives to reduce summer stream temperatures
Condition 4. Information on restoration implementation objectives
Condition 5. SMART objectives
Condition 6. Integrated restoration plan

Conditions for Project #2001-033-00, *Hangman Creek Fish & Wildlife Restoration* (ISRP 2020-8; pages 250-256):

Condition 1. Methods for measuring outcomes
Condition 2. Desired outcomes and methods for Beaver Ponds objective
Condition 3. Desired outcomes and methods for channel realignment objective
Condition 4. Project and landscape-scale monitoring

Summary: The ISRP finds that the revised proposals for both projects are significantly improved and meet our previous conditions, and thus meet scientific review criteria.

Although we find that the conditions are met, after careful review of both Hangman Creek projects, it remains unclear why they continue as two separate projects. They have similar goals: to restore native fish to the Hangman Creek watershed by measures designed to improve fish passage, increase floodplain water storage/base flows, and ultimately reduce summer stream temperature. Although project 2001-033-00 states that its focus is to address landscape-scale management issues that could not be addressed by focusing on instream and near stream habitats, the project includes actions to re-establish riparian and floodplain vegetation, install 25 Beaver Dam Analog structures in the stream channel, and re-water a relict stream channel. Combining the two projects would provide for better integration of project activities and improve development and evaluation of project's actions to achieve these goals. A combined project also would likely streamline proposal development and make future reviews more efficient.

The ISRP supports the concept of protection being an active partner with restoration. Some of the currently envisioned actions may be limited by effects of climate change. We encourage the proponents to consider how climate could influence restoration efforts in the next 20 years and how this could affect the actions taken and their potential for success.

1. Project #2001-032-00, Coeur d'Alene Fisheries Enhancement-Hangman Creek

ISRP Recommendation

Meets Conditions

The proponent significantly improved the project proposal and adequately responded to each of the six conditions. The proposal now provides the content and detail for moving forward. However, there are some additions and modifications that would further clarify the proposal. These are included in the comments for each of the conditions where appropriate. The additional time and effort invested in addressing the conditions are appreciated. Given the long history of this project, the ISRP encourages the proponents to consider developing a synthesis of past restoration work and key findings, results, and lessons learned for this and the companion project (2001-033-00). Such a report would address the long history of the project and would improve understanding of work completed to date and summarize important information, including many valuable lessons learned. Such a synthesis would create a context for future watershed restoration planning and provide valuable information for others pursuing projects with similar goals.

ISRP Comments on each Condition

Condition 1. Detection of changes in redband trout and westslope cutthroat trout populations

Adequate. The proponents directly addressed the ISRP review comments regarding use of the various metrics to assess responses to restoration in the redband trout and westslope cutthroat trout populations. The corresponding changes in the objectives and monitoring methods needed clarification. The proponents point out that this is not a research project, but the project aims to track effectiveness of restoration work on these trout populations. They identify factors likely to influence the accuracy of population and density estimates. Overall, the monitoring of population changes appears well-organized and reasonable.

Condition 2. Quantitative assessment of responses to restoration treatments

Adequate. The proponents provided a well-organized description of planned assessment of restoration treatments and adequately clarified the sampling design, desired precision, and PIT-tagging plans. The assessment will be facilitated by a comprehensive set of implementation and effectiveness objectives provided in the response, and by the summaries and links that describe methods for this work. Additional work could further improve the revised proposal, especially by an effort to enhance linkages between objectives for fish passage and instream structural work. For fish passage, there is no specific discussion of how passage will be evaluated at the two culvert sites. Passage into these tributaries is expected to be very important, given that elevated summer stream temperatures in the mainstem may require juveniles and adults to move from the mainstem into upper tributary areas for thermal refuge. For the large wood additions, it is noted that sorting of substrate and scouring of additional pool habitat

are expected. Techniques are not discussed for evaluating if this actually occurs, or that other instream structural work will produce the expected improvements. It would be useful to assess such changes.

The proponents have made a clear choice of how to spend limited resources, emphasizing detection of change in the success of the fluvial life history of redband trout. The increased fish assessment effort in the revised proposal is noted (i.e., change from every five to every three years for abundance estimates in Indian Creek, and change to annual abundance estimates for the suppression reach in Nehchen Creek). These changes were in response to the ISRP concern that proponents were shifting too far away from the former efforts that conducted annual estimates of fish abundance in multiple streams. The concern still exists that the level of sampling for fish abundance estimates to measure fish responses to habitat restoration and patterns of fluvial life history is too limited. However, the proponents' desire to concentrate time and dollars to the restoration effort, not to status and trend monitoring, is clearly stated and the reason is understood.

