



Independent Scientific Review Panel

for the Northwest Power & Conservation Council
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Memorandum (2017-10)

October 20, 2017

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

From: Steve Schroder, ISRP Chair

Subject: Response Review of Mid-Columbia Coho Restoration Program (Project #1996-040-00)

Background

At the Northwest Power and Conservation Council's September 25, 2017 request, the ISRP reviewed a [response](#) from the Yakama Nation regarding Project #1996-040-00, *Mid-Columbia Coho Restoration Project*. The response is intended to address ISRP concerns regarding broodstock development and genetic issues raised in our most recent review ([ISRP 2017-4](#)).

The Master Plan is designed to achieve the Yakama Nation's (YN) long-term vision to re-establish naturally spawning coho populations in mid-Columbia tributaries to biologically sustainable levels that will provide significant harvest in most years.

This is a long-running project, and the ISRP has reviewed the project numerous times over the years including annual reviews of proposals for funding through the Fish and Wildlife Program for fiscal years 1998, 1999, and 2000; a partial Step Review in 2000 ([ISRP 2000-5](#)); a provincial review for funding in fiscal years 2003-2005; a concurrent Master Plan review and FY 2007-09 proposal review in 2006 ([ISRP 2006-5](#)); and two iterative Step Reviews in 2009 ([ISRP 2009-6](#) and [2009-47](#)). Since 1998, the project has received generally favorable reviews that included constructive comments on future direction and provided scientific support for the effort.

ISRP Recommendation and Comments

Meets Scientific Review Criteria

In our most recent review of the Yakama Nation's Mid-Columbia River coho reintroduction program, we requested that Tribal researchers consult with Columbia River Inter-Tribal Fish Commission (CRITFC) geneticists on two issues. First, we wondered if it would be possible to

create and maintain two separate coho broodstocks. One broodstock (the “upriver broodstock”) would comprise only coho that had demonstrated the ability to ascend Tumwater Falls in the Wenatchee. The other broodstock (the “lower river broodstock”) would consist of coho captured at Dryden, a location downstream of Tumwater Falls. Currently, coho recovered at Dryden and Tumwater Falls are mated with one another. This approach maximizes the genetic diversity of the overall (single) broodstock but reduces the intensity of selection for fish able to ascend Tumwater Falls. Our recommendation to maintain two separate broodstocks is based on the plausible hypothesis that matings between fish that have been able to ascend Tumwater Falls will produce progeny that will be more adapted to ascend the falls in their return migration than the hatchery fish currently being produced by the project. Since relatively few females are able to ascend Tumwater Falls, progeny produced by the lower river broodstock could still be used to sustain production release goals and maintain overall genetic diversity.

Tribal researchers agreed that maintaining two separate broodstocks would benefit the reintroduction program. They, however, pointed out several concerns. Because the number of females captured at Tumwater Falls has been consistently low, it may not be possible to keep the progeny produced by Tumwater Falls x Tumwater Falls matings separated from progeny produced from Dryden parents throughout the entire rearing period. Apparently they do not have the facilities that can be used to rear a small group of juveniles. Another concern was the potentially small effective population size of the upriver broodstock due to the limited number of parental fish. Finally, a study carried out by the Tribe (Murdoch and Jefferies 2015) indicated that it was primarily early returning female coho that had the capacity to successfully navigate past Tumwater Falls. Traits or metrics that could be used to identify males that could successfully ascend the falls have not yet been identified. However, unlike females, male coho are readily captured at the falls and could be incorporated into the upriver broodstock when needed.

Even with the difficulties mentioned above, the Tribe now plans to create and maintain two broodstocks, an upriver (Tumwater Falls) and a lower river (Dryden) one. In their response, they describe how this will be done. Fish ascending Tumwater Falls will be used in the upriver broodstock. In addition, they plan to supplement the upriver broodstock by incorporating early and immature female coho recovered at Dryden. Floy tags will be applied to all upriver broodstock and tag color will be used to distinguish collection location. Floy tags will not be applied to the lower river broodstock. We suggest two refinements be considered. First, the Tribe should attempt to reach progeny goals by preferentially using adults collected at Tumwater Falls. Second, when supplementing the upriver broodstock with early returning females collected at Dryden, the Tribe should preferentially include the earliest arriving fish. To the extent that migration timing is heritable, the progeny of early returning adults are expected

to be better adapted to ascend Tumwater Falls upon their return to the Wenatchee River. Different colored Floy tags could be used to differentiate when fish destined for the upriver broodstock are collected at Dryden. This is particularly important because maturation timing is typically not correlated with migration timing.

The Tribe plans to release juveniles produced from the upriver broodstock upstream of Tumwater Falls. This approach could allow them to imprint on upper Wenatchee River cues and should increase their ability or motivation to navigate over the falls when they return as adults. Juveniles produced from the lower river broodstock will be released at the project's usual acclimation sites, both upstream and downstream of Tumwater Falls. The plan to "backfill" the upper basin with juveniles produced from the lower river broodstock is reasonable as long as these releases do not cause density-dependent reductions in the growth or early emigration of juveniles produced from the upriver broodstock. Genetic and phenotypic changes will need to be monitored to address concerns over unintended effects of this selective breeding program.

We are pleased with the Tribe's thoughtful response and approach. Like them, we are hopeful that selective breeding will lead to the creation of a coho population that is better adapted to use available habitat in the upper Wenatchee River. The Tribe's response noted some infrastructure and logistical constraints on revising the breeding program. Although not specifically mentioned, we assume that facilities are available that can be used to separately rear fish produced from the upriver and lower river broodstocks. Currently, out-of-basin facilities are used to rear the project's coho. When revising the Master Plan, the proponents should describe how these difficulties will be overcome. Monitoring will be needed to document successes (and failures) and for guiding modifications to the plan.

The second issue we asked Yakama Nation researchers to discuss with CRITFC geneticists was the feasibility of using existing genetic samples to track and compare the success of progeny from four different coho crosses in navigating over Tumwater Falls. The goal of such a study would be to ascertain if fish produced from Tumwater x Tumwater Falls, Dryden x Dryden, and reciprocal crosses differ in their performance in reaching and passing over Tumwater Falls. In their response, Yakama Nation researchers indicated that they have been collecting genetic samples from all the coho used as broodstock since broodyear 2013. Data on who was mated with whom, broodstock collection site, spawn date, rearing facility, and release site were also recorded. These data along with Parentage-Based Tagging (PBT) will be used in the future to assess the relative performance of fish produced from the upriver and lower river broodstocks in navigating Tumwater Falls, and will likely provide new opportunities to assess and refine breeding and smolt release decisions. The findings from this study could also help to guide other recolonization programs in the Columbia Basin.