



Independent Scientific Advisory Board

for the Northwest Power and Conservation Council,
Columbia River Basin Indian Tribes,
and NOAA Fisheries
851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204

MEMORANDUM (ISAB 2012-3)

May 11, 2012

To: ISAB Administrative Oversight Panel
Joan Dukes, Chair, Northwest Power and Conservation Council
Paul Lumley, Executive Director, Columbia River Inter-Tribal Fish Commission
John Stein, Science Director, NOAA-Fisheries Northwest Fisheries Science Center

From: Rich Alldredge, ISAB Chair

Subject: Review of “Synopsis of Lamprey-Related Projects Funded through the Columbia River Basin Fish and Wildlife Program”

Background

In the Final Review of 2010 Proposals for the Research, Monitoring, and Evaluation and Artificial Production Category ([ISRP 2010-44A](#)), the ISRP recommended that the sponsors of Program-funded Lamprey projects provide a synthesis of results of their work over the past decade. The Council concurred with this recommendation and requested a synthesis report. In response to this recommendation, the Columbia River Basin Lamprey Technical Working Group and the Columbia Basin Fish and Wildlife Authority completed a report titled: *Synopsis of Lamprey-Related Projects Funded through the Columbia River Basin Fish and Wildlife Program*.

Specifically, the Council called for the development of this synthesis report on the lamprey efforts under the program (see Table 1 below) to address the issues and questions raised by the ISRP in its December 2010 programmatic comments. The Council recognized the progress being made through these projects at learning more about the little-known Pacific lamprey (*Entosphenus tridentatus*), a key anadromous species from a tribal cultural point of view and also possibly an important species for bringing marine-derived nutrients to tributary ecosystems. However, the Council expressed concern about the lack of an overall synthesis of results from all the lamprey restoration projects in the Basin implemented over the past decade. The Council recommended that a summary of results should be completed to guide future lamprey restoration efforts.

Table 1. Projects listed in the Synopsis of Lamprey-Related Projects Funded through the Columbia River Basin Fish and Wildlife Program

Number	Title	Proponent	Purpose and Emphasis
1994-026-00	Pacific Lamprey Research and Restoration Project	NOAA, Umatilla Confederated Tribes (CTUIR)	Programmatic RM and E
2002-016-00	Evaluate the Status of Pacific Lamprey in the Lower Deschutes River	Confederated Tribes of Warm Springs	Programmatic RM and E
2007-007-00	Determine Status and Limiting Factors of Pacific Lamprey in Fifteenmile Creek and Hood River subbasins, Oregon	Confederated Tribes of Warm Springs	Programmatic RM and E
2008-308-00	Willamette Falls Lamprey Escapement Estimate	Confederated Tribes of Warm Springs	Programmatic RM and E
2008-470-00	Yakama Nation Ceded Lands Lamprey Evaluation and Restoration	Yakama Confederated Tribes	Programmatic RM and E
2008-524-00	Implement Tribal Pacific Lamprey Restoration Plan	CRITFC	Hydrosystem RM and E

The Council requested that the synthesis summarize results and develop conclusions on the data gathered to date about the status and trends of lamprey populations, limiting factors, and critical uncertainties and risks. The report should also prioritize actions based on these conclusions. Critical questions to analyze include the value of tributary habitat projects in helping to improve lamprey returns, whether mainstem dam passage is the key limiting factor, and the relative role of other factors such as ocean conditions and toxic contaminants.

Based on these recommendations, the staff requested that the Independent Scientific Advisory Board (ISAB) review the synthesis report and consider the following questions:

1. Does the synopsis clearly summarize the known status and trends of lamprey populations, limiting factors, and critical uncertainties and risks?
 - The value of tributary habitat projects in helping improve returns
 - The importance of mainstem dam passage
 - The relative role of ocean conditions and toxic contaminants
2. Does the synopsis speak to priorities for future actions, or a path to prioritize actions?
3. Is the information well synthesized and described?

ISAB Review Summary

The sponsors of Program-funded lamprey projects provided a synopsis that is useful in demonstrating the type and extent of new information being acquired about Pacific lamprey in the Columbia River Basin. However, the synopsis does not compile new findings on lamprey into a form that adequately addresses the Council’s questions. A synthesis of the current state of understanding of factors limiting lamprey recovery was not developed. Given the

rudimentary state of knowledge of Pacific lamprey, emphasis is needed on identifying critical uncertainties and risks in an analytical way.

The synopsis succinctly states that “The major impediments to implementation of restoration plans for lamprey are lack of both funding and legal requirements to perform restoration actions.” These limitations may be real, but justification for either increased recovery funding or for legal requirements mandating recovery should be presented in this synopsis.

The ISAB recommends that the synopsis be revised to include the information identified in our specific comments below.

Specific Comments on the Lamprey Synthesis Report

1. *Does the synopsis clearly summarize the known status and trends of lamprey populations, limiting factors, and critical uncertainties and risks?*

- ***The value of tributary habitat projects in helping improve returns***
- ***The importance of mainstem dam passage***
- ***The relative role of ocean conditions and toxic contaminants***

The project summaries are useful in demonstrating the type and extent of new information that is being acquired about Pacific lamprey in the Columbia River Basin. Nevertheless, perhaps because the projects summarized in this report are too new or limited in scope, the synopsis does not compile and synthesize project findings into a form that adequately addresses the Council’s questions. It would have been helpful to collate and contrast results from the various projects by including:

- (1) tabular summaries by topic, for example use of tributary habitat, escapements, ammocoete densities, mainstem passage, migration times, straying, translocation, and artificial propagation
- (2) a figure showing project locations, their coverage with respect to the overall historical range of lamprey in the Basin, and the conservation status for the areas assessed by Luzier et al. (2011).

In the summary of limiting factors and uncertainties, the authors have repeated the comprehensive list from Luzier et al. (2011) of known or suspected factors affecting Pacific lamprey throughout the species’ range, with no attempt to prioritize these factors and uncertainties for the Columbia River or to link the issues to the projects in question. Consequently, the ISAB is not able to assess how well these projects help to identify limiting factors and resolve uncertainties.

The synopsis states that investigators are primarily attempting to document lamprey status and basic life history patterns in tributaries. A number of restoration activities are also being implemented. The synopsis briefly mentions the Tribal restoration plan and the USFWS assessment (Luzier et al., 2011), but details of these plans were not described.

Mainstem and tributary passage: The importance of mainstem passage is briefly discussed, along with other factors that limit lamprey production in the Basin. The relative importance of factors limiting lamprey production is not discussed in detail; the report cites Luzier et al. (2011), who provide a ranking of threats to lamprey for subbasins based on expert opinion. Some effort has been made to improve mainstem passage, but the report explains that costs to improve adult passage and reduce impingement of juveniles during downstream migration are significant. Further funding is needed for works to improve lamprey migrations. The synopsis reports that lamprey specific passage structures have been constructed at multiple dams beginning in 2009, but data are not provided to indicate whether these structures benefit migrating lamprey.

Ocean conditions. The ocean life-history phase of Pacific lamprey, typically 1-3 years in duration, is a parasitic feeding and growth phase. This phase is critical to reproduction and survival of the species, as well as to transportation of marine-derived nutrients and/or toxic marine contaminants to freshwater spawning and rearing habitats. The authors of the synopsis acknowledge that direct research on this life-history phase is needed, but largely dismiss this issue because of perceived difficulties in sampling and lack of tagging technologies. These difficulties may be overstated as surface seining or trawling in the ocean are both relatively well known and effective techniques for sampling lamprey at sea. Also there are tagging technologies, such as acoustic tags, currently being used to track juvenile salmon that would likely be effective for tracking the coastal marine life-history phase of Pacific lamprey. Available information on these and other aspects of the potential for marine research and the relative importance of ocean conditions as a key limiting factor are not well developed in this synopsis. The available scientific literature is not thoroughly reviewed.