The question remains: Are mean return rates of fluvial redband trout and proportion of fluvial to resident life history types realistic outcomes for the proposed restoration actions? Beyond increasing the level of stream connectivity and reducing thermal blocks that the stream restoration efforts address for basic allowance and potential for fluvial life history, the conditions that determine the rate of fluvial life history is murky territory. Could the factors that might increase the rate of *Oncorhynchus mykiss* fluvial life history (density dependent factors leading to inadequate food, too low of lipid storage; genetic-based high metabolic rates, etc. [see Kendall et al. 2014]) be similar to factors promoting emigration and smolting? Would these factors be at odds with, or not in the purview of, what typical stream habitat restoration addresses (i.e., enhanced food production, increased rearing space, etc.)? Furthermore, the rate of return of emigrated fish may be partly or entirely dependent on conditions outside the project area where the project's restoration actions have no influence. The ability to affect fluvial rate and ability to maintain a target fluvial rate with specific stream restoration actions is, however, worthy of a hypothesis-driven research project. This issue should be revisited and directly assessed in future funding rounds.

Kendall, N.W, J.R. McMillan, M.R. Sloat, T.W. Buehrens, T.P. Quinn, G.R. Pess, K.V. Kuzishchin, M.M. McClure, and R.W. Zabel. 2015. Anadromy and residency in steelhead and rainbow trout (*Oncorhynchus mykiss*): a review of the processes and patterns. Can. J. Fish. Aquat. Sci. 72: 319–342.

Condition 3. Quantitative implementation objectives to reduce summer stream temperatures

Adequate. The proponents provided a clear, quantitative implementation objective that generally meets SMART objective criteria. The objective describes a reduction in days where the summer stream temperature exceeds 68°F. Additionally, the response describes a comprehensive network of sites to monitor summer stream temperature. Data are presented showing the recent reduction in days over 68°F attributed to restoration work. However, this metric likely may not be sufficient to fully understand changes in stream temperature. Use of other metrics such as a measure of variability, degree days, and maximum temperature is recommended. Roon et al. (2021) provides references, background, and ideas for other useful diagnostic temperature descriptors (e.g., number of days when daily temperature > 16˚C, the number of consecutive days > 16˚C, the number of days > 20˚C, and the number of consecutive days > 20˚C). The seasonal temperature regime could be used as input into a bioenergetics model to help understand fish response.

It is not clear if data are available to address the trends in summer stream temperature for the last 10-15 years. If so, describing a longer trend for summer stream temperatures is recommended. Another method to consider would be the use of a solar pathfinder or densiometer to measure incoming solar radiation/shading to the stream surface in areas where revegetation is being conducted. This could reveal near-term responses to restoration that may not initially be detected by temperature monitoring. The timeframe for achieving the desired outcome is given as Year 2040. It also would be informative to describe what would be expected to be achieved during the lifetime of the current proposed project (2025) as a basis for adaptive management and future planning.

Roon, D.A., J.B. Dunham, and J.D. Groom. 2021. Shade, light, and stream temperature responses to riparian thinning in second-growth redwood forests of northern California. PLoS ONE 16(2):e0246822.

Condition 4. Information on restoration implementation objectives

Adequate. A comprehensive set of implementation objectives is provided to describe the full range of proposed activities. These are time bound and quantitative. The ISRP encourages the project to reconsider the proposed design of the fish passage restoration (culvert replacements) and about how to measure successful implementation. The proposed design criterion is described as a replacement that will "pass a minimum of a 50-year flood event." Elsewhere, the proponents state that the project seeks to reestablish natural processes. The proponents should consider a stream simulation design that provides a replacement culvert width of bankfull or greater and will pass a 100-year flow along with associated sediment and debris. Such a design would likely be more successful in addressing the flashy hydrologic cycle and high sediment loads described for the Hangman Creek watershed, and it would be more resilient to changing hydrology. Measurement of the post project channel/culvert width and gradient would likely be sufficient to ensure successful implementation. Although the initial cost would be higher, it is likely that long-term maintenance will be reduced, and the overall goals of natural stream function be better met.

In the Methods, the proponents stated that the restoration target of "1.5 year flood intervals … will promote floodplain reconnection, reduce unit stream power within the stream channel, reduce rates of stream bank erosion and promote aggradation within the currently incised channel," but these targets have no associated methods for quantitative assessment of changes in these processes. Low-cost methods for monitoring processes might be considered to evaluate the effects of the restoration actions for communicating results and adaptive management. For example, frequency of floodplain reconnection may be tracked using a crest gage. Bank erosion may be tracked using strategically placed photos points with a marked rod for scale. Channel elevations could be tracked over time with annual cross-sectional surveys at strategic locations using a hand level and stadia rod.

