



Independent Scientific Review Panel

for the Northwest Power & Conservation Council
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Memorandum (2020-10)

September 24, 2020

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

From: Stan Gregory, ISRP Chair

Subject: Follow-up Review of the Northern Pikeminnow Management Program

Background

The Northern Pikeminnow Management Program (NPMP) is a basinwide program to harvest northern pikeminnow (hereafter referred to as pikeminnow) with the goal to reduce predation on salmon and steelhead. The Pacific States Marine Fisheries Commission (PSMFC) administers the NPMP in cooperation with Washington Department of Fish and Wildlife (WDFW) and the Oregon Department of Fish and Wildlife (ODFW). ODFW conducts program evaluation, population indexing, tagging operations, and evaluates other predator responses. WDFW implements the Sport Reward Fishery through operating Sport Reward Fishery registration stations, collecting and disposing of pikeminnows caught, and issuance of reward vouchers. The PSMFC provides fiscal and technical services to the two state agencies, pays all rewards, and assists WDFW in staffing the registration stations.

On August 31, 2020, the Northwest Power and Conservation Council asked the ISRP to review a response from ODFW, WDFW, and PSMFC regarding the Northern Pikeminnow Management Program (Project 1990-077-00, Development of Systemwide Predator Control). The response, titled [*A Plan in Response to the 2019 Independent Scientific Review Panel's Qualifications for Renewal of the Northern Pikeminnow Management Program*](#), is intended to address the conditions the Council placed on the project as part of the Mainstem and Program Support Project Review in August 2019.

Council 2019 Recommendation

Continue implementation through FY 2020. Sponsor to meet with project cooperators and interested parties to coordinate a plan for addressing ISRP qualifications 1, 2, and 4. A draft plan will be submitted in August 2020 for ISRP and Council review. Recommendation for implementation in FY 2021 and beyond will be determined based on review of the plan. Council encourages sponsor to publish peer-reviewed papers on this work to benefit the region and beyond (ISRP qualification #3).

The Council recommendation was based on the ISRP's final review recommendation ([ISRP 2019-2](#)):

Qualifications: The ISRP recommends that the proponents describe their responses to the ISRP's comments and suggestions below in their upcoming annual report covering FY 2019 accomplishments.

1. This long-running project has fully developed annual objectives and well-established field and analytical tasks. However, the project's methods were developed over twenty years ago. Consequently, the proponents should determine (a) if it is possible to use their extensive capture-recapture data in the Barker Model to estimate survival, recruitment, movement, and abundance; (b) if their estimators for abundance based on CPUE are still valid; and (c) how well those approximations align with potential estimates produced from capture-recapture data. Validation of the abundance estimator is important since it is linked to the project's predation index. The proponents should also determine whether current bioenergetic models could provide improved estimates of consumption of juvenile salmonids, instead of indices of consumption.

2. The ISRP asks the proponents to determine if direct measures of predation due to colonial waterbirds that have been developed can be applied to piscivorous fishes in the Basin. Although results from analyses on a variety of parameters including PSD, W_r , diet composition, and indices of abundance, consumption, and predation failed to detect signs of compensatory responses in northern pikeminnows, smallmouth bass, and walleye, their data suggest that localized compensatory responses may be occurring. The proponents should perform analyses to evaluate trends in locations that exhibit potential compensation by these predators. We also recommend that the proponents work with the Basin's avian researchers to see if their efforts to remove northern pikeminnow have prompted a compensatory effect in colonial waterbirds. Recently, direct measures of predation due to colonial waterbirds have been developed. The data collected by this project appear to be suitable for a similar analysis. We ask the proponents to explore this possibility with the avian researchers.

[3] Although it is clear that the project is using adaptive management to change and refine its actions, a brief description of the process being used is needed. Is it a formal process or an ad hoc one prompted by an apparent need?¹

The ISRP's review provided below of the proponents' response is organized following the three qualifications from the 2019 review.

ISRP Review of Proponents' Response

Recommendation and summary comment

Meets scientific review criteria (conditional)

The ISRP greatly appreciates the proponents' response and constructive approach to peer review. The response and scientific dialogue benefited from a July 16, 2020 teleconference between several ISRP members and the project proponents to clarify details of the ISRP's qualifications. The response demonstrates that the NPMP understands the ISRP's recommendations and will be exploring alternatives to address them. In the project's presentation to the ISRP in 2019 and the ODFW M&E team's response to our review, the Program leaders responded positively and agreed with the majority

¹ In the 2019 ISRP report, this was our fourth qualification. ISRP Qualification 3 regarding peer reviewed publication is not included in this review or list because the Council did not ask for a response on that item but encouraged the proponents to publish.

of our recommendations and concerns. The proponents point out that modifications to the project require collaborative decisions by the proponents' agencies and must be legally implementable under their fish collecting permit from the National Marine Fisheries Service (NMFS). Although the proponents agree with the majority of our recommendations and intend to explore actions to address them, it is unclear how and when the recommendations will be addressed. Consequently, the ISRP requests that the PSMFC, ODFW, and WDFW respond collectively to the ISRP review and indicate how the recommended actions will be addressed. Understanding the need for flexibility, the ISRP suggests that the proponents and the Council staff agree on a mutually determined date for a response to the following requests, preferably before the field season in 2021:

1. **Action Implementation:** Based on the proponents' response, the ISRP asks the three co-managers to report which actions will be implemented to assess and reduce impacts of pikeminnow predation on salmon and steelhead recovery, explain how they will be conducted, and provide a timeline for each effort. The actions identified in the response include use of the Barker Model, Brownie Bird Band Model, and Wisconsin Fish Bioenergetics Model, as well as evaluation of compensatory or additive mortality of juvenile salmonids and compensatory responses of other predators. If funds need to be reallocated to accomplish these tasks, the response should update the original budget to reflect the reallocations.
2. **SMART Objectives:** The proponents need to develop SMART objectives for the new activities the proponents plan to pursue over the next 5 years.
3. **Adaptive Management:** A project with three independent co-managers and other collaborators requires a formal adaptive management process. The ISRP asks the PSMFC, ODFW, and WDFW to develop a collective adaptive management process for both the Sport Reward Fishery and the ODFW M&E components and provide a description of the process to the ISRP.

The NPMP is managed jointly by multiple agencies, so modifications to the program require support from the co-managers. The response focuses on the efforts of the ODFW M&E team, which is only partially in control of their monitoring actions. The NPMP receives more than \$4 million annually, over \$2 million of which funds the Sport Rewards Fishery and creel stations. The ISRP assumes that the NPMP co-managers can reallocate or request more funds to address needed additions or changes. The ISRP asks the co-managers to describe which actions will be implemented and by whom, and to indicate how the Program's resources will be allocated to accomplish these tasks. These joint adaptive management decisions will directly influence the scientific soundness of the collective pikeminnow management efforts in the Columbia River and predator management throughout the Basin.

One of the immediate challenges for the co-managers and adaptive management process is potential permit limitations on future sampling by boat electrofishing. The ODFW M&E team indicates that the 2020 Columbia River System BiOp requires them to substantially reduce the take of ESA listed salmonids by 2023 and potentially eliminate boat electrofishing. This would significantly reduce their ability to monitor abundance of pikeminnow, smallmouth bass, and walleye and would limit their ability to evaluate mortality of juvenile salmon and steelhead. It also eliminates options for recalibrating the abundance indices and increasing control efforts near areas of high pikeminnow predation (e.g., tailraces of the dams). The lack of credible evaluation options greatly decreases the ability to measure effectiveness of the pikeminnow control efforts and inform adaptive management decisions. The ISRP recommends that the NPMP co-managers notify the Council and BPA if the NPMP cannot obtain scientifically credible information because sampling by electrofishing is reduced or eliminated.

Comments on the proponents' responses

1.a Use of a Barker Model

The NPMP response identifies several limitations of the available data, including: 1) small number of recaptures, the majority of which are dead fish, 2) <10% of recaptures are from PIT tag detectors, samples from bird colonies, and NPMP electrofishing, and 3) the large spatial scale of the project (i.e., sampling over the 750 km of the mainstem), which together make it unlikely that the Barker Model can be used effectively for estimating pikeminnow abundance.

The proponents will discuss application of the Barker Model with Dr. Mary Connor, who applied it in Murderer's Creek on the John Day River. They also intend to explore the Brownie Bird Band Recovery Model, which may be a better alternative because it is designed to use tag recoveries from dead animals. The Brownie Model may be able to provide estimates of annual natural mortality and exploitation, particularly in areas of low tag returns. The ISRP encourages the proponents to pursue these options, so the results can be used to improve and adjust the monitoring efforts and analyses. The NPMP should describe their evaluations of these models and basis for their selection or rejection of alternative approaches for analyzing mark-recapture data to supplement and potentially calibrate current metrics for pikeminnow populations.

1.b. & c. Are the abundance estimators valid? How do the CPUE estimates align with a mark-recapture estimate?

The NPMP agrees that use of an alternative method for estimating pikeminnow abundance would allow them to evaluate the current CPUE approach. The NPMP proponents also indicate they will compare their CPUE estimates from boat electrofishing with CPUE estimates from the Sport Reward Fishery and annual tagging efforts to validate the current abundance index and examine its sensitivity to environmental conditions and specific types of thresholds. While the response indicates the proponents do not disagree with the recommendation, it only indicates they will use existing data from the Sport Reward Fishery Program for the comparisons. The proponents do not state that they plan to validate their current approach with a more robust estimate of pikeminnow abundance in the near future. The ISRP understands the value of using a standard protocol for long-term historical data, but such approaches require recalibration. If funds cannot be obtained or reallocated to validate their abundance estimate, the NPMP could reduce the additional funding burdens of validation by conducting the validation in one reservoir, or parts of several reservoirs (to achieve some replication) in a sound statistical approach, which might be more feasible.

