

RRS Project Review

Project ID: 2003-054-00¹

Title: Evaluate the Relative Reproductive Success of Hatchery-Origin and Wild-Origin Steelhead Spawning Naturally in the Hood River

Short Description: This project has been using genetic samples, collected from adult steelhead at Powerdale Dam between 1991-2010, to estimate relative reproductive success (RRS) over multiple brood years for two populations (summer and winter run) of hatchery and wild steelhead in the Hood River. To date, the results from this project show that hatchery steelhead have reduced fitness in the wild resulting from “extremely fast genetic adaptation to hatchery conditions.” While this project continues to work towards completing the full 19 year pedigree (4 generations) estimates of RRS of steelhead in the Hood River, the research focus has expanded to include identifying environmental conditions driving rapid adaptation to captivity and genetic traits under selections in the hatchery culture of steelhead.

Sponsor: Oregon State University

BiOp association:

RPA 64.1 Estimate relative reproductive success (RSS) of hatchery,
RPA 64.2 Determine if artificial production contributes to recovery

Is this an Accord project? No

Budget (2008 to present):

BPA	Total	\$3,103,893
	FY16	\$ 331,526
Cost share	No cost share	

Proposal from last Categorical Review:

<https://www.cbfish.org/Proposal.mvc/Summary/RMECAT-2003-054-00>

Most recent Council recommendation:

<https://www.cbfish.org/Assessment.mvc/CouncilRecommendationAssessmentSummary/Assessment/2003-054-00-NPCC-20110124>

** Sponsor has addressed Council recommendations.

¹ This is one of the six exclusively RRS projects in the program.

Date of most recent annual report available on Pisces/cbfish? FY15 Annual Report: *Reproductive Success-Steelhead in the Hood River*. Submitted April 2016.

<https://pisces.bpa.gov/release/documents/DocumentViewer.aspx?doc=P148409>

Short summary of project reporting compliance: Contract management and project performance has been excellent. Sponsor was on time with all annual reports. To date, 9 peer-reviewed scientific papers have been published from this project.

Summary of the scope of the project as it was reviewed by Council: The work to date on this project has “provided evidence that multi-generation hatchery stocks of steelhead are less productive when spawning naturally than non-captive fish, that a single generation in the hatchery results in depressed performance in the wild, and that hatchery effects on natural production persist in wild-born individuals with hatchery-born parents.” As such, the sponsor proposed to Council that future directions of work include the following objectives: 1) complete the full 19- year pedigree for summer and winter-run steelhead in the Hood River; specifically, test where the summer run F1 hatchery fish show fitness declines similar to that of the winter run F1 hatchery fish, 2) identify the selective mechanisms in the Hood River steelhead hatchery that make hatchery fish different from wild fish, and 3) identify the genes whose expression levels are under selection in the hatchery, which could point to the traits under selection. Specific mechanisms to be tested are rearing density, feeding methods, and flow regimes.

Summary of the scope of the project now: The research focus of this project has expanded to include examining the effects of environmental conditions (rearing density, flow regimes, structure) on fitness and performance, and identifying which genes are differentially expressed (DE) between wild and hatchery steelhead, which may point to specific traits that are under selection in the hatchery.

Has the scope of this project changed significantly since it was reviewed? The scope of this project has changed, but not significantly, since it was reviewed by Council. The sponsor has been successful at meeting the objective of estimating RRS of steelhead in the Hood River, and the focus of the project has expanded to understanding the causes of domestication selection in hatcheries.

Link to ISRP/AB Critical Uncertainties Appendix D review:

<http://www.nwcouncil.org/media/7149871/isabisrp2016-1appendixd.pdf#page=124>

Comments: This project is specifically listed in the 2008 FCRPS BiOp (RPA 64.1), and the May 2010 document on Recommendations for Implementing RM&E for the 2008 NOAA fisheries FCRPS BiOp (RPA 64.2). The sponsor addressed all Council and BPA project manager recommendations since the review, has been timely with all required deliverables and contracting deadlines, and the quality of their work is exemplary.

Questions to all project sponsors with RRS studies:

- How does this project inform (1) the Council’s Research Plan and (2) the Council’s Fish and Wildlife Program objectives?

- Can any results from this study be extrapolated to other geographic locations or other populations?
- How does the Idaho Supplementation Study inform this project?
- Does this project have any of the following elements:
 - (a) A scientific question
 - (b) A hypothesis
 - (c) A specific time frame within which to answer the question posed
- How was it determined which species or geographic area to study?
- How does this effort work or collaborate with other RRS projects on aspects of the study (methodology, data and conclusions)?
- How does **density dependence** factor in to this study moving forward?

Questions relative to this project:

- Results to date show that hatchery steelhead have reduced fitness in the wild. What more information is expected from this study?