



Independent Scientific Review Panel

for the Northwest Power & Conservation Council
851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204
www.nwcouncil.org/fw/isrp

Memorandum (ISRP 2015-6)

July 1, 2015

To: Phil Rockefeller, Chair, Northwest Power and Conservation Council

From: Greg Ruggerone, ISRP Chair

Subject: Review of Rock Creek Fish and Habitat Assessment, Project #2007-156-00

Background

At the Council's April 9, 2015 request, the ISRP reviewed the "Rock Creek Fish and Habitat Assessment for Prioritization of Restoration and Protection Actions" and supporting documents for the Yakama Nation's project #2007-156-00, *Rock Creek Fish Habitat and Assessment*. These assessment and prioritization documents were submitted in response to the Council's November 5, 2013 recommendation from the Geographic Category Review that the project proponent submit a "geomorphology and salmonid assessment report to the ISRP."

The project proponents describe the purpose of the project as follows:

"The overall goal of this project is to improve habitat conditions for steelhead trout (*Oncorhynchus mykiss*), listed under the Endangered Species Act (ESA), in the Rock Creek subbasin in southeastern Washington in order to support sustainable populations. This report describes results of the monitoring and evaluation activities, Ecosystem Diagnosis and Treatment (EDT) modeling, and genetic analysis of salmonid populations and habitat conditions in Rock Creek. The project also addresses information gaps identified in the National Oceanographic and Atmospheric Administration (NOAA)-Fisheries' *Recovery Plan for the Rock Creek Population of Middle Columbia River Steelhead* and the Northwest Power & Conservation Council's (NPCC) *Rock Creek Subbasin Plan*, which state that ongoing monitoring and evaluation within the Rock Creek watershed is a high priority."

This is the fifth ISRP review concerning this project:

1. An original proposal was submitted and reviewed as part of the Categorical Review for Research, Monitoring and Evaluation and Artificial Production projects ([ISRP 2011-44B](#), pages 201-202). The ISRP found that proposal needed further detail to allow a complete review.

2. The proposal was revised and submitted for review in May 2011. The ISRP found that although detailed information was provided for the steelhead population survey and PIT-tag interrogation work, similar details were needed for many other project components ([ISRP 2011-19](#)). The ISRP specifically requested more information on the Ecosystem Diagnosis and Treatment (EDT) assessment; plans for restoration; pathogen and temperature issues; protection of riparian plantings; plans to address cattle grazing and non-native fish; and study design and methods.
3. In February 2012, the proponent submitted another revised proposal to address the ISRP's concerns. The ISRP found that the revised proposal "meets scientific review criteria - in part (qualified)." The ISRP found that a deliverable associated with genetic work was not justified. For the qualifications, the ISRP asked for (A) a progress report describing the results of the project's various fish and habitat assessments, (B) an outline of a strategy for incorporating the results of various studies into an integrated management plan with provisions for incorporating new information as it becomes available, and (C) field-verified assessments showing that the proposed restoration actions will address factors that are known to limit the abundance and diversity of native fish species ([ISRP 2012-4](#)).
4. In 2013, the ISRP reviewed the project's proposal submitted for the Geographic Review of habitat restoration projects ([ISRP 2013-11](#), pages 81-84). The ISRP found that the project "meets scientific review criteria – in part (qualified)." The qualifications were that (A) the project's geomorphology and fish population reports should be reviewed by the ISRP when they become available and (B) the strategy for incorporating these data into the restoration prioritization process needs to be clearly described.

As noted above, the Council agreed with this ISRP qualification and recommended that the proponent complete its assessment and submit it for ISRP review. The ISRP's review of the assessment follows below.

ISRP Recommendation

Meets Scientific Review Criteria

The project proponents have addressed the concerns raised in the previous ISRP review and appropriately highlighted the most pressing issue—water availability. The four documents included in the response, along with several appendices, adequately addressed the ISRP's first qualification. These documents included a review of fish data collected between 2008 and 2013, a review of EDT model runs, a summary of reports about Rock Creek produced over the last several decades, and a Fluvial Reconnaissance Report (FRR) that provides a detailed geomorphic characterