



Independent Scientific Review Panel

for the Northwest Power & Conservation Council
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Memorandum (ISRP 2009-32)

July 24, 2009

To: Tony Grover, Director, Fish and Wildlife Division
From: Eric Loudenslager, ISRP Chair
Subject: Response Request for Twin Lakes Enhancement Proposal (#2008-111-00)

Background

At the Council's July 1, 2009 request, the ISRP reviewed the Colville Confederated Tribes' *Twin Lakes Enhancement Proposal* (#2008-111-00), a Columbia River Fish Accords project. The purpose of this project is to improve summer habitat for native inland redband trout in Twin Lakes, Washington by enhancing dissolved oxygen levels in bottom waters.

Recommendation

Response requested

This proposal lacks sufficient technical justification, background information, and detail in other areas (including study design, objectives, and methods) to enable the ISRP to evaluate the scientific merit of the proposal. The ISRP requests a response for the proponents to provide the following information in order to complete this review:

- Summary results and reports (with web based links to reports if available) from the three years of redband trout studies in Twin Lakes by the Colville Confederated Tribes should be included in the Technical Justification section.
- What is the source(s) of anthropogenic phosphorous loading to Twin Lakes?
- The proposal does not present basic limnological data about the project lakes. Included should be such data as catchment basin area, water surface area, maximum and mean water depth, shoreline development, water sources and flux, and the characteristics of lakebed sediments and aquatic macrophytes. Lacking such basic information, the ISRP cannot evaluate reasonability of the project.
- Include a discussion of how redband trout can be re-established in an already diverse fish community dominated by non-native species.
- Section E indicates that this is a new project, but clearly this project is ongoing (~three years?). Please explain.
- Unless there are mortality or growth data on redband trout available from Twin Lakes studies, the objectives in Section F will need to be revised.

- Work Elements (WE) 2 and 3 (the main ones) are too general, and much more detail is needed on hydroacoustic and creel survey designs and methods.
- Can golden shiner be used to monitor changes in methyl mercury during the study?

Specific ISRP Comments

1. Technical Justification, Program Significance and Consistency, and Project Relationships (sections B-D)

The technical justification for this project regarding benefits to fish (native redband trout) lacks detail. The goal is to enhance redband trout habitat by oxygenating the hypolimnion May to October, but the problem of hypoxic impacts on redbands is not really documented. The proponents state, “For lake-adapted redband forms, our recent work over the past three years on Twin Lakes, within the reservation of the Colville Confederated Tribes (CCT), has provided a clearer picture of cumulative stresses that reduce native trout habitat and jeopardize re-establishment programs.” A summary of data from the three years of studies on redbands would be very helpful.

This is an ongoing project to benefit fish; however, fish data are not presented and the problem is only mentioned in general terms. Water quality data are nicely summarized, but what is the species composition of the fish communities in these two lakes and relative abundance of redband trout at current time? If the current fish community is dominated by largemouth bass, golden shiner, and hatchery produced brook trout and rainbow trout of coastal origin (as several papers by Christensen et al. indicate), how will redband trout be re-established in an already diverse community of non-native species? This project might be better framed as a habitat improvement project prior to re-establishment of redband trout, with plans for redband stocking included. The water quality data collected are valuable, and results of oxygenation thus far appear to have improved oxygenation of the metalimnion, with clear benefits to plankton populations. Including data on existing fish populations would make data presentation and project justification much more complete.

Two other deficiencies with respect to technical justification that also make the proposal unacceptable in its present form are: (1) the project focuses on treatment of an in-lake symptom of eutrophication but does not address the basic causes, which must have been (and perhaps still are) anthropogenic inputs of soluble reactive phosphorus, and (2) the proposal does not consider alternatives to the proposed method, hypolimnetic oxygenation, for retarding phosphorous release from lakebed sediments (if indeed, retarding this source is appropriate as part of a long-term solution to apparent hypereutrophication in the lakes). Sources of external phosphorus loading must be diagnosed and reduced to appropriate levels *before* in-lake treatment—and reducing external loading may alone reverse eutrophication, eventually solving the “habitat squeeze” problem that the proponents describe. Cooke et al. (1993) state that “for most in-lake techniques [of phosphorus control] to be effective, important external loading sources should be controlled first.”