Condition 5. SMART objectives

Adequate. A complete set of objectives meeting SMART objective criteria is provided. They are a substantial improvement, and they will establish an excellent foundation for project monitoring and evaluation. The proponents have generally addressed this Condition quite well. A remaining concern is that the sole metric for physical habitat response is stream temperature. Other habitat improvement metrics, such as pool frequency/area/volume, pieces of large wood, riparian shade, and the number of

successful beaver colonies could be assessed post-treatment on an annual basis for several years to assess longer-term effectiveness of restoration actions. While spending time and effort on these assessments may be not be feasible during this funding cycle, the proponents should consider doing so in future funding cycles.

Condition 6. Integrated restoration plan

Adequate. A strategic approach for the project is provided and supported by a useful graphic showing mainstem and tributary streams and general treatment sequence and location. The new information represents a substantial improvement in the proposal and is much appreciated. As mentioned earlier, a synthesis of treatments and observed or measured restoration responses would be a useful companion for supporting the current strategy. The ISRP appreciates the proponents' descriptions of several lessons learned that have contributed to the approach and details of the current strategy.

2. Project #2001-033-00, Hangman Creek Fish & Wildlife Restoration

ISRP Recommendation

Meets Conditions

The additional organization and documentation provided is appreciated. It provides needed detail for the project. Objectives for implementation are provided for each proposed activity. An overall objective for desired outcomes of all activities (i.e., an increase in the depth of the shallow groundwater table by 2 feet by 2025 using a network of 43 wells) is provided. It remains somewhat unclear how this overall objective (measured through a network of wells) will be sensitive enough to determine the effectiveness of individual restoration activities, especially formation of beaver ponds, channel realignment, and vegetation planting. This is discussed in more detail in Conditions 1 through 4.

ISRP Comments on each Condition

Condition 1. Methods for measuring outcomes

Adequate, in part. The proponents added much needed information to the implementation and effectiveness objectives, which now meet SMART criteria. This allows a more direct association of the objectives with the proposed methods. The description of methods for evaluating effectiveness of tree/shrub planting (A-3) are adequate. Other methods still lack some needed specificity. The approach for native grass establishment (Objective A-2), particularly evaluation of noxious weed presence below 5%, need additional detail. There is a detailed discussion of drone flights, of "validation" walk-throughs, and of the timing for initiating them, but the specific protocols and measurements to evaluate the actual conditions observed are not described. A reference to an established protocol(s) for photo interpretation and on-the-ground validation of these desired conditions would suffice. Being able to determine the presence of less than 5% noxious weeds seems challenging with the current technique.

Condition 2. Desired outcomes and methods for Beaver Ponds objective.

Adequate. Effectiveness will be linked to changes in groundwater elevation and/or reductions in depletion rates using a network of shallow, ground-water wells. Annual inspection for durability and maintenance will also be made. Current literature suggests these types of activities have limited to no impacts on groundwater elevations (Nash et al. 2018, Nash et al. 2021). It can be especially challenging to associate changes in groundwater elevation with a specific action while precipitation patterns are changing and if other water uses in the catchment are not accounted for. Secondary habitat effects of BDA's (substrate sorting, slowing of stream velocities and enhancement of over bank flows) are mentioned but will not be specifically monitored. Monitoring of some of these secondary effects might be a useful tool in evaluating short-term responses from this type of restoration treatment.

Nash, C.S., J.S. Selker, G.E. Grant, S.L. Lewis, P. Noël. 2018. A physical framework for evaluating net effects of wet meadow restoration on late-summer streamflow. Ecohydrology 11:e1953. *https://doi.org/10.1002/eco.1953*

Nash, C.S., G.E. Grant, S. Charnley, J.B. Dunham, H. Gosnell, M.B. Hausner, D.S. Pilliod, and J.D. Taylor. 2021. Great expectations: Deconstructing the process pathways underlying beaver-related restoration. BioScience 71(3):249–267. *https://doi.org/10.1093/biosci/biaa165*

Condition 3. Desired outcomes and methods for channel realignment objective

Adequate. The proponents added much needed information about desired outcomes and methods for evaluation of success. Primary effectiveness monitoring will be made using shallow groundwater wells (Numbers 10-15).

Condition 4. Project and landscape-scale monitoring

Adequate. The proponents describe linkage of this project to the broader-scale landscape monitoring for habitat succession by the Upper Columbia United Tribes (UCUT). The linkage and coordination between this project and its companion project, 2001-032-00, remains a bit tenuous and not entirely clear. The description provided states that the focus areas of these two projects "overlap somewhat" but will "eventually increase the area of operation for the Fisheries Project." Given that the broad primary focus of both projects is to re-establish native fish by reducing stream temperatures and to increase floodplain groundwater storage and stream base flows, the information should be integrated into a more robust approach for determining landscape or watershed scale changes.

By the next funding cycle, the ISRP encourages these two projects to share more common ground. If the fisheries project extends its focus downstream because of an increase in distribution of redband trout, greater overlap in study areas would provide a valuable demonstration for other projects in the Columbia River Basin.