



Independent Scientific Review Panel

for the Northwest Power & Conservation Council
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Memorandum (2020-5)

April 30, 2020

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

From: Stan Gregory, ISRP Acting Chair

Subject: Follow-up Review of Freshwater Mussel Research and Restoration Project
(#2002-037-00)

Background

In response to the Northwest Power and Conservation Council's February 7, 2020 request, the ISRP reviewed the Confederated Tribes of the Umatilla Indian Reservation's (CTUIR) [response](#) to the Council's recommendations and ISRP qualifications for Project #2002-037-00, *Freshwater Mussel Research and Restoration*. Specifically, the response is intended to address the Council's conditions placed on this project as part of the Mainstem and Program Support Project Review from August 2019: "Sponsor to address ISRP qualifications and submit in a report to Council for ISRP review by January 30, 2020. See Programmatic issue for Research." The ISRP's review ([2019-2](#)) listed six qualifications to which the CTUIR responded to point-by-point. Our review below follows the same outline.

As described in the CTUIR's [2019 proposal](#):

"Since its inception in 2003, the Freshwater Mussel Project of the CTUIR has conducted research designed to understand the biology and ecology (both biotic and abiotic) of freshwater mussels...The long-term goal of this project has been to utilize project findings for development and implementation of restoration actions for freshwater mussels in the Umatilla River and other mid-Columbia basins on ceded lands. The restoration of freshwater mussels is a part of an ongoing efforts to rebuild ecosystem diversity, function, and traditional cultural opportunities in the context of First Foods."

ISRP recommendation and overall comments

The ISRP appreciates the responses by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) to qualifications from the 2018 and 2019 reviews of the project. This is an important undertaking, one having significant implications for both the region and the CTUIR. However, the responses raise significant concerns, detailed below, and **do not satisfy the ISRP's qualifications set forth in 2018 and 2019.**

The concerns stem from having most direct responses postponed, to be provided later in the final Master Plan. The CTUIR's response cover letter acknowledges this: "Some of the final responses to ISRP qualifications will be fully addressed through the CTUIR *Master Plan for Freshwater Mussel Conservation, Supplementation, Aquaculture, Restoration, and Research* which is scheduled to be completed in fall of 2020." Nevertheless, the ISRP expected the proponents to provide initial attempts to address all qualifications, even if labelled as "provisional," to demonstrate that the project and master plan development are on a scientifically sound trajectory. **Therefore, the ISRP requests an audio-visual teleconference with the proponents to discuss the responses to past qualifications and to better understand current plans and anticipated structure and content of the Master Plan.**

Uncertainties with future coronavirus control measures make scheduling meetings and deadlines difficult. Understanding the need for flexibility, the ISRP suggests an audio-visual teleconference by June 1st, a detailed outline one week later, and a mutually determined schedule for a completed Master Plan, perhaps by October 1, 2020. These steps would greatly improve the chances for a positive outcome of the eventual ISRP review of the Master Plan.

Comments on the CTUIR's responses to ISRP's six qualifications

ISRP 2019-02 COMMENT 1

Provide satisfactory responses to qualifications from the previous ISRP review (ISRP 2018-8, page 69). This includes establishing quantitative restoration objectives and specific timelines, establishing testable hypotheses, and formulating a plan to provide empirical information on factors causing population declines. Prior to the official release of the Master Plan, these objectives, hypotheses, and plans can be labeled as "provisional."

The outline for the Master Plan in Appendix A is a solid start, and the ISRP expects to receive a fully completed Plan by autumn 2020 for review. The present document did not provide a plan with necessary elements including restoration goals, quantitative objectives, testable hypotheses, research and restoration methods, approaches to data analyses, monitoring activities, timelines, modelling approaches to population and landscape effects, coordination with other tribal workers and organizations, or publication plans. Drafts of these elements should be available now if the Plan is to be completed by autumn 2020.

The CTUIR needs to develop SMART objectives for the project. Note that the objectives in Table 1 are only topics to be addressed, not SMART objectives. Guidance for goals and SMART objectives from a recent ISRP review is provided in the Appendix at the end of this memo. There are no quantitative restoration objectives, specific timelines, or testable hypotheses in the present document. A 60% draft Master Plan is promised by “summer 2020,” but with no specific deadline for a final Plan.

ISRP 2019-02 COMMENT 2

Provide an adequate description of an adaptive management (AM) process, either for the current activities or the Master Plan to be developed in 2019. The use of SMART objectives, a Gantt chart, or another decision-making process would be especially helpful in illustrating the project’s quantitative objectives, deliverables and timelines. The AM process should include explicit stages for actions and decisions and, as well, explicit schedules and decision processes for each stage.

The response simply promises SMART objectives, a Gantt chart, and a decision-making process in the Plan to be submitted in autumn 2020. The description of what will be included in the Plan is worded vaguely and reinforces the need for a meeting between ISRP representatives and the proponents. In addition to objectives, deliverables, and timelines, adaptive management requires a synthesis of results relative to the SMART objectives to aid decision making.

The ISRP does not understand the sequencing of the Synthesis phase. The project will need to synthesize results throughout the laboratory, field, and restoration phases. Perhaps the “Synthesis phase” should be referred to as the “Restoration Strategy Development Phase,” and data synthesis becomes one element of the strategy development process.

While the project has a long (17 years) history of field and laboratory investigations, the ISRP is concerned that the proponents may not be making sufficient and timely progress to effectively reintroduce or rehabilitate mussel populations in their native habitats. Most of the project’s results and publications concern taxonomy, but future results and publications guided by quantitative objectives and adaptive management need to focus on characterizing ecological restoration processes. Moreover, no reports were provided of work since the 2017 field season ([Glidewell 2018](#)), so the ISRP was not able to evaluate progress from the 2018 and 2019 field seasons. Well-crafted SMART objectives, a Gantt chart, and a decision-making process—with an effective adaptive management approach—will be essential in convincing the ISRP and others that the project can continue to meet goals and objectives in a timely manner.

Specific Comments:

1. The proponents state “Through the use of standardized protocols and metrics, the CTUIR will evaluate the risks, benefits, and successes of the proposed and ongoing freshwater mussel program and will systematically address critical scientific uncertainties.” What progress has been made on these important and essential deliverables? While many of the answers are contained in previous Annual Reports, the overall progress was not sufficiently summarized in the most recent Annual Report ([Glidewell 2018](#)). It could be informative to present a synopsis, perhaps in a table or a sidebar. A synopsis of the completed analyses of risks, benefits, and successes of the freshwater mussel program will be a critical component of the Master Plan.
2. The objectives in Table 3 are topics for objectives rather than objectives, and the hypotheses are intents rather than hypotheses.

ISRP 2019-02 COMMENT 3

It remains unclear to the ISRP if the proponents have an approach for integrating the research components. Therefore, the ISRP reiterates its suggestion that the development of population models and landscape analyses of habitat suitability would provide a context for integrating results from investigations of population trends, reintroduction success, host specificity, and artificial propagation. The ISRP requests direct responses to these suggestions. If population models and landscape analysis of habitat suitability are not appropriate or other approaches are more appropriate, the proponents should inform the ISRP and provide adequate description of their approach for integration.

The response indicates that the Plan will include a landscape analysis of habitat suitability, and the project has conducted network-scale studies in the past. It is likely that future efforts will include additional studies of mussel abundance and habitat at different locations in the stream network. Nevertheless, the proponents have not incorporated analyses of the entire landscape (i.e., analyses extending beyond the stream positions within the network) to understand factors affecting the distribution and abundance of mussels. To date, the project has not explicitly related watershed condition to instream habitat and its suitability for mussels.

Other than mentioning population modeling in the first sentence of the response, the CTUIR does not address the ISRP recommendation to incorporate population modeling in their research. The ISRP continues to believe that population modeling could improve the success of conserving existing populations and restoring populations where they have been extirpated. Modeling could potentially increase the understanding of underlying reasons for trends in abundance and success or failure at restoration sites.

