



Independent Scientific Review Panel

for the Northwest Power & Conservation Council
851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204
www.nwcouncil.org/fw/isrp

Memorandum (ISRP 2016-7)

March 29, 2016

To: Henry Lorenzen, Chair, Northwest Power and Conservation Council

From: Steve Schroder, ISRP Chair

Subject: Review of Box Canyon Northern Pike Suppression Progress Report (#2007-149-00)

Background

In response to the Northwest Power and Conservation Council's January 20, 2016 request, the ISRP reviewed the Kalispel Tribe of Indians' report [Box Canyon Reservoir Northern Pike Mechanical Suppression Project: Summary of 2012-2015 Project Results](#) (hereafter "progress report"). The suppression effort is implemented through the Kalispel Tribe's project, *Non-Native fish Suppression in Graham Creek* (#2007-149-00). The ISRP notes that the Graham Creek project title does not accurately reflect the northern pike suppression actions funded under this project number. We suggest that the northern pike suppression effort in the Box Canyon Reservoir be provided with its own project number or that a more encompassing title be created so that progress in both of these projects can be tracked.

The progress report is intended to address the Council's recommendation and ISRP's qualification as part of the Resident Fish, Data Management, and Program Coordination Category Review (see [ISRP 2012-6](#)). The progress report summarizes the potential northern pike threat and suppression effort:

Northern Pike (NP), illegally introduced in the Clark Fork River, Montana have immigrated to Box Canyon Reservoir (BCR), Pend Oreille River ... where they have caused drastic declines in native species and gamefish being managed by the Kalispel Tribe Natural Resources Department (KNRD), Washington Department of Fish and Wildlife (WDFW) and Idaho Department of Fish and Game (IDFG). The NP population grew exponentially from 5,500 adults in 2010 between Newport (Pioneer Park; RKM 135) and Riverbend (RKM 98) and was thought to exceed 10,000 individuals in 2011. Northern Pike threaten to undermine current and future recovery efforts for Bull Trout and Westslope Cutthroat Trout, as well as other native salmonids, minnows, suckers and introduced gamefish within the watershed. Northern Pike pose significant risks to the anadromous fisheries of

the Columbia River and Endangered Species Act (ESA) recovery efforts if left to emigrate further downstream.

Provided all the information collected since NP were first detected in BCR and the potential impacts if left unchecked, KNRD and WDFW developed a joint management position to:

1. Minimize the impacts of NP to native species.
2. Reduce the number of NP in BCR.
3. Reduce the spread of NP downstream and prevent further illegal introduction.

To that end, KNRD and WDFW developed and implemented a suite of measures designed to drastically reduce NP abundance in BCR including: removal of NP from the list of gamefish in WA and maintaining their designation as a prohibited species; promotion of harvest-oriented fishing contests; and implementation of a large-scale mechanical suppression project. WDFW has also produced a webpage dedicated to sharing information on the deleterious effects of NP, survey summaries, mechanical suppression results, and management position on the Agencies' [website](#). Although each of these measures contribute, the primary measure leading to a significant reduction of NP in BCR has been the four years of mechanical suppression implemented by KNRD, with support from WDFW from 2012-2015. KNRD implemented annual BCR mechanical suppression using targeted spring gillnet saturation with funding and assistance provided by Bonneville Power Administration, US Bureau of Indian Affairs, WDFW, Kalispel Tribe, and Avista Corporation.

The ISRP's review of the progress report follows below, organized by the ISRP's review criteria.

This project and our review are closely related to the Lake Roosevelt northern pike suppression effort and our review of that project ([ISRP 2016-2](#); [2016-6](#)). The development of the long-term management and monitoring framework in conjunction with Washington Department of Fish and Wildlife is commendable. The ISRP also compliments the proponents on the work and effort they have put into this project to date.

Recommendation

Meets Scientific Review Criteria (Qualified)

The report provides data on northern pike catch per unit effort (CPUE) indicating that a substantial decline in northern pike abundance has been achieved by the Box Canyon Reservoir suppression program. Its effectiveness was increased by focusing netting and removal on the pre-spawning period when northern pike are congregated in backwaters and sloughs. The suppression program, including monitoring of the northern pike population, is needed to not only continue suppression of the northern pike population but also to determine the efficacy of

the program over time. Future emphasis may be directed toward refinements to enhance program effectiveness.

Qualifications that should be addressed in future statements of work and annual progress reports include:

- 1) The project's goal to minimize population-level effects on native fishes and desired nonnative sport fishes needs to be clearly stated. Additionally, quantitative objectives with time frames and metrics that facilitate assessment of the suppression program on bycatch of both native fishes and nonnative sport fishes are needed.
- 2) The objectives and methods for the public outreach effort are unclear and need further development.
- 3) Testable hypotheses associated with the project's quantitative objectives need to be established, stated, and examined with appropriate statistical tests. For example, one hypothesis could be that there will be no statistically significant differences in CPUE among years following the initial decline in northern pike CPUE associated with the suppression project. Several statistical methods are available to test this hypothesis.
- 4) The report states that a compensatory response in juvenile recruitment has not been observed in northern pike due to the suppression effort. Methods for assessing possible compensatory responses or data to support this conclusion, however, were not included in the report. In future reports, the methods used to assess the possibility of compensatory responses and the results of these evaluations should be reported if compensatory responses are a concern.
- 5) Documentation of specific locations where suppression netting occurs, habitat characteristics at each location, the amount of effort expended at each location during each year and sampling period (i.e., March-April, May-June), and the composition of the catches at each location need to be included in future reports. This information will enable evaluation of the suppression program's effectiveness and facilitate data analyses.
- 6) Full description of the SPIN survey method is needed to enable judgments about the CPUE data produced by this technique. There is concern that conclusions regarding the magnitude of the reduction in the northern pike population based on the SPIN survey may be biased if SPIN sampling is concentrated in areas where suppression netting has just recently occurred.
- 7) A subset of suppression netting locations is used to obtain biological information on northern pike. Future reports need to (1) describe how these locations are selected, (2) indicate where these netting episodes take place, (3) document soak times and number of nets used at each location, (4) specify the time of year when the samples are obtained, and (5) report obtained data.
- 8) The methods used to determine sexual maturity of both male and female northern pike need to be described.

- 9) The methods for taking and preserving scales and cleithra need to be described, as well as the analyses that will be conducted using these structures.
- 10) Within the section, Future Management, it is stated that some northern pike have entrained from the system and that maintaining a suppressed population ensures large emigration events are prevented during peak river flows. If data or literature exists to support the assumption that suppression efforts in upstream reservoirs will prevent establishment of northern pike downstream in the Columbia River system, they need to be included in future reports.
- 11) Future reports should describe the adaptive management protocol that the Box Canyon Reservoir Northern Pike Mechanical Suppression Project is using and how lessons learned have been incorporated into the program.

Additional comments are provided below for the proponents to consider in future reports.

Comments

1. Clearly defined objectives and outcomes

A single quantitative objective with a time frame is clearly stated in the report, *“Achieve (by 2014) and maintain (2015 on) an 87% reduction in abundance of NP, measured by catch-per-unit-effort (CPUE) as follows: 1. From 13.2 NP/net night to <1.7 NP/net night in southern ½ of BCR in Spring Pike Index Netting (SPIN) survey, and 2. From 2.9 NP/ net night to <0.5 net night in northern ½ of BCR in SPIN survey.”* Explanation of the reasoning used for choosing an 87% reduction in CPUE would be beneficial. The objective is made with the assumption that CPUE from SPIN surveys is an accurate index of abundance (i.e., number of fish) of northern pike in the reservoir. An 87% reduction in CPUE from the SPIN surveys may not correspond to a proportional (i.e., 87%) reduction in abundance of northern pike in the reservoir. Discussion of this assumption would benefit current and future reports.

An unstated objective of the suppression program is to minimize bycatch. Development is needed of (1) quantitative objectives regarding bycatch of native fishes and non-native sport fishes and (2) metrics to assess these objectives.

In the Results and Discussion section it is stated that *“We have not observed a significant compensatory response in juvenile recruitment that would lead us to question the efficacy of our efforts (i.e., total catch of young fish declined annually since 2013),”* but the evidence for this observation is unclear. Development of methods with metrics (i.e., CPUE, body condition, growth rate, etc.) to facilitate assessment of compensatory responses by juveniles to suppression of northern pike is needed.

