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for the Northwest Power & Conservation Council  
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**Memorandum (ISRP 2007-8)**

**June 20, 2007**

**To:** Tony Grover, Fish and Wildlife Division Director, Northwest Power and Conservation Council

**From:** Eric Loudenslager, ISRP Chair

**Subject:** Review of John Day Study Plan for Project 2003-017-00, Integrated Status and Effectiveness Monitoring Program (ISEMP)

## **Introduction**

At the request of BPA and the Council, the Independent Scientific Review Panel (ISRP) reviewed the Integrated Status and Effectiveness Monitoring Program's (ISEMP) study plan for Bridge Creek (John Day River subbasin, Oregon). This John Day study plan is part of a larger research monitoring and evaluation (RME) initiative through the ISEMP project that includes similar efforts in the Wenatchee and Salmon River subbasins. In the 2003 Mainstem and Systemwide project selection process, the Council's and BPA's recommendations for funding this project included a provision that the M&E plans for different watersheds -- John Day, Wenatchee, and Upper Salmon -- be reviewed by the ISRP before implementation. The ISRP previously reviewed the Wenatchee (see ISRP 2003-6<sup>1</sup> and ISAB&ISRP 2004-1<sup>2</sup>) and Upper Salmon study plan (ISRP 2006-1<sup>3</sup>). In addition, the ISRP's recommendation on the ISEMP FY 2007-09 proposal was "Fundable (Qualified)."<sup>4</sup> The qualification was that four questions related to the proposal's technical background, integration among components, and objectives needed to be explicitly addressed. In addition to our review of the John Day study plan, this memo provides our review of the project sponsors' response to our four questions.

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<sup>1</sup> ISRP Review of Revised Mainstem Systemwide Proposals for Research, Monitoring, and Evaluation: [www.nwcouncil.org/library/isrp/isrp2003-6.pdf](http://www.nwcouncil.org/library/isrp/isrp2003-6.pdf)

<sup>2</sup> ISAB and ISRP Review of the Draft Research, Monitoring & Evaluation Plan for the NOAA-Fisheries 2000 Federal Columbia River Power System Biological Opinion: [www.nwcouncil.org/library/isab/isab2004-1.pdf](http://www.nwcouncil.org/library/isab/isab2004-1.pdf)

<sup>3</sup> ISRP Review of Salmon Subbasin Pilot Projects Monitoring and Evaluation Plan: [www.nwcouncil.org/library/isrp/isrp2006-1.htm](http://www.nwcouncil.org/library/isrp/isrp2006-1.htm)

<sup>4</sup> [www.cbfwa.org/solicitation/components/forms/Proposal.cfm?PropID=563](http://www.cbfwa.org/solicitation/components/forms/Proposal.cfm?PropID=563) or see ISRP 2006-6.

## Recommendation

**The ISRP finds that this proposal *Meets Scientific Review Criteria.***

The project sponsor provided a detailed response to the ISRP's questions that include well-reasoned explanations of how the ISEMP effort is integrated into existing John Day monitoring programs and a reasonably complete study plan for the Bridge Creek Intensively Monitored Watershed (IMW). If the project goes forward as planned, the results should be very helpful in designing restoration programs for other streams in semi-arid subbasins, particularly where land management practices have resulted in incised channels and loss of pool habitat.

## Comments on the Study Plan

While other organizations have implemented limited beaver reintroductions, this study plan proposes to bring beavers back on a scale that has not been attempted in other watersheds. The general design of the Bridge Creek study is appropriate and the use of nearby Murderer's Creek as an unenhanced control is also appropriate, even though the two watersheds are not exactly identical.

The ISRP has relatively minor suggestions. They are organized into the following categories:

### *Contingency Planning*

It will be important to minimize grazing and agricultural encroachment in riparian areas where beavers are reintroduced; the study plan does not specify how this will be accomplished with landowners, or what will be done if unanticipated grazing damage occurs. The proposal would benefit from contingency steps that would be taken in the event that the "starter dams" are damaged by unforeseen and exceptionally high flows, i.e., will they be repaired or will the starter dams be a one-time measure? The trapping and release of many beaver families into the Bridge Creek watershed is without precedent, and there may be unforeseen problems such as unplanned predation or high mortality of transplanted animals. Again, contingency planning would be prudent. It may be necessary to re-visit the habitat monitoring schedule and spatial resolution of stream transects. Regularly scheduled two-year habitat surveys may need modification if there is an unusual event such as a large flood, wildfire, or exceptional drought. Additional investigation could help to determine if one-kilometer transects are an appropriate scale for detecting channel changes after beaver population establishment.

### *Specific Objectives, Response Metrics, and Summary of Previous Studies*

The sponsors provide a thorough discussion of the problem and the rationale for the particular restoration action chosen. They propose to provide structures that would allow beaver to establish stable dams and so bring about aggradation and reconnect Bridge Creek with its floodplain. The sponsors provide a comprehensive discussion of the expected changes resulting from the restoration actions. These changes, in effect, can serve as the broad hypothesis that will be tested. They propose to implement a hierarchical experimental design that will enable

assessment of project effectiveness at the watershed, tributary, and stream reach scales. This approach seems sound as it will add scientific rigor to the assessment of project effects.

Several elements could have been addressed more completely by the sponsors:

1. The sponsors should have provided more explicit habitat and population objectives for the Bridge Creek project. While objectives were discerned from the discussion, explicitly stating what they intend to accomplish would aid in assessing the progress of the work.
2. More information on the physical and biological characteristics of the reference watershed, tributaries, and reaches could have been provided.
3. Has the proposed approach to reestablish beaver been successful elsewhere? What are some of the problems that are likely to be encountered and how will they be remedied? Have the sponsors considered possible negative effects of dams including, at least initially, elevated temperatures and colonization by non-native predator or competitor species.
4. Several of the reference sites have ongoing monitoring programs. Are the methods being used in existing programs consistent with the methods proposed in the work plan, so that meaningful comparisons can be made?
5. Are the reaches proposed for restoration in Table 11 in priority order? How was the prioritization done, given all the parameters in the table?
6. A shortcoming of the work plan is the somewhat unclear definitions of the metrics that will be used to assess project effectiveness *at the watershed and tributary scale*. It is difficult to foresee how the work will proceed without clear knowledge of what will be measured or calculated for each of the spatially hierarchical levels. It is not clear what the expected impact on the steelhead population is because varying metrics are used in the document. For example, on page 6, “the restored reaches will potentially increase steelhead rearing capacity approximately 30 fold” and also on page 6, “we estimate that 4 km of fully restored stream would roughly double the current Bridge Creek population” and on page 16 they indicated the desire to detect a 50% increase in survival as a result of habitat restoration projects. Clarification of the overall projected benefits of the project on the Bridge Creek steelhead population is needed.

### *Experimental Design*

The experimental design(s) include BACI, hierarchical, and stair-step designs, depending on the response variable of interest and the scale of comparison. This complexity will make implementation, analysis, and interpretation challenging, but perhaps unavoidable. The sponsors claim that the hierarchical design will support the testing and development of causal relationships; however, establishing causality is not possible in dynamic systems experiencing uncontrolled confounding effects. It will therefore be difficult to both forecast the projected benefits (see item 6 above) and establish true cause-effect relationships between the restoration actions and the fish response.

## **Comments on the Sponsor's Responses to the ISRP's Four FY 2007-09 Questions**

The ISRP's FY 2007-09 questions are in italics followed by our comments on the projects sponsor's response in normal font.