1.d. Use of bioenergetics model to estimate consumption

The NPMP agrees that a bioenergetic model would provide improved estimates of consumption and calibration of the current consumption indices. Additionally, a bioenergetics model could provide consumption estimates for walleye, for which peer-reviewed indices are not available. In a teleconference with the ISRP, the project staff indicated that they collect 1,200 samples per year for diet analysis. Most fish recovered in the diet samples are highly digested and degraded, so accurate data on mass are difficult to obtain. Therefore, the NPMP would need to collect additional fish samples to achieve quantitative estimates of diet. The proponents will explore use of eDNA and genetic analyses to

better identify stomach contents and sensitivity of bioenergetic models to the parameters to determine where improvements are most likely.

The ISRP requests additional information about the consumption index currently used. To what factors is the index most sensitive (e.g., temperature, prey data, or other parameters)? What power analyses has the ODFW subproject conducted in the past, and how did they determine that the current analyses are the best possible approach? The proponents' response indicates they currently do not have funds available to obtain the information required for the bioenergetic model and conduct this analysis. The co-managers need to consider the importance of better understanding the factors that determine the consumption of juvenile salmon and steelhead by pikeminnow and other non-native predators.

2a. Can direct measures of colonial water bird predation be applied to northern pikeminnow and other piscivorous fishes?

The ISRP suggests three approaches to explore compensatory response of predators and salmonids: 1) analyses of compensatory versus additive mortality of smolts (similar to recent avian research: Payton et al. 2020, Haeseker et al. 2020), 2) measuring compensation of other predators that increase in abundance as pikeminnow decrease in abundance, and 3) using life cycle models to evaluate the effect of pikeminnow predation and control efforts on the full life cycle of salmon and steelhead.

To date, the NPMP has measured the effect of the Sport Reward Fishery on the abundance of larger predatory pikeminnow, but it has not measured the response of juvenile salmon to reductions in pikeminnow abundance. The ODFW M&E team indicates that it will work with Allan Evans and Quinn Payton from Real Time Research to determine if their approach is suitable for measuring compensatory mortality of pikeminnow. PIT tag recovery methods for avian predators and pikeminnow are substantially different. In terms of direct measures of consumption, the project staff indicated during the teleconference that they annually recover approximately 100 ingested smolts with PIT tags from 200,000 pikeminnows. The approach used by Evans and Payton is possible with reservoir-specific data on juvenile salmon survival and pikeminnow abundance, but the ODFW subproject notes that their captures of pikeminnow are insufficient to calculate abundance indices in many years. Reservoir-scale measurements would be adequate to examine compensatory mortality, so the low number of captures within the three areas of each reservoir would not be a constraint. The subproject describes additional limitations on the amount of information available in a given year (e.g., yearly rotation of reservoirs sampled, inadequate samples for calculating consumption indices, collecting permit limitations). The ISRP recognizes that these limitations may affect the analysis, and we encourage the NPMP to explore the approaches used by the avian predation projects, which would allow the proponents to estimate the effect of pikeminnow on juvenile salmon survival.

2b&c. Proponents should perform analyses to evaluate trends in locations that exhibit potential localized compensation and work with avian researchers to determine if northern pikeminnow removal has prompted a compensatory effect in colonial waterbirds.

Collaboration with the avian predation projects could allow these projects to explore complex interactions between avian and fish predators of juvenile salmon and steelhead. The proponents state that obtaining information on localized compensatory responses of other predators, compensatory

versus additive mortality of smolts, and use of the life cycle models could be new projects rather than efforts added to the existing Program. The response indicates that they will explore use of the CSS survival estimates, the pikeminnow CPUE, and the life cycle models, but it is unclear whether those analyses would become part of the existing NPMP. The proponents should consider soliciting the assistance of the multi-agency life cycle modeling workgroup chaired by NOAA to incorporate predation hypotheses into the models.

3. Adaptive management

The NPMP response describes several major changes in their program over the last 25 years. They point out that these changes have been ad hoc adjustments based on perceived needs rather than an explicit adaptive management process. The program participants recently have evaluated the project more formally and have developed a list of key issues that require attention in the future. The co-managers agreed to “participate in a process to review, discuss, and adopt changes on a cooperative and collaborative basis” and held their first meeting in July 2020.

The ISRP strongly supports the development of an explicit, regularly scheduled, and formalized decision-making process for the collective efforts of the Sport Rewards Fishery and the monitoring component. These efforts have a common purpose but are managed separately. Identification of key questions, design of the types and distributions of ongoing actions, and allocation of funds and staff resources greatly influence the scientific soundness of the program. Development and implementation of a structured decision support system would greatly benefit the NPMP’s efforts to increase survival of salmonids by reducing pikeminnow predation. Consequently, we recommend that the co-managers develop a formal adaptive management process for their collective pikeminnow control efforts and reassess the critical questions that should be addressed to make the program effective for improving recovery of salmon and steelhead in the Columbia River.

References

- Haeseker, S.L., Scheer, G. and McCann, J. 2020. Avian Predation on Steelhead is Consistent with Compensatory Mortality. *Journal of Wildlife Management* 84: 1164-1178. doi:10.1002/jwmg.21880
- Payton, Q., Evans, A. F., Hostetter, N. J., Roby, D. D., Cramer, B., and Collis, K. 2020. Measuring the additive effects of predation on prey survival across spatial scales. *Ecological Applications* 00(00):e02193. 10.1002/eap.2193