The objectives and methods for the public outreach effort are unclear. To augment WDFW’s public outreach effort (i.e., webpage) on northern pike’s deleterious effects, are signs

strategically placed around Box Canyon Reservoir describing the State of Washington's law requiring that prohibited aquatic species such as northern pike be killed before transporting them beyond the riparian perimeter of the water body in which they were caught? Does the Kalispel Tribe have signage or handouts/brochures explaining the northern pike suppression effort?

2. Sound science principles (i.e., methods)

The results of a scientific study cannot be accurately evaluated without a reasonably complete understanding of the methods. There are several aspects of the Methods section that need to be expanded to enable the reader to evaluate results. These include:

- 1) It is stated in the report that *"there are more than 50 independent slough or backwater locations that were repeatedly targeted over the course of the suppression effort."* Documentation of the specific locations where suppression netting occurred, habitat features at these locations, the amount of effort expended at each location during each year and each phase (i.e., March-April, May-June), and the catch is needed.
- 2) The reservoir-wide SPIN survey method is used as an index of northern pike abundance with sampling conducted each year following the Phase I removal effort. Full description of the SPIN survey method is needed to enable judgments about the assessment technique and the resulting CPUE data.
- 3) A subset of suppression netting locations was used to obtain biological information. Documentation of the locations, the amount of effort at each location, the duration and times of sampling, and the resulting data is needed.
- 4) The methods used to determine sexual maturity in male and female northern pike need to be described.
- 5) Scales and cleithra were taken from northern pike. Methods for taking and preserving these body parts need to be described. The reasons for taking scale and cleithra samples and how these structures will be processed and analyzed need to be explained.

The presentation of catch data from the suppression program does not include information on the locations where gillnetting efforts occurred and the extent of effort in each location. In the Methods it is stated that more than 50 slough and backwater locations were targeted in the suppression program, but the data presentation (i.e., unnumbered figure on page 18) indicates that much of the effort may have occurred at only four locations. Documentation on the specific locations, number of net nights of effort in each location during each year, habitat characteristics at each location, and catch at each location is needed to enable evaluation of

the suppression program. Further, description of habitat characteristics at locations where CPUEs of northern pike are high could be useful in designing future suppression efforts.

Figure 18 describes catch rates of northern pike at four locations and the metric used is number of northern pike captured per hectare. Additional metrics of catches at each of these locations would be useful and could include the number of northern pike per net night of effort and the number of net nights of effort expended in each area.

No testable hypotheses or statistical tests of hypotheses are included in the report, and summary statistics presented in the report do not include measures of variance. Testable hypotheses with application of appropriate statistical tests need to be included in future reports.

Diet data along with diet analysis and bioenergetics modeling would be insightful. The project proponents may find it desirable to collaborate in research on diet and bioenergetics of northern pike in the Columbia River Basin in the future. Although northern pike suppression is likely to benefit native fish populations, it would be worthwhile for researchers and managers in the Columbia River Basin to use models to explore how focal species might be affected by expanding northern pike populations and to estimate the potential value of suppression efforts. The ISAB/ISRP's 2016 Critical Uncertainties Report identifies non-native species and their effects on native fishes as a top priority uncertainty. For example, a bioenergetics modeling approach based on seasonal diet and population data for northern pike could be used to estimate their consumption of salmonids. Consumption estimates could be used to compare predation-related mortality under different scenarios of current, suppressed, or expanding northern pike populations. It is highly unlikely that northern pike can be eradicated from the Columbia River Basin, so it is important to identify tolerable densities beyond which northern pike impacts on focal species become unacceptable.

3. Monitoring and evaluation

Overall, the Results section and associated tables provide a good summary of the suppression effort and the effects on northern pike abundance and length distribution. The data indicate substantial declines in northern pike CPUE, average weight, and length, as well as the percentage of mature female northern pike, since the suppression program began in 2012.

