

Good afternoon Tony:

Thank you for the opportunity to review and comment on the ISAB/ISRP report *Critical Uncertainties for the Columbia River Basin Fish and Wildlife Program* (ISAB/ISRP 2016-1). We appreciate the thought and effort that has gone into its development. At a high level, the critical uncertainties and advice for moving forward seem good and reasonable, though certainly difficult to achieve. The impending challenge is to identify the appropriate mix of priority work and provide the additional funding needed to accomplish it. We offer the following comments and suggestions in large part to guide next steps in developing a research plan for the Northwest Power and Conservation Council's (Council) Fish and Wildlife Program (Program).

We agree with the ISAB/ISRP that spill management, as a prominent critical uncertainty worthy of additional attention, must be considered when framing life-cycle benefits: "*What are the effects of spill operations on returning adults that subsequently affect adult fish migration behavior, straying, pre-spawning mortality, and smolt-to-adult return ratios (SARs)?*" (p. 26). Including this in the "*Hydrosystem flow and passage operations*" theme reflects the importance that understanding and addressing direct and indirect hydrosystem effects has on life-cycle survival and behavior.

We advise that the report has omitted an emerging critical uncertainty regarding adult passage for steelhead. Recent research and monitoring data suggests that tributary overshoot by Middle Columbia, Upper Columbia, and Lower Snake wild adult steelhead is a potentially significant limiting factor to population viability. Recent analyses indicate that this overshoot behavior, while variable, is common, widespread, and sometimes a substantial component of migratory behavior. The effects arising from this phenomenon are critically important as several populations are losing significant portions of their returning natural-origin adults in the mainstem Columbia River upstream of their natal tributaries. Research is needed to assess the patterns and magnitude of this phenomenon, as well as potential operational and passage changes to reduce the associated losses.

These two critical uncertainties regarding hydrosystem flow and passage operations (spill management and steelhead overshoots) should be top priorities identified in the next research plan and addressed by the Program.

We endorse additional research to assess the value of off-site mitigation actions to restore tributary habitat. The tributary habitat uncertainties identified in the report are consistent with high/highest priority critical uncertainties and RM&E objectives in the Mid-Columbia and Draft Snake River Recovery Plans. These plans also identify the need for establishing integrated, multi-disciplinary science teams as part of the recovery implementation framework to advance RM&E (which is consistent with the "establishing infrastructure needed to address uncertainties" recommendations on page 17 of the ISAB/ISRP report). Relevant to the Mid-Columbia, it is important to note that the majority of the high/highest priority RM&E viability and threats criteria related objectives (including tributary habitat status/trends and restoration effectiveness monitoring) has only been partially implemented due to funding limitations. We urge the Council to implement these ISAB/ISRP recommendations.

We appreciate the ISAB/ISRP acknowledgement of many uncertainties related to hydrosystem effects on white sturgeon. This is consistent with the Council's recognition of white sturgeon restoration as an emerging priority. It also reflects the relatively low funding investment in this species – a species that has been characterized as iconic, that is highly dependent on mainstem habitats, and that has been severely impacted by habitat changes attributable to the development and operation of the hydrosystem. "*In cases where substantial information on a particular theme has already been amassed, the value of new information might be lower than for other themes (e.g., sturgeon) where little is currently known*" (p.144). There is much to learn about environmental factors (in addition to flow) that

influence recruitment (e.g., turbidity) or carrying capacity (e.g., food webs) in the reservoirs. Passage, especially upstream passage, is key to restoring a meta-population structure that is not unidirectional (i.e., downstream only) and to provide the habitat diversity needed to support all life stages. Restoration efforts would be better informed by further study of sturgeon movements and interactions with passage structures at the hydrosystem projects.

