



Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (ISRP 2009-56)

December 22, 2009

To: W. Bill Booth, Chair, Northwest Power and Conservation Council

From: Eric Loudenslager, ISRP Chair

Subject: Qualification Review for Accord Proposal, Resident Fish Research, Monitoring, and Evaluation proposal (#2008-109-00)

Background

At the Council's December 16, 2009 request, the ISRP reviewed documentation provided by the Confederated Tribes of the Colville Reservation to meet a condition for the Accord project *Resident Fish Research, Monitoring and Evaluation (RM&E)* (#2008-109-00). The Council placed the condition on the proposal on December 9, 2009 based on the ISRP review of the proposal ([ISRP 2009-44](#)) which requested that a statistical power analysis be developed and reviewed by the ISRP before the radio-tagging effort is implemented.

The project's goal is to improve the basic understanding of the population dynamics of rainbow trout (*Oncorhynchus mykiss*) within the San Poil Subbasin by examining movements and winter ecology among life histories.

Recommendation

The qualification is satisfied. The power analysis provides sufficient clarification of the analytical boundaries of the study. This analysis should guide the interpretation and management implications of the study results. The ability to answer all the questions posed by the objectives would likely require increased sample sizes of tagged fish.

Specific Comments

The response document, *Power Calculations for Rainbow Trout Movements*, is written by John Skalski at the University of Washington in consultation with the project proponent. The ISRP encourages and supports the proponents enlisting the assistance of statisticians in developing study designs like this.

The statistical power analysis is useful in characterizing one comparisons of interest. It also explains some simplifications that are necessary in order to easily obtain approximate sample size estimates. The resulting recommendation for a sample size of $n=30$ for each group is more

than was stated in the revised proposal (the revised proposal had a sample size of $n=15$ for each of two years, for each life-history type). The Power Calculation report claims the sample size of 30 for each group is adequate to detect differences in movement probabilities between 0.15 and 0.30. This claim is true in some situations. For example a sample size of 30 for each group is adequate to detect a difference between movement probabilities of 0.5 and 0.8 or between 0.6 and 0.9 with statistical power of at least 0.80. However, to detect differences between 0.5 and 0.65 with power at least 0.80 requires 134 observations per group and detecting differences between 0.75 and 0.90 would require 79 observations per group to attain 0.80 power. It appears that a sample size of 30 per group would not be adequate for detecting a difference in migration probabilities of 0.15. The sample size for detecting a difference of 0.20, say between migration probabilities 0.6 and 0.8, with power of 0.80 is 64 per group.

The power analysis raises a question, what difference in migration probabilities is biologically meaningful to detect? If the difference between migration probabilities is less than 0.30 then more than 30 fish per group should be tagged.

Moreover, the analysis is based on partitioning the recapture location into three categories (in the Power Calculation these are tributary, mainstem, and lake). The monitoring and evaluation section and the objectives section of the revised proposal suggest that the questions of interest involve “essential spawning areas, over-wintering areas, warm ground water, and ice.” The proposal does not include any explanation of how these features of interest will be partitioned into a 3 x 3 contingency table to analyze the association of the different life-history types with these environmental features.

The power analysis provides an important context for understanding the analytical boundaries from this type of study. Whether or not a 3 x 3 contingency test is sufficient to analyze all the potential questions of interest, expanding interpretation beyond the elementary level of contrasting where fish were first intercepted and tagged and where they were subsequently recaptured is unsupportable. The sample size of tagged fish will probably not be large enough to evaluate microhabitat associations.