The authors need to clearly state whether they consider ocean conditions to be a key limiting factor, and if so whether research on the effects of ocean conditions is a priority for future actions. At a minimum the authors should suggest a path for more thorough evaluation of this issue. For example, the authors might initiate collaborative discussions with ongoing BPA-funded projects on the effects of ocean conditions on salmon in the Columbia River estuary, plume, and coastal ocean. There are many important issues that might be jointly addressed regarding trophic and other ecological interactions or linkages between Columbia River salmon and Pacific lamprey such as which fish species are key hosts for lamprey in the ocean and to what extent has the abundance of host populations changed over time in relation to lamprey. A low-cost approach might be to use existing data on ocean conditions collected by other projects. For example, ocean salmon projects are currently using data on ocean conditions to develop tools for forecasting salmon returns to the Columbia River. Perhaps these data and tools could also be used to evaluate the effects of ocean conditions on Pacific lamprey to the Columbia River.

Toxic contaminants: Lamprey are likely very susceptible to toxic contaminant effects because they live in the substrate and also have fatty tissue which can accumulate pollutants. Project 2008-524-00 includes an evaluation of contaminant and water quality issues. This project,

which includes both legacy and emerging contaminants in juvenile and adult Pacific lamprey in the Columbia Basin, is listed as ongoing with no findings reported.

The use of modern pesticides, including herbicides, in the Columbia Basin is presented with maps showing use patterns and specific chemicals used in agriculture in the ISAB Food Web report ([ISAB 2011-1](#)). It should be noted that residues of legacy contaminants, that is, those now banned such as DDT, heptachlor, dieldrin, and PCBs, have declined quite dramatically over the last several decades, although some adult lamprey from the Willamette River indicate concentrations above acceptable risk for human consumption. Legacy contaminants require monitoring into the future, but this should not be at the expense of emerging contaminants. Besides modern pesticides, numerous studies have reported a variety of manufactured and natural organic compounds such as pharmaceuticals, steroids, surfactants, flame retardants, fragrances and plasticizers detected, especially in waters in the vicinity of municipal wastewater discharges and livestock agricultural facilities. Use patterns and exposure routes need to be assessed when designing lamprey contaminant studies in the Columbia Basin. A comparative approach among locations is required. A good example of a comparative study is the mercury residue data from California mentioned in the synopsis. A recent list of the top 40 priorities for science to inform U.S. conservation and management policy included as priority No. 11, “What are the aggregate effects on ecosystems of current-use and emerging toxicants?” (Fleishman et al. 2011).

2. Does the synopsis speak to priorities for future actions, or a path to prioritize actions?

The ISAB finds the synopses of individual projects are a compilation of activities designed to address a range of possible, but typically not well documented, negative impacts. There did not seem to be strong prioritization even within projects. The individual project synopses are focused on objectives, and in some cases mostly preliminary results, and lacked syntheses. This shortfall is one reason the ISRP requested the synthesis.

What is still badly needed is a true synthesis of existing information, emphasizing what is known and, more importantly, key information gaps and the best approaches for addressing those gaps. A conceptual framework for understanding, classifying, and prioritizing the lamprey research to date is needed. The descriptions provided are essentially brief summaries of what was done, rather than what was learned and identification of data gaps. For that reason, the document has little utility in directing and focusing research efforts.

The status of the tribally focused action plans (*Tribal Pacific Lamprey Restoration*) and various impediments to implementation of these plans are discussed in response to questions 3 - 6. These sections offer reassurance that planning and coordination of both research and conservation actions are improving in the Basin, and identify slow progress in modifying structures to improve dam passage as a potential impediment to recovery efforts.

