Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (2018-2) January 18, 2018

To: James Yost, Chair, Northwest Power and Conservation Council

From: Steve Schroder, ISRP Chair

Subject: Review of 2017 Lamprey Synthesis Report

Background

In response to the Northwest Power and Conservation Council's November 21, 2017 request, the ISRP reviewed the report *Synthesis of Threats, Critical Uncertainties, and Limiting Factors in Relation to Past, Present and Future Priority Restoration Actions for Pacific Lamprey in the Columbia River Basin, November 15, 2017* (hereafter Lamprey Synthesis) prepared by the Columbia River Inter-Tribal Fish Commission (CRITFC), Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Indian Reservation, and Confederated Tribes and Bands of the Yakama Reservation. The ISRP also considered a report with supporting information from the Confederated Tribes of the Warm Springs Indian Reservation.

A detailed description of the review process leading up to this 2017 Lamprey Synthesis and ISRP review is provided in the Lamprey Synthesis document. Basically, the Lamprey Synthesis was developed to address the Council's June 2011 recommendation (programmatic issue #8) and the ISRP's 2010 recommendation (ISRP 2010-44A) from the Research, Monitoring and Evaluation and Artificial Production Category Project Review. The recommendations were for the proponents of Program-funded lamprey projects to develop a synthesis report summarizing the results of their work and how those results might inform future restoration actions and research. An initial attempt was made to provide this summary through a 2012 report titled *Synopsis of Lamprey-Related Projects Funded through the Columbia River Basin Fish and Wildlife Program.* In 2012, the ISAB reviewed that document and found that, although it demonstrated the extent of new information being acquired about Pacific lamprey in the Columbia River Basin, it did not compile and evaluate new findings on lamprey and factors limiting their recovery into a form that adequately addressed the Council's questions (ISAB 2012-3). The ISAB recommended that the document be revised to more completely address the Council's questions and previous ISRP concerns (see pages 2-4 of the Lamprey Synthesis).

Chapter 5 of the Lamprey Synthesis addresses the specific questions from previous ISRP and ISAB reviews, and the ISRP review comments below are organized by those original questions and the subsequent responses. It is important to note that many of the issues raised in the Council's 2011 programmatic recommendation have been addressed through the regional and West Coast-wide Pacific Lamprey Conservation Initiative, which was recently reviewed by the ISRP (2017-13).

ISRP Comments

Overall comments on the report

The Lamprey Synthesis provides a comprehensive account of current knowledge about the Pacific lamprey and its conservation status in the Columbia River Basin. It concisely documents the history and scope of partnerships, collaborative research, management, and restoration efforts. The Lamprey Synthesis also provides substantial guidance toward identification of critical uncertainties, limiting factors, and priority management actions that should inform future research and restoration efforts within the Fish and Wildlife Program. Questions previously posed by the Council, ISAB, and ISRP were largely addressed to our satisfaction.

One fundamental question that warrants further attention is: do Pacific lamprey exist as partially reproductively isolated, locally adapted populations within the Columbia River Basin? The Lamprey Synthesis does not provide much discussion of genetic evidence from recent studies and does not consider the implications of this uncertainty for restoration strategies. It states (p. 9): "*Although more work is needed to better understand lamprey genetics, Pacific Lamprey appear to exhibit low genetic differentiation among regional stocks, and population structure reflects a single broadly distributed population across much of the Pacific Northwest.*" This statement is potentially misleading. The low level of differentiation observed in ***neutral gene*** frequencies does indicate greater historical gene flow among regions in Pacific lamprey than in Pacific salmon, presumably reflecting weaker philopatry, but it does not preclude genetic differentiation in ***adaptive gene*** frequencies or selection for local adaptations at the watershed scale. Divergent natural selection among groups of lamprey spawning in different watersheds would not be surprising given that Pacific lamprey spend 5 to 9 years (over half the total life cycle) as relatively sedentary ammocoetes in sediments accessed shortly after hatching and which likely vary among watersheds (i.e., spawning locations). More direct measurement of straying rates (perhaps through tagging studies) and modeling is needed to determine whether observed straying rates would prevent local adaptation at plausible rates of natural selection. A better understanding of the spatial scale of local adaptation within the basin is needed to guide precautionary strategies for supplementation.

Another general concern involves Section 6.2 (Remaining Restoration, Research and Monitoring Needs). It is difficult to identify or evaluate specific evidence or analyses that the authors have used to develop the conclusions presented in Section 6.2. For example, supplementation for restoration is identified as a priority (in Section 6.2.2, Range-wide Themes, and also on page 100), but this prioritization warrants further discussion and justification in relation to habitat restoration.

Comments on responses to past ISRP and ISAB questions

Question 4.1. – What are the general conclusions of the studies to date? Are lamprey recovering in the Basin?