Analyzing specific sources of external nutrient loading for the lakes should be part of a watershed analysis. The proposal has no watershed analysis, nor analyses of land uses and other

anthropogenic disturbances. Watershed analysis is required for Columbia River Basin fish and wildlife mitigation projects, and it is possible that data already exist in the subbasin assessment or elsewhere.

The proposal does not present basic limnological data about the project lakes. Included should be such data as catchment basin area, water surface area, maximum and mean water depth, shoreline development, water sources and flux, and the types, abundances and distributions of lakebed sediments and aquatic macrophytes. Location of the lakes should be given (county, township-and-range numbers, latitude and longitude).

The proposal does not refer to pertinent scientific and technical literature on remedying unfavorably high phosphorus content in lakes. The proposal seems to reference only two articles on technology for dealing with the “habitat squeeze” problem: McQueen and Lean (1986) and Moore (2004). According to the titles of the articles, both focus on just one technique, hypolimnetic aeration, and do not compare it with alternatives. A more comprehensive and recent reference is Cooke et al. (2005). That book was not available to ISRP at the time of this review (but will be in August); it updates Cooke et al. (1993), which we reference. The revised proposal should incorporate applicable material from Cooke et al. (2005) and other recent literature on applied limnology, particularly on diagnosing external sources of nutrient enrichment and on alternatives for dealing with phosphorus-induced eutrophication.

One of the benefits of the project is to lower mercury concentrations in the water column and in zooplankton, but because ultimate benefactor will be fish for human consumption, it would be useful to monitor fish for mercury levels during the study. The golden shiner may be a good species for monitoring, as pelagic feeding shiners have been used for mercury level monitoring successfully in other lakes (Gorsky et al., 1999).

Work on understanding and improving the habitat for redband trout in the lakes is clearly important in terms of BPA fish and wildlife guidelines within the Fish and Wildlife Program and shows relevance to the Intermountain Subbasin Provincial Plan. Relationships to other projects are briefly mentioned but not clearly detailed.

Much of the proposal is focused on assuring that a tightly controlled experiment (“a full-scale treatment and reference lake is unique in its simplicity and statistical power”) would be carried out as a comparison of one lake vs. the other. The important question from a fishery management standpoint is: does oxygenation provide a cost-effective means to increase trout production that is better than the alternatives? If existing data suggest the answer is yes, then the project proponents can consider expanding the treatment to the adjacent lake. However, this proposal intends to test hypolimnetic oxygenation in South Twin Lake when the same oxygenation protocol is already in use in the North Lake. This approach will compromise the treatment-control design of the study.

2. Objectives, Work Elements, and Methods (section F)

Objective 1 is to decrease the mortality and increase the growth potential of salmonids in North Twin Lake. However, without any baseline data on mortality how can this be shown? The ISRP also did not see any growth data for redbands or other salmonids. Work Elements (WE) 2 and 3 (the main ones) are too general and need much more detail on hydroacoustic and creel survey designs and methods.

Objective 2 (for South Twin Lake) - our comments for Objective 1 (above) also apply to Objective 2.

If there is a temperature/dissolved oxygen squeeze such as has been identified in North Twin Lake and that situation can be ameliorated, trout will very quickly take advantage of the situation and improved growth and survival will follow. Fish depths are currently being monitored by set nets at three different depths. The results observed to date from the hydroacoustics, sonic tracking and gill nets currently being employed indicate that data have been gathered already to show that fish will readily inhabit the newly oxygenated area. The proposed work on additional fish telemetry therefore seems superfluous.

Other basic data collection on the fish population and angler catch (given as WE 2 and 3 in this proposal) is needed, but identified as “performed in cooperation with the hatchery project 198503800” and thus it is not clear why there are work elements here.

A new objective of cost analysis should be included, and results used to help determine the affordability of conducting similar oxygenation projects in other lakes of the region.

As written, the items in Section F’s “milestones” do not constitute milestones. Instead, they state methods—and often do this too vaguely. A milestone is a distinguishing mark, i.e., specific evidence that the project has progressed toward the objective. The project’s methods must be shown but should be explicitly labeled as methods. Each milestone, on the other hand, should be expressed as a specific result that the method is supposed to attain along the path to completing the work. For example, under Objective 2, *Decrease mortality and increase growth potential of salmonids in South Twin Lake*, of Phase 1 (2010), and its Work Element 2, ***Collect/Generate/Validate Field and Lab Data (157). Fish size, numbers, growth and distribution***, Milestone A says “Collect, measure and evaluate salmonids monthly using gill nets placed at specific depths in North and South Twin Lakes. Capture depths will be noted and weights and length will be measured to determine condition factor, relative weight and monthly growth.” This should be re-labeled and numbered as a set of methods, and then the set’s milestones stated in such terms as; “Milestone A. Tables showing the length frequency distributions and total numbers of the redband trout during each month”; “Milestone B. An analysis of growth in length of redband trout, expressed as (state growth parameter[s])”; “Milestone C. An analysis of condition factors (state which metric) of redband trout on various dates and at various ages”; “Milestone D. Tables (maps?) showing areal (or horizontal?) distribution of the lake’s redband trout on different dates and at different times of day”; “Milestone E . . .”

With respect to Objective 2, Work Element 3, the “roving” creel census (“Milestone A”) lacks specificity about the method. Exactly what will be measured? Number of anglers and angling trips? Total harvest? Catch per angler-trip? Catch rate (fish creeled/hour)? Fish caught but released? And exactly what are to be the sampling regime and data analysis methods? Reliable measurement of angler harvest, catch rate, and such is difficult, is labor intensive, and can be very expensive. Without detailed description of the design for sampling and data analysis, the ISRP cannot judge whether this work element is reasonable. The basics of this comment apply to other work elements, as well.

To the extent that the project is an experiment (much of it is implied as such), the proposal could be sharpened by stating the hypotheses that are being tested and explicitly labeling them as such. One hypothesis is mentioned in the M&E section with regard to iron and manganese release.

3. M&E (section G)

This is, by far, the strongest part of the proposal and if section F could be revised to match the level of clarity and detail of Section G, the proposal would be significantly improved. The objectives are clearly stated and measurable. The methods are well detailed, plus statistical evaluation approaches are provided for each objective. It almost seems that there are two separate proposals here.

4. Overall Comments - Benefit to F&W (all proposal)

As a habitat restoration or enhancement project, this proposal has merit, but the potential benefits for redband trout are not adequately justified (documentation is needed that there is a specific problem). This project could be presented as a habitat improvement project prior to re-establishment of redband trout, including plans for stocking redbands and fisheries management plans regarding how to deal with the dominant non-native species.

The Objectives, work elements, and methods in section F need more detail but are adequate for M&E in section G.

A major issue for both lakes is whether the increase in fish production (in one or both lakes) and a possible shift in species composition towards the more desired redband trout are worth the cost of oxygenation. Because this is a hatchery-based fishery, those benefits would be relatively straightforward to estimate by relating the value of the sport catch to the cost of producing hatchery fish. A secondary issue is what might the minimum amount of oxygenation that is needed be in order to achieve trout production objectives. These issues should be addressed in a revised proposal.

References:

Cooke, G.D., E.B. Welch, S.A. Peterson and S.A. Nichols. 2005. Restoration and management of lakes and reservoirs. CRC--Taylor & Francis, 591 pgs.

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Gorski, P.R., R.C. Lathrop, S.D. Hill, and R.T. Herrin. 1999. Temporal mercury dynamics and diet composition in the mimic shiner. Transactions of the American Fisheries Society 128:701-712.