*The proposal is very complex. How are all of the separate parts of the proposal going to be integrated? Some questions related to the technical background of the project and its objectives need to be addressed:*

The sponsors describe the overall project objectives as evaluating tools that support the development of a region-wide Research, Monitoring and Evaluation (RME) program. The tools include:

- protocols and new technologies
- novel indicators
- sample designs
- analytical, data management and communication tools and skills
- restoration experiments

*1) What is the role of the sponsors in this project? Coordination? Data collection? Data analysis? Will the sponsors have some involvement in each objective?*

The sponsor has provided a thorough description of the ISEMP role in John Day monitoring. It is clear from the response that ISEMP plays a key role in coordination among the various state, federal, tribal, and university organizations involved in studying the John Day subbasin. Their data collection role will be somewhat limited (primarily to the Bridge Creek study), but that is appropriate considering the other monitoring programs active in the drainage. The collaborative ISEMP-CSMEP examination of alternative mark-recapture survival estimation techniques for PIT-tagged fish (Barker robust design vs. Cormack-Jolly-Seber) is worthy of support.

The proposed Intensively Monitored Watershed – Bridge Creek Restoration Study, which is a major component of ISEMP's John Day effort, does a good job of describing the scientific rationale for the restoration effectiveness work, although it does not address coordination in much detail.

Integration of ISEMP objectives is evident but could have been made more explicit by the sponsors. Objectives 3 and 4 obviously are connected. Objective 3 involves testing of different protocols and establishing statistically valid methods, and Objective 4 will use the information gained from Objective 3 to develop a sampling design. What is less explicit is how the sampling design will be used in effectiveness monitoring or experimental management designs (Objective 5). The products of Objective 6 -- development of data analysis tools -- presumably will be used

in analysis of the data generated from Objective 5. Development of databases of both current and historic data -- Objective 7 -- naturally follows from previous objectives. Objective 2 appears to relate to Objective 3 and possibly Objective 4, but the relationship is not made clear.

The sponsors described their role in the project in a clear and detailed way, which the ISRP appreciates. They have responsibility for overall project management and have succinctly described their function: "... the NWFSC's role is to provide a single focused mission for ISEMP, to lead the data management and analysis tasks, and to coordinate project activity between each of subbasins." Each of the subbasins has already initiated different monitoring programs (including some IMWs), so management and coordination could be a daunting and time consuming task, but certainly one worth pursuing.

### *2) What does monitoring at the subbasin scale mean?*

The sponsor's response to this question does not specify the hydrologic unit code that corresponds with the term "subbasin scale." It is assumed that the John Day River is considered a subbasin and Bridge Creek, a major tributary to the lower John Day, is considered a watershed; these assumptions generally match spatial conventions used throughout the Columbia Basin.

Although the ISRP's question was a little open-ended, the response was generally thoughtful: "Monitoring at the subbasin scale involves developing data and information for which the subbasin or population is the appropriate spatial scale of inference and analysis. Thus, monitoring at the subbasin scale refers to the data collection and analysis necessary to answer questions at the scale of subbasins – monitoring at this scale must be intentional since it is not generally possible to simply aggregate or parse data or information collected at scales above and below that of subbasins." And "implementing a regional RME program of monitoring at the subbasin scale requires the development and testing of hierarchical designs and accompanying data collection and management protocols that provide a cogent analysis of information to meet management needs at scales ranging from populations to MPGs [major population groups] to ESUs [evolutionary significant units]." ISEMP acknowledges that it does not have all the answers to monitoring at the subbasin scale, but they are working toward designing monitoring programs around hierarchically defined geomorphic domains that are relevant to metapopulation structure. In general, however, the sponsors characterize monitoring at the subbasin-scale as monitoring that requires the development and testing of designs, data collection and management protocols that provide for an analysis of information to meet management needs at scales ranging from populations to major population groups to ESUs. They provide enough details to indicate that challenges to monitoring at multiple scales have been considered and are being addressed.