Specific Comments:

1. If the project needs help to plan, design, and conduct population modeling or landscape-scale analyses of habitat suitability for mussels, the proponents should seek advice and assistance from scientists that have expertise in modeling mussel populations at landscape scales (e.g., Oregon Cooperative Fisheries Research Unit, CRITFC, Kootenai Tribe). Past linkages with Xerces and Utah State University have been highly productive. It is very likely that a population modeling effort will expose data gaps, which may require adaptive changes to fill these gaps in future data gathering efforts.
2. Based on the proponents' response, the state of knowledge about mussel habitat and species relationships remains limited. Can the proponents demonstrate an increased understanding of mussel habitat and species relationships through analyses and syntheses of existing data?
3. It may be timely and scientifically prudent to re-evaluate existing estimates of presence/absence and abundance, as well as methods employed to make the estimates, to see if they require revision or improvement. Other mussel researchers and the scientific literature could provide valuable advice and insights.

ISRP 2019-02 COMMENT 4

Provide a response to the following ISRP concern and suggestion: Much of the effort on restoring mussels to the Columbia River Basin appears to rest on developing laboratory culture methods, which to date have not been successful. Other methods such as field inoculation of host fish and translocating adult mussels are discussed as options if mussel culture proves unsuccessful. The ISRP feels that it would be prudent to develop all possible methods concurrently and to use an adaptive management framework to assess them in tandem and further develop those that are successful, while phasing out or making major modifications to those that are not.

The proponents' response indicates disagreement with the ISRP's suggestion to explore other methods, such as field inoculation of host fish and translocating adult mussels, as restoration options if mussel culture proves unsuccessful. The proponents state that culturing in the lab or hatchery are preferable to field inoculations of fish hosts or translocating mussels because these alternatives require years or decades to demonstrate positive benefits to populations. This is true for all of the possible restoration methods, including artificial culture in the lab. The ISRP would like to better understand this disagreement through discussion in a teleconference.

ISRP 2019-02 COMMENT 5

Identify specific publications, authors, intended journals, and timelines for analysis, writing, and submission of peer-reviewed publications as well as for agency reports (e.g., technical bulletins)

and other significant grey literature. Indicate how each planned publication is linked to specific objectives and work areas.

The ISRP has commended the proponents for past publications and collaborations with Xerces and others. The ISRP continues to encourage the proponents to think about future process-based publications or overview (synthesis, perspective) publications. The ISRP was pleased to see the titles and intended journals for four peer-reviewed papers that are planned over the next three years. Cumulatively, the project has considerable knowledge to share about processes that worked and those that did not, as well as insights into what might be successful pathways for mussel re-establishment (e.g., a perspectives article). We encourage the proponents to discuss and complete their plans for a larger synthesis and more ecologically focused articles.

Specific Comment:

1. Of 8 publications in refereed journals so far, 5 describe basic taxonomy, 1 involves reproductive biology, 1 addresses habitat relationships across spatial scales, and 1 considers conservation/extinction risks. Future publications should include more of their field results, landscape analyses, and outcomes of restoration actions.

ISRP 2019-02 COMMENT 6

The third goal of incorporating mussel monitoring in other monitoring efforts remains vague and weakly linked to the subsequent eight objectives. Explain how observations about mussels based on other monitoring efforts (building on their training of other programs) will be recorded, verified, incorporated into a spatially explicit database, and used in a landscape analysis of mussels (i.e., presence/absence, abundance, diversity, recolonization, extirpation, trends). As well, the proponents should devise ways to be sure that mussel and environmental monitoring are conducted in tandem.

The ISRP agrees that the proponents should be careful about using data from other projects for obtaining primary information on mussel distribution and abundance. The additional concern about the destructive nature of both restoration and monitoring for other species is warranted. Crews using electrofishing methods that sweep up and down the streams for fish monitoring are not conducive to collecting meaningful information on mussels. The ISRP recognizes that this is a difficult situation since most crews are hesitant to add additional days of sampling to the field schedules, and the resulting data may be suspect. The ISRP and the proponents should discuss which option may be more time and cost effective—collaborative field work with CTUIR staff that are collecting data for other projects or with separate dedicated Mussel Project staff. This is an issue to be explored.

Specific Questions/Comments:

1. Has the project produced documents and online training to assist biologists in the region in mussel identification? Has the CTUIR offered to collaborate with other projects to assist them in the verification of identifications and sampling designs?
2. It remains to be seen if the proponent's efforts to coordinate with other groups to gain their assistance for monitoring in other basins will provide credible information on mussel distribution and abundance. It also is yet to be demonstrated that mussel conservation can be improved as a value-added product of other habitat restoration activities.
3. The ISRP believes that the project would benefit greatly from assistance from experts experienced in designing landscape-level monitoring studies. Options might include the USGS Cooperative Fisheries and Wildlife Research Units at OSU, UI, and UW or the NOAA Fisheries Science Center in Seattle.