Given concerns about the potential impacts of bycatch of species other than northern pike, it is good that the report has included data on catches of bycatch species. There is concern that the extent of bycatch associated with a continuing suppression of northern pike may affect populations of native fishes or desired game fishes. A discussion of bycatch is presented with inclusion of some bycatch data that indicates declines in smallmouth bass, black crappie, and yellow perch have occurred (Table 7). Consequently, in future reports the potential effects of the suppression program on warmwater sport fishes that are desirable to anglers will need to be assessed and discussed.

The report states that *“Catch and mortality of non-target species generally increased with increasing water temperatures as the season progressed, although short-term survival of incidental catch was estimated at >90% for the duration of the project.”* This is an important conclusion that needs to be supported by a description of methods and presentation of data.

A major conclusion of the report is that *“Based on 2015 SPIN results, the adult population south of Riverbend (including sloughs) was reduced by more than 98% following four years of mechanical suppression.”* The SPIN surveys occur immediately after Phase I removal efforts and are likely to be in the same areas where removal efforts have occurred, so segments of the northern pike population not present in these areas (i.e., sexually immature fish, sexually mature fish that spawn in other locations, sexually mature fish that have spawned and exited these areas, etc.) are not being sampled. Conclusions regarding the magnitude of the reduction in the northern pike population based on the SPIN survey may be biased and make it appear that suppression is more effective than it may actually be if SPIN sampling is concentrated in areas where suppression efforts immediately preceded sampling. Consideration of this source of potential bias is warranted in future reports.

Estimates of northern pike abundance, that are independent of the removal efforts and SPIN surveys, may be needed to evaluate the extent of northern pike population suppression. In the Introduction it is stated, *“The NP population grew exponentially from <400 adults in 2006 to >5,500 in 2010 between Newport (Pioneer Park; RKM 135) and Riverbend (RKM 98) and was thought to exceed 10,000 individuals in 2011.”* No citation is provided nor an explanation is given as to how these estimates were obtained, but it appears that population estimates from mark-recapture experiments have been conducted. Similar estimates may need to be made periodically to provide additional quantitative measures to evaluate the northern pike suppression program.

Effort may be needed to estimate the annual exploitation (i.e., annual fishing mortality) rate that the northern pike population experience as a result of the annual gillnetting and fishing tournament. This is an important element of both monitoring and evaluation. At present, it appears that there is no assessment of the annual exploitation rate by the suppression effort. Mark-recapture estimates of abundance or analyses with depletion or catch-at-age models would be useful in conjunction with the suppression efforts and SPIN surveys to make this evaluation. It is important to determine what proportion of the northern pike population needs to be removed annually in order to prevent further growth of the population. Given the relatively rapid growth of the northern pike population in the reservoir and high fecundity of the species, it is likely that a very high level of continuous exploitation will be needed to suppress the population.

4. Benefit to fish and wildlife (discussion of results in relation to objectives)

It is evident that the suppression program has removed large numbers of northern pike from the reservoir. The CPUE data from the SPIN surveys indicates large declines in northern pike CPUE, but uncertainty remains as to the extent of suppression of the population that has actually occurred or the benefits that suppression in Box Canyon Reservoir will have on the spread of northern pike downstream in the Columbia River system.

The Introduction to the report states that "northern pike have caused drastic declines in native species and gamefish." There is no doubt that northern pike are voracious piscivores, but this statement should be supported with references that document population-level effects of northern pike predation on focal fish populations, such as salmonids.

Within the section, Future Management, it is stated, "*Although some NP have entrained from the system, maintaining a suppressed population ensures large emigration events are prevented during peak river flows.*" This assumption needs to be confirmed. If data or literature exists to support the assumption that suppression efforts in upstream reservoirs will prevent establishment of northern pike downstream in the broader Columbia River system, they should be included in future reports.

The report provides information on "lessons learned" that is relevant to adaptive management. For example, the investigators learned that northern pike CPUE was higher and bycatch CPUE was lower during the early part of the season. Furthermore, catch and release mortality reportedly increased later in the season when temperature increased. These are important lessons that will likely benefit both the Box Canyon Reservoir and other northern pike suppression programs. More emphasis should be placed in future reports on describing lessons learned and their contribution to adaptive management. Is there an adaptive management protocol for the Box Canyon Reservoir Northern Pike Mechanical Suppression Project? If not, one should be developed.