### *3) What are some examples of metrics that represent subbasin-scale performance?*

Sponsor's response to this question was fairly general without providing many specifics. They do mention categories of habitat parameters (water quality/quantity, measures of [physical] habitat quality) as well as population parameters; however, in fairness to the sponsors, clearly demonstrated metrics of subbasin performance have yet to be established. One metric that is

believed to be an important performance indicator is the number of smolts per female. This response measure was also strongly endorsed in the ISAB's tributary habitat report (ISAB 2003-2<sup>5</sup>). The Bridge Creek study plan goes into more detail, although it is a watershed-scale, not subbasin-scale, study. The Bridge Creek plan describes some population and habitat metrics appropriate to the restoration work undertaken at that scale.

Nevertheless, the sponsors provide few actual examples of subbasin-scale response metrics. It does not appear from their response to this question that a comprehensive set of subbasin metrics has yet been identified. For example, water quality measured at the base of a catchment may only reflect local site conditions and not necessarily catchment-wide impacts. Water temperature is a good example. Temperatures are often elevated in the lower reaches of rivers but temperature and other water quality metrics may be within tolerable ranges in upper reaches of the basin. Measuring temperature at the base of the catchment may be meaningful locally but may not accurately reflect spatially variable temperature patterns throughout the basin. Also, subbasin-scale metrics should account not only for spatial but also temporal variation in metrics, and should take into account watershed-scale processes. Much work needs to be done to develop an adequate subbasin-scale monitoring program, and the ISRP appreciates ISEMP's efforts to evaluate potential response measures.

*4) How will the information generated by the projects be integrated and analyzed to accomplish overall project objectives such as determining limiting factors and evaluation of basinwide project effectiveness?*

The sponsors have been studying the effects of temporal variability at the subbasin and watershed scales on limiting factor assessments and restoration effectiveness determinations. They appear to have put considerable effort into selection of appropriate analytical methods. The work is still in progress, and it is unclear how the methods described in the response will be applied at different spatial scales, but the sponsors may not have addressed this question as yet. Their answer to this question emphasizes two areas of investigation: novel statistical approaches and refinement of habitat performance models. When combined with the results of ISEMP's projects in the Wenatchee and Salmon river subbasins, the John Day monitoring studies should provide important tools for analyzing habitat restoration effectiveness elsewhere in the Columbia River Basin. The ISRP strongly endorses this work.

The Bridge Creek restoration work plan differs in specifics from the IMW efforts undertaken by ISEMP in other subbasins (e.g., where the restoration emphasis is on water conservation). Here the primary restoration technique is natural habitat recovery mediated by beaver reintroduction and "starter" beaver dams in an incised portion of the stream channel. Overall, the study plan is well written and complete, and the study design is appropriately set up for a system of this size. The ISRP supports the Bridge Creek study. The approach is not entirely novel, but it is applied at a scale unprecedented in the mid-Columbia (Columbia Plateau) and the breadth of the response metrics should yield important insights into what variables will or won't be useful for assessing restoration effectiveness elsewhere.

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<sup>5</sup> [www.nwcouncil.org/library/isab/isab2003-2.htm](http://www.nwcouncil.org/library/isab/isab2003-2.htm)

The sponsors mention several potential methods of analysis that are promising for identifying possible limiting factors and evaluating project effectiveness. It should be noted, however, that these analytic methods applied to observational studies, or even experiments applied in uncontrolled environments, cannot establish causality. Rather, they can identify empirical links of interest that may be useful for making management decisions. Furthermore, analytical methods cannot determine accuracy, which requires knowing the true value of the parameter of interest. Analytic methods can be compared theoretically and with simulation studies to compare the magnitude of bias (accuracy), but this does not mean that accuracy can be established in a particular application to data.

Finally, the ISRP understands that for the FY 2007-09 proposal, the project budget varies between what the project sponsor requested, the Council recommended, and BPA committed to funding. The ISRP's review does not delve into funding issues and their potential impact on the proposal quality; rather, we reviewed the proposal and response provided at face value. As with all reviews, Council or BPA decisions to fund or not fund particular objectives and work elements could affect the project's scientific soundness.

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