Recommended Reading

The ISRP does not intend to be prescriptive in offering the following references. However, if the proponents are not aware of them, these articles could be helpful in developing the Master Plan (especially McMurray and Roe 2017).

McMurray, S.E. and K.J. Roe. 2017. Perspectives on the controlled propagation, augmentation, and reintroduction of freshwater mussels (Mollusca: Bivalvia: Unionoida). *Freshwater Mollusk Biology and Conservation* 20: 1-12.

Meador, J.R. et al. 2011. An evaluation of the factors influencing freshwater mussel capture probability, survival, and temporary emigration in a large lowland river. *Journal of the North American Benthological Society* 30:507–521.

Pandolfo, T.J. et al. 2016. Species traits and catchment-scale habitat factors influence the occurrence of freshwater mussel populations and assemblages. *Freshwater Biology* 61: 1671–1684.

Shea, C.P., et al. 2011. Misidentification of freshwater mussel species (Bivalvia: Unionidae): contributing factors, management implications, and potential solutions. *Journal of the North American Benthological Society* 30:446–458.

Appendix

Guidance for Goals and Objectives from the recent Category Review of Resident Fish and Sturgeon Projects:

3. GOALS AND OBJECTIVES

Projects that meet the ISRP's review criteria have clearly defined goals and specific objectives. If the project involves research, also describe specific questions, hypotheses, and predictions (expected results) following the guidelines for research below. Proponents may consider a table format for this section.

A. **Goals** describe in qualitative terms, the ultimate desired outcomes of a project, and its aspirations for overall benefits to fish and wildlife. One such goal might be: *To reintroduce coho salmon to a subbasin and establish a natural reproducing population that can support harvest.*

B. **Objectives** describe steps needed to implement the project and describe desired outcomes. They must be **SMART**: (1) **S**pecific and clearly defined, (2) **M**easurable (quantifiable), (3) **A**chievable and testable, (4) **R**elevant and applicable to the Program with benefits to fish and wildlife, and (5) **T**ime-bound with clear milestones and end dates.

1) **Quantitative biological, physical, or social objectives** describe the expected outcomes needed to achieve the goals and provide the metrics for effectiveness monitoring. For example, a quantitative objective for the goal stated above could be to: *Achieve returns of 2,000 natural-origin adult coho annually to the subbasin by 2040.*

Methods for monitoring will be described in detail in the next section. Monitoring may be conducted as part of the proposed project or in collaboration with another project. Coordination activities need not list quantitative biological and physical objectives.

2) **Quantitative implementation objectives** describe specific steps needed to achieve the quantitative biological, physical, or social objectives, and hence, the overall goal.

For example, for the goal and quantitative biological objective above, the implementation objective could be: *To acclimate and release 500,000 hatchery-origin coho smolts annually in the subbasin through 2025.*

Research, monitoring, and evaluation: If the project includes research, monitoring, and evaluation (RM&E) components, describe the central question that clearly frames the hypotheses. In the best cases, two or more alternative hypotheses that appear plausible can be defined, but in other cases the null hypothesis of "no effect" is chosen as the alternative.

A. **Research question** – A central question that needs to be answered forms the basis for the research. An example might be: *Will removing nonnative smallmouth bass from Reservoir A increase the survival of spring Chinook salmon smolts migrating through the reservoir and increase returns of adult salmon?*

B. Alternative hypotheses – For example, owing to the complex life cycle of Chinook salmon, several alternatives are possible. Two might be:

1) Predation by smallmouth bass has strong direct effects that reduce survival of Chinook smolts so much that the effects are detected in returns of adult salmon from each brood year

2) Smallmouth bass predation effects are overwhelmed by ocean conditions and transport of smolts so that the effects of predation on adult returns are evident only in periods of suitable ocean conditions when smolts are not transported

C. Specific predictions – Once alternative hypotheses are defined, then clear predictions can be made from each, describing the expected results. A key is to design an experiment or sampling program to compare these predictions to empirical data to see which hypothesis is best supported.