- *Passage*
- *Dewatering and stream flow management*
- *Stream and floodplain degradation*
- *Lack of awareness*

- *Oceanic life*
- *Contaminants*

The response to Question 4.1 is satisfactory. It includes an excellent summary and maps of conservation status by 4th level Field HUC. Although counts of adult returns, densities of larval Pacific Lamprey, and estimates of juvenile outmigration have increased in recent years, abundances and distribution are still far below historical levels. The NatureServe ranks listed in the Lamprey Synthesis range from Imperiled to Extinct.

Question 4.2. – What have emerged as primary limiting factors for lamprey basinwide?

The lengthy response to Question 4.2 reflects a commendable effort to capture and summarize information on potential limiting factors for each watershed, largely based on information reported by Luzier et al. (2011). Given limitations of current knowledge, the rankings of limiting factors are often based on expert judgment and must be treated as speculative. Although the Lamprey Synthesis states (p. 69) that "no single threat can be pinpointed as the 'primary limiting factor' in the observed decline," the exercise has helped to identify the most probable threats as mainstem and tributary passage, dewatering and stream flow management, and stream and floodplain degradation. Numerous tagging studies demonstrate that passage remains a major limiting factor for adult lamprey at many dams. Indeed, it seems that the cumulative effects of passage on adult escapement might explain much of the historical decline in abundance. Perhaps enough passage data have been gathered to begin to quantify these cumulative impacts through life-cycle modeling.

Very little is known about the possible importance of limiting factors in the ocean. Although this knowledge gap is mentioned in Section 6.1.3, it is surprising that a greater emphasis on the oceanic life phase was not triggered by the finding that returns of adult Pacific lamprey at Bonneville Dam are correlated with abundances of marine host fishes (Murauskas et al. 2013, cited in the Section 2.1). Both oceanic life and contaminants are discussed as limiting factors, but the Lamprey Synthesis does not identify which aspects of oceanic life (e.g., availability of fish hosts) or which contaminants (e.g., pheromone disruptors) should be prioritized for further research.

Question 4.3. – What are the major impediments to implementation of recovery plans?

The response to Question 4.3 explains that lack of awareness is no longer the major impediment to recovery planning because of steady progress on public outreach and coast-wide planning. The authors conclude that the primary impediment to recovery is now a lack of funding to implement a prioritized list of project proposals. Although these conclusions seem reasonable, they are not well justified by analysis or evidence presented in the Lamprey Synthesis.

Question 4.4. – Is the draft lamprey master plan for Tribal Pacific Lamprey Restoration that will guide recovery efforts completed? (Project #2008-524-00)

The response to Question 4.4 states that the master plan was completed by CRITFC in 2011 and provides a list of objectives stated in the master plan. However, the Lamprey Synthesis does not indicate whether and how the master plan has been used to guide management and research activities since its completion.

Question 4.5. – Are study designs and sampling methods coordinated among projects?

The response to Question 4.5 provides a summary of collaborative efforts to coordinate planning and implementation of studies. Examples of subgroups working on passage metrics, tagging, and genetics are presented as evidence that steady progress is being achieved. However, it is hard to judge the extent of progress without more detail about the achievements (which would likely be beyond the scope of the Lamprey Synthesis).

Question 4.6. – What are the escapement goals for lamprey, recognizing that development of these metrics is difficult because of lack of historical information?

The response to Question 4.6 indicates that the overall escapement goal for the basin (in CRTIFC 2011) is based on historical values seen at Bonneville Dam. Escapement goals for individual watersheds (as for salmon) are not yet considered feasible for Pacific lamprey given current uncertainties about population structure, productivity, and how sustainability should be defined for lamprey. However, the response acknowledges that escapement goals could become important as a management tool in the longer term.

Question 4.7. – What is the status of lamprey in various subbasins and can a comparison of their status inform an analysis of limiting factors?

The Lamprey Synthesis provides summaries of NatureServe conservation status as well as rankings of limiting factors for most watersheds (specifically 4th level Field HUC). The response to Question 4.7 does not specifically address whether a comparison of status among watersheds might help diagnose limiting factors. However, it seems that the biological data available from individual subbasins are inadequate (i.e., not sufficiently comparable and contrasting) to draw inferences about limiting factors.

Question 4.8. – Comparative data on the non-anadromous brook lamprey might help determine if limiting factors in the ocean are important for the Pacific Lamprey.

The response to Question 4.8 points out inferences about specific limiting factors based on a comparison of anadromous Pacific lamprey and resident western brook lamprey populations would be questionable. The difficulty occurs because the factors affecting ocean and mainstem passage would be conflated for most Pacific lamprey runs. On the other hand, the authors indicate that occupancy data for resident lamprey can be (and are being) used to evaluate potential rearing habitat for anadromous lamprey, especially in areas upstream of blocked or difficult passage.