A recent assessment report characterized risks to Columbia River lamprey populations using a modified NatureServe ranking approach (Luzier et al., 2011). It would be helpful to have a complete description of the results of this assessment and its conclusions relative to the separate initiatives described in the synthesis. Presumably this analysis resulted in a ranking of priorities for future work. If so, the assessment report is apparently the only document which could be used to chart a path for future lamprey work because the present synopsis document does not.

Given that returning adult lamprey often do not migrate back to their natal river, as do salmon, lamprey passage at mainstem dams should be more thoroughly documented and reported than current efforts as a means to evaluate overall lamprey status. Consistent monitoring in key tributaries is also needed. It is not clear from the synopsis if there is a comprehensive strategy in the Columbia Basin to document lamprey status.

3. Is the information well synthesized and described?

The ISAB concludes that the material is not well synthesized and described. The issue seems to begin with a difference between what was requested by the Council and the ISRP and what was provided by the Work Group. The Work Group provided an abbreviated summary of what has been done rather than a synthesis. A synthesis takes available information, often disparate or fragmented, and integrates it in a scientifically creative way into a coherent scientific analysis, including emergent hypotheses and priority research questions. A synthesis fully utilizes and even preferably extends the data into a meaningful and useful document providing direction. It often requires creative quantitative or quasi-quantitative analysis, especially when prioritization is needed. A good synthesis extends our knowledge. Unfortunately, the last half of the document, i.e., a response to ISRP questions, is not a well-rounded synthesis. It does not facilitate prioritization. There was no methodology defined in the manuscript for prioritizing actions. The Council letter indicated that *“the Council believed that a summary of results should be completed to guide future lamprey restoration efforts.”* This document is not sufficiently rigorous to be a guiding document.

4. Does the synthesis adequately answer the specific questions asked by the ISRP?

The synopsis provides brief answers to each question posed by the ISRP. The answers are not comprehensive but rather they provide a basic summary of information, along with citations that include some details. The responses to questions are not provided in enough depth to be adequate.

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

The data do not show that lamprey are recovering in the Basin.

Question 4.2 *What have emerged as primary limiting factors for lamprey basinwide? The ISRP noted that lamprey are declining coast wide, suggesting that ocean factors may be affecting survival, but no studies are being conducted in the marine environment. Lampreys are also likely very susceptible to toxic contaminant effects but very limited work is being done on this issue. Most proponents are focusing on key limiting factors in tributary habitat, but the ISRP, as well as ISAB (2009-3) has pointed out this approach is too restrictive for anadromous lamprey. A comparison of lamprey stocks in various rivers might be useful, including those outside the Columbia River.*

The listing and narrative on ten possible limiting factors on page 10 is informative, but no ranking of them is given. A more synthetic and analytical strategy to review the existing information would have been more appropriate.

Most of the project summaries do not describe findings regarding key limiting factors. For example, Project 2007-007-00 states that a goal is to identify factors that may limit lamprey production in Fifteenmile Creek, but no information is provided. Likewise, Project 2008-470-00 states that an objective is to identify all known and potential limiting factors in a variety of subbasins, but no information is provided in the project description. Given the limited descriptions provided in most of the project descriptions, it is difficult to determine whether goals and objectives of the project are met. The synopsis briefly notes that investigators are primarily attempting to document lamprey status and basic life history patterns in tributaries rather than implementing restoration activities (p. 10) based on limiting factors. The synopsis briefly mentions the Tribal restoration plan and the USFWS assessment, but details of these plans are not described. The ISAB acknowledges the need for basin specific data on population assessments and enumerations, as detailed in the synopsis but also notes that an approach to compare results between subbasins with different conditions was not conducted.

ISAB remarks on possible specific limiting factors are also given in response to Question 1 (above).

Question 4.3 *What are the major impediments to implementation of recovery plans? Will mainstem passage problems be resolved to enable sufficient numbers of adults to migrate into tributaries to initiate recovery in synchrony with translocation and habitat improvements such as ramps on low head dams and irrigation screens?*

The narrative in the response shows that emphasis is currently being placed on mainstem passage restoration. However, this strategy is not supported by presentation of scientific evidence that this is the key limiting factor for lamprey.