To date, both the Council and Bonneville Power Administration have refrained from making additional investments in understanding the effects of the hydrosystem on habitats, predator population dynamics, and viability of fish and wildlife populations in the Lower Columbia River. We agree that *“progress has been made, but there is a continuing need for information about the impacts of hydrosystem flow and passage operations on all focal species (e.g., salmonids, white sturgeon, Pacific lamprey, and eulachon)”* (p. 4). Many of the critical uncertainties identified will require increased investment in research downstream from Bonneville Dam. A few examples include:

- *How do hydrosystem operations affect fish survival (including salmonids, eulachon, sturgeon, lamprey, and other focal species)?*
- *What are the responses of focal species (anadromous salmonids, white sturgeon, Pacific lamprey, and eulachon), life history types, and populations to alternative restoration actions and locations in the estuary, mainstem, and tributaries that will best inform management decisions?*
- *How effectively can undesirable impacts of predation be ameliorated by management actions including hydrosystem operations, habitat modifications and predator population control?*
- *What proportion of adult salmon and white sturgeon are killed by sea lions (and other marine mammals) during their upstream migration below Bonneville Dam?*
- *To what extent is the viability or abundance of native fish and wildlife populations in the Columbia River Basin jeopardized by predation?*

With respect to information management, the value of research is in the data and their evaluation, yet the systems to organize/analyze/share are still not adequate. Progress is being made through Coordinated Assessments and StreamNet projects; and the Council should continue **and** increase support for developing infrastructure among fish and wildlife manager partners. Data sharing is dependent on strong information management programs and we should continue work to reduce reliance on desktop computing.

Synthesis is mentioned several times in the report but this should be elevated to a standalone item in the upcoming research plan. To fully understand systemwide benefits/impacts and Program effectiveness, the ISAB/ISRP report's themes will need to be combined as life-cycle effects in a framework that anticipates future environmental and climatic changes. Addressing threats as isolated themes will only get us so far. To fully understand the system and look into the future we need a holistic approach that uses all the available information to provide a best assessment of how the system is operating.

The Council should collaborate with existing processes and forums that involve state, federal and tribal fisheries managers and action agencies to establish integrated, multi-disciplinary science teams and synthesize the effectiveness of Program actions, based on research findings, in achieving life-cycle benefits. This is consistent with the report's recommendation to establish *“the necessary infrastructure to adequately address critical uncertainties (CUs) at the level of spatial, temporal, and analytical complexity commensurate with the uncertainty”* (p. 17).

A robust research plan is needed to guide future budget allocations and funding decisions necessary to assess threats, contingent actions to address threats, and to mitigate for hydrosystem impacts.

Collaboration among the Council, the action agencies, and the region's fish and wildlife managers is essential to developing an effective and regionally endorsed research plan. The Council should commit to an adaptive approach that employs a transparent and structured decision analysis framework to prioritize the RM&E that will better inform the decisions we face to minimize and mitigate for fish and wildlife impacts and losses attributable to hydrosystem development and operation. Appendix A presents examples of adaptive management approaches that are a good foundation to build upon. We agree that *"a decision about which kind of information to collect should depend on both the cost of collecting the information and the value (for making a specific management decision) of the information once collected"* (p. 143). While we appreciate the ISAB/ISRP's thematic organization, it may be appropriate to further lump the themes into categories that reflect the areas of Program responsibility as well as the direct or indirect nature of effects related to the hydrosystem versus mitigation actions. We suggest three categories framed by these questions:

1. What is the effectiveness of current and proposed FCRPS operations to improve life-stage and life-cycle survival?
2. What is the effectiveness of mitigation actions addressing tributary habitat restoration, hatcheries, harvest, and predation?
3. How are other threats such as toxics and invasive species likely to influence the effectiveness of Program measures intended to protect, restore and mitigate fish and wildlife resources? To what degree does the construction and operation of the FCRPS aggravate potential impacts from these threats?

Thank you again for the opportunity to review and comment on the ISAB/ISRP Critical Uncertainties report. We look forward to working with the Council and all of its regional partners in developing a research plan and identifying an appropriate set of criteria and priorities for continued and new research that will help restore a healthy and productive ecosystem.

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