Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (ISRP 2017-6) **June 15, 2017**

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

From: Steve Schroder, ISRP Chair

Subject: Review of Expanded Proposal for Lake Roosevelt Northern Pike Suppression Project (1994-043-00)

Background

At the Northwest Power and Conservation Council's June 2, 2017 request, the ISRP reviewed a proposal from the Spokane Tribe of Indians (STOI) to increase and expand northern pike removal efforts in Lake Roosevelt as part of Project #1994-043-00, *Lake Roosevelt Data Collection*. Specifically, the project proponents propose to prevent further establishment and geographic spread of northern pike within and downstream of Lake Roosevelt by reducing northern pike abundance in the Kettle Falls area. In their proposal, the proponents explain the need for an expanded removal effort: "*The Lake Roosevelt Northern Pike population is experiencing chronic recruitment and exponential growth. Since the initial 2015 pilot study, the Lake Roosevelt Co-Managers have removed over 2,000 Northern Pike in the Kettle Falls area, encountered an increasingly diverse size-class structure, and documented the presence of age-0 Northern Pike in the Kettle River, Colville River.*"

The ISRP considered the following documents to complete this review:

- Budget Oversight Group (BOG) Request Summary
- Lake Roosevelt Northern Pike Suppression 2017 - BOG Request
- References and supporting information

The ISRP had previously reviewed a 2016 proposal for a pilot removal effort (ISRP 2016-6) and recommended the project met scientific review with qualifications. The Council considered the ISRP's review and recommended implementation of the project through 2018 with the condition that the ISRP's qualifications be addressed in contracting and that funding beyond the Fiscal Year 2018 field season will depend on ISRP and Council review. In the 2016 proposal, the

proponents stated "*it is critical that a monitoring and suppression plan be developed immediately while abundance is still relatively low… to reduce the risk of Northern Pike numbers expanding within Lake Roosevelt and beyond*."

The ISRP's qualifications from 2016-6 included:

1. *Include explicit hypotheses to be tested by the proposed activities and provide quantitative objectives for what is to be achieved.*
2. *Include quantitative objectives for the northern pike suppression effort as a means to evaluate program success (e.g., reduce northern pike CPUE by __% and reduce the relative abundance of large northern pike [> __ mm total length] by __% by the year 20___). Quantitative objectives should be developed for each metric used to evaluate northern pike suppression, and a time frame should also be included in each objective.*
3. *Include quantitative objectives regarding the protection of native fishes captured as bycatch.*
4. *Revisit the elements of the proposal that describe criteria for assessing the effects of bycatch and actions to alleviate the effects of bycatch on native species. The focus should be on preventing population-level effects of bycatch on native species. We question bycatch limitations for non-native piscivorous fishes (e.g., walleye) as they do not appear to be consistent with the Council's Fish and Wildlife Program to protect native fishes.*
5. *The planned use of 4-hour gillnet sets during daylight hours using nets with panels of five different mesh sizes needs to be supported. A detailed review of literature or a comparative study of catch rates during the day and at night, for varying durations of gillnet sets, and for different mesh sizes is needed to determine the design of gillnets and sets that will optimize catch efficiency for northern pike.*
6. *Include a study design and description of the otolith microchemistry methods the project will use to determine the natal origins of northern pike sampled in Lake Roosevelt. Discuss how knowledge of natal origins will inform adaptive management decisions regarding northern pike suppression in Lake Roosevelt.*

The proponents' 2016 proposal also stated that "*work completed for the proposed request for scope change and budget increase will be used by Lake Roosevelt Co-Managers (STOI, WDFW, CCT) to develop a short-term, three year Northern Pike relative abundance survey and suppression plan for FY17, FY18 and FY19*." The ISRP suggested that, if requested, it could review the co-managers three-year plan before implementation.

The ISRP's review comments below are in two parts. First we evaluate whether the expanded effort is scientifically justified (Part A), and second we consider to what extent our qualifications from 2016 have been addressed (Part B).

ISRP Recommendation

Meets Scientific Review Criteria (Qualified)

The STOI proposal partially meets scientific criteria (Part A below) by providing evidence that the northern pike population is now reproducing and spreading in Lake Roosevelt. Northern pike are likely to have a significant effect on native fishes, including anadromous salmonids, if their distribution expands further downstream from Lake Roosevelt. The ISRP is not surprised that further suppression efforts are needed, as we had previously questioned (ISRP 2016-6) whether the current removal effort would be sufficient to control the spread of northern pike in Lake Roosevelt. Even though the quantitative catch per unit effort (CPUE) data from standardized surveys presented in the proposal for 2015-2017 do not demonstrate a substantial increase in the northern pike population, other information regarding abundance and age distribution of catches in recent sampling efforts suggests that additional suppression is warranted.