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 synopsis states that the Tribal Pacific Lamprey Restoration Plan was finalized in December 2011 and, further, that “It should be noted that this project is not actually a ‘master plan’ in the sense of a master plan being all-encompassing. The Tribal Pacific Lamprey Restoration Plan is a tribally focused action plan; however, it incorporates much of the information available in, and is consistent with, other regional lamprey planning documents. In turn, these other documents include information from, and are consistent with, the Tribal Pacific Lamprey Restoration Plan.” Coordination between the various entities concerned with lamprey recovery is critical. The persisting question is if cooperative arrangements will advance development of an overall “master plan” for lamprey recovery efforts, or if efforts remain too compartmentalized for this to happen?

Question 4.5 *Are study designs and sampling methods coordinated among projects? Some proponents noted that key technical issues, such as sampling efficiency for juvenile lamprey during instream trapping, as well as our inability to tag juvenile life stage lamprey to obtain travel time and survival information, have yet to be resolved. Others did not, suggesting increased communication among groups is needed. The ISRP is therefore concerned that data may not be comparable between projects, or that critical information is lacking, e.g., juvenile travel time and survival.*

The synopsis reports progress in this critical area with some unresolved issues and indicates a comprehensive RM&E program is still wanting and should be the focus of future work. A monitoring and evaluation framework which would provide metrics such as juvenile travel times, survival, and adult passage metrics is needed.

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

“Escapement goals” are probably overly optimistic but nonetheless are based on historical levels. Goals for basinwide returns have been established for several time frames (2012, 2020, 2035), although the objectives seem ambitious in light of known inadequacies in understanding of limiting factors, lack of legal mandates for remediation, and limited funding.

The authors suggest that escapement goals for individual subbasins would be difficult to justify given the uncertainty about the spatial scale of homing and population structure in Pacific lamprey, and the long time required to observe a stock-recruitment response. But many of the Council’s objectives (as summarized on page 1 of the synopsis) involve maintaining the historical *distribution* of lamprey in the basin. Accordingly, goals could be developed based on estimates of spawning and rearing habitat capacity within subbasins without specific knowledge of population structure. Evidence for the existence of isolated populations within the Basin might constrain how the distribution objective could be achieved, but it would not in

itself prevent the setting of spawning or ammocoete density goals by subbasin. Moreover, the statement that “the concept of ‘returning adults’ is therefore a misnomer when applied to Pacific lamprey” is inconsistent with the use of the word “population” throughout the report, and specifically with the evidence for improved status in the Umatilla River Subbasin following the translocation project and modifications to improve passage at the Threemile Falls Dam (last sentence of response to question 1). This ambiguity underscores the potential value of further tagging or genetic research to identify the spatial scale of natal homing in Pacific lamprey.

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?*

This question is addressed; the answer seems to be “perhaps, to a limited extent.” The lack of quantitative monitoring data over a range of subbasins is obviously an impediment. It would be helpful to have an explicit description of the data used to identify limiting factors in Luzier et al. (2011) to evaluate how those data relate to the information generated in the six projects listed in Table 1.

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.*

This suggestion is not fully addressed, aside from a comment on the differing population structures of Pacific and brook lamprey.

References

Fleishman, E. (and 29 others). 2011. Top 40 priorities for science to inform U.S. conservation and management policy. *BioScience* 61:290-300.

Luzier, C.W., H.A. Schaller, J.K. Brostrom, C. Cook-Tabor, D.H. Goodman, R.D. Nelle, K. Ostrand and B. Streif. 2011. Pacific lamprey (*Entosphenus tridentatus*) assessment and template for conservation measures. U.S. Fish and Wildlife Service, Portland, Oregon. 282 pp