Other aspects of the proposal fall short of expectations. Most of the previous ISRP qualifications have not been adequately addressed (Part B below). The description of objectives is improved but still not adequate. Objective 1 for suppressing northern pike is stated quantitatively, but the 5-year timeline for achieving this objective does not match the 1-year time frame of this proposal. Objective 2 identifies catch limits for non-target species but it does not specify limits per unit time or unit of fishing effort, and it includes limits for non-native piscivores. Objective 3 describes a method for gillnetting rather than an expected outcome quantified with a timeline to track progress.

Thus, the following concerns, along with our original qualifications (see Part B below), must be addressed. The responses to the qualifications and concerns should be described in the next annual report and also in the *Three-year Northern Pike Relative Abundance Survey and Suppression Plan.* The ISRP should review the annual report and the Suppression Plan before long-term commitments are made for this project.

1. Provide quantitative objectives and timelines, as discussed below and in ISRP 2016-6. Clearly articulate quantitative catch limits for non-target species.
2. Provide justification for terminating the suppression of northern pike if catch limits are exceeded for non-native walleye and smallmouth bass and hatchery trout.
3. Describe in more detail the methodology and level of effort associated with the proposed expansion of the removal effort, and demonstrate how the methodology will be adequate to track the status of northern pike in Lake Roosevelt over time.
4. Assess whether the benefits of longer nighttime set times outweigh the harm to other species by comparing catch rates of northern pike and mortality rates of other species in daylight versus nighttime sets, and using gillnets versus electrofishing.

In summary, the ISRP recommends that the current proposal sufficiently meets scientific criteria to *begin* expansion of efforts to suppress the spread of northern pike in Lake Roosevelt, provided the proponents can at the same time meet the urgent qualifications listed above, with emphasis on developing and implementing a monitoring program. However, the ISRP cautions that much more analysis and policy development is needed to justify a long-term program to suppress northern pike in Lake Roosevelt. Indeed, the overall strategy for controlling northern pike and other non-native predators requires broader discussion within the Fish and Wildlife Program.

Comments

A. Scientific justification for the expanded effort

The assumption motivating the suppression effort is that northern pike are spreading in Lake Roosevelt, and they are having or will soon have a detrimental effect on native fish populations. The ISRP previously agreed (ISRP 2016-2) that the spread of northern pike poses a risk to native fishes and that early and intensive efforts at suppression are warranted. However, it remains unclear whether the spread of northern pike threatens native salmonids and other native species to a greater extent than the existing presence of other non-native, piscivorous species already reproducing in Lake Roosevelt (i.e., walleye and smallmouth bass). The ISRP also questioned (ISRP 2016-6) whether the previously proposed effort (annual total of 6 days of targeted gillnetting over three separate 2-day time periods) would be sufficient to suppress the spread of northern pike in Lake Roosevelt, based on evidence from other northern pike suppression projects such as the Box Canyon project. Even so, we agree, in principle, that suppression efforts should be intensified as quickly as possible to prevent the spread of northern pike downstream of Lake Roosevelt.

The most compelling argument for immediately increasing suppression efforts is the first recorded catch of age-0 northern pike in Lake Roosevelt (about 48 age-0 fish per hour during boat electrofishing in 2017). This report strongly suggests that northern pike are now reproducing in Lake Roosevelt rather than migrating there from upstream habitats. However, more detailed documentation of the sampling methods and the catch rates of age-0 northern pike by location and habitat type are needed to confirm spawning success and identify likely spawning locations that could be targeted by the removal program.

More detailed documentation is also needed to support the assertion (on page 2 of the proposal) that "*During October 2016, an additional 171 Northern Pike were incidentally caught during juvenile White Sturgeon and Fall Walleye Index Netting surveys. Juvenile White Sturgeon and Fall Walleye Index Netting surveys had never previously caught such large numbers of Northern Pike."* This assertion, based largely on new data from the white sturgeon survey,

seems at odds with other historical survey data tabulated in the proposal. High catches of northern pike were also reported in the targeted overnight gillnet sets in spring 2017, but no previous data are available (or were presented) for comparison.

Conclusions about the trend in northern pike abundance can be misleading if survey data are not directly comparable in terms of time of year, environmental conditions (e.g., temperature), gear type, set duration and time of day, and random versus targeted sampling locations. It seems that the most comparable data presented in the table do not demonstrate an increase in northern pike abundance. For example, catch rates for northern pike in the (random) summer Relative Abundance Survey were 21 in 87 sets in 2015 (CPUE = 0.24) versus only 14 in 122 sets in 2016 (CPUE = 0.12). Similarly, catch rates for northern pike in the (random) spring supplemental gill net removal surveys were 29 in 44 sets in 2016 (CPUE = 0.66) versus 26 in 47 sets in 2017 (CPUE = 0.55). Careful monitoring with standard methods will be needed to track actual changes in abundance. These concerns were described in detail in our previous review (ISRP 2016-6).

The surveys have demonstrated that northern pike occur mostly in localized concentrations and that targeted gillnetting can increase the effectiveness and feasibility of the removal effort, while decreasing the bycatch ratio. Overnight gillnet sets have proven more effective at catching northern pike than 4-hour daytime sets, but no data are presented to demonstrate that the increased catch rate of northern pike in overnight sets outweighs the possible harm to other species through increased bycatch mortality. A particular concern of longer nighttime sets in the targeted areas is the possibility of increased mortality to burbot.

The proposal does not clearly state the methods and level of effort that will be applied to suppress northern pike. (The budget page indicates the project would fund 7 biologists and technicians for 3 months each, suggesting that the level of effort would be substantial.) The proposed methodology should be described in greater detail so that reviewers can evaluate whether the effort is consistent with the objectives. For example, funding is requested for only 1 year, yet Objective 1 refers to an expected reduction in northern pike CPUE after a 5-year period. To help evaluate progress, the time frame for the objective should be consistent with the time frame of the proposed effort.

In summary, this proposal does not scientifically demonstrate that northern pike abundance is increasing exponentially as claimed, but it does provide a reasonable case that increased suppression efforts are feasible and warranted to reduce the rate of population expansion in Lake Roosevelt. Controlling the abundance and range of northern pike in Lake Roosevelt by netting alone will likely require intensive annual effort in perpetuity, so it may be advisable to consider using a combination of additional control techniques. Clearly, expanding the intensity and spatial scope of this project will be expensive, possibly endless, and ultimately, a policy decision for the Council and BPA.

B. Progress toward addressing ISRP's 2016 Qualifications

The six qualifications from the ISRP's 2016 review are numbered and listed in italics below. Our comments on progress towards addressing them, based on the 2017 proposal, follow in normal font. The first three qualifications all refer to quantitative objectives and are grouped together to avoid redundancy.

1. *Include quantitative objectives for the northern pike suppression effort as a means to evaluate program success (e.g., reduce northern pike CPUE by __% and reduce the relative abundance of large northern pike [> __ mm total length] by __% by the year 20___). Quantitative objectives should be developed for each metric used to evaluate northern pike suppression, and a time frame should also be included in each objective.*

2. *Include explicit hypotheses to be tested by the proposed activities and provide quantitative objectives for what is to be achieved.*

3. *Include quantitative objectives regarding the protection of native fishes captured as bycatch.*

Objective 1 (to reduce CPUE to <0.5 northern pike/net within 5 years) is quantitative and has a timeline for achievement. However, the 5-year timeline does not match the 1-year duration of proposed activities.

Objective 2 (to limit bycatch of native and managed gamefish species) is non-quantitative, but the accompanying text provides quantitative limits on the bycatch of 11 species. As in the 2016 proposal, it is unclear if the catch limits would be calculated for each day, season, or across all 5 years. The basis for the metrics is not described.

Objective 3 (to use 5-panel gillnets) describes a method for gillnetting rather than an expected or desired outcome quantified with a timeline to track progress.

Additional quantitative objectives should be developed. For example, the proponents express concern about observed changes in the length distribution of northern pike, so it seems appropriate to include a quantitative objective to describe changes in the length distribution of the northern pike population expected or desired by the end of the proposal period, as noted in Qualification 2 (ISRP 2016-6). Similarly, if northern pike are being aged, then expected or desired changes in the age distribution could also be expressed in a quantitative objective.

4. *Revisit the elements of the proposal that describe criteria for assessing the effects of bycatch and actions to alleviate the effects of bycatch on native species. The focus should be on preventing population-level effects of bycatch on native species. We*

question bycatch limitations for non-native piscivorous fishes (e.g., walleye) as they do not appear to be consistent with the Council's Fish and Wildlife Program to protect native fishes.

No information is provided to indicate how the bycatch limits were developed, or the effect that exceeding the specified limits might have on native fish populations. For example, how do the proposed limits on bycatch from suppression efforts compare to existing mortality in recreational fisheries in Lake Roosevelt? More specifically, how high (approximately) would the total harvest rate on each species be at its bycatch limit, and why would exceeding this harvest rate justify termination of the suppression program? The ISRP does not expect a rigorous statistical analysis, but the STOI should consider and justify the tradeoffs between terminating suppression to protect non-native species versus continuing suppression despite the expected bycatch of non-native species.

The ISRP still questions why the STOI would terminate the suppression effort if bycatch of non-native walleye reached 100 fish, or bycatch of non-native smallmouth bass reached 100 fish, or if bycatch of hatchery trout reached 50 fish. Setting catch limits for abundant hatchery trout and non-native predators (that are popular with sport fishermen) implies that protecting these non-native species is more important than reducing the abundance of northern pike. For this reason, the ISRP encourages the STOI to remove the bycatch thresholds for non-native species from the proposal. Instead, suppression methods could be altered if catch rates for non-target species are considered too high relative to catch rates for northern pike, while still allowing the suppression effort to continue with high priority. The STOI should also consider testing revival boxes to increase the survival of native fishes captured incidentally in the suppression effort. Attempts to release native fishes alive are not mentioned in this proposal but King and Lee (2016) provide some information on catch and release survival.

5. *The planned use of 4-hour gillnet sets during daylight hours, using nets with panels of five different mesh sizes, needs to be supported. A detailed review of literature or a comparative study of catch rates during the day and at night, for varying durations of gillnet sets, and for different mesh sizes is needed to determine the design of gillnets and sets that will optimize catch efficiency for northern pike.*

Qualification 5 is not addressed in the proposal, and it still remains an important issue to address. The proposal suggests that catch rates of northern pike can be increased by gillnetting or electrofishing overnight rather than during daylight. However, no statistical comparison of catch and bycatch rates is provided. The ISRP encourages the STOI to develop a statistically appropriate approach for evaluating catch and bycatch rates to assess the ratio of benefit and harm (to other species) under alternative scenarios for fishing gear (gillnet versus electrofishing), environmental conditions, fishing locations, duration of fishing, and time of day (daylight versus nighttime).

The proposal must more clearly describe the proposed level of effort by habitat type, location in the lake and gear type. The proposal states that seven personnel would be fully funded for three months. Additional information is needed. Will suppression occur five days a week for three months? Will this level of effort achieve Objective 1 (a catch rate of <0.5 northern pike per net)?

6. *Include a study design and description of the otolith microchemistry methods the project will use to determine the natal origins of northern pike sampled in Lake Roosevelt. Discuss how knowledge of natal origins will inform adaptive management decisions regarding northern pike suppression in Lake Roosevelt.*

Qualification 6 is not addressed in the 2017 proposal. Lee and King (2016) state that they have archived otoliths for future analysis, pending a demonstration that the samples can be used to identify and target specific spawning areas. However, the capture of age-0 northern pike in Lake Roosevelt in 2017 suggests that northern pike may be reproducing in the lake, in addition to migrating from upstream spawning areas. Successful reproduction of northern pike in Lake Roosevelt is not particularly surprising, but this recent confirmation means it will be important to re-evaluate whether the otolith microchemistry study proposed previously will still be cost effective and useful for adaptive management decisions.

As described in ISRP (2016-6), it is important that the STOI develop a statistically rigorous approach for assessing changes in the northern pike population over time. Suppression is likely to be an annual requirement in perpetuity, so development of consistent metrics and methodology will be critical for monitoring trends and evaluating progress. Metrics should involve indices of northern pike abundance, sex ratio, and size or age distributions. Furthermore, diet analyses should be conducted to estimate the percentages of species consumed by northern pike. Lee and King (2016) reported that yellow perch and walleye were the primary species eaten by northern pike in 2016 and that salmonids represented only 6.8% of the diet (by numbers of fish). This observation suggests that northern pike, as a top fish predator, might compensate to some extent for their own depredation on salmonids by reducing predation by other non-native fish predators (see ISAB 2016-1 for a recent review of the complexity of estimating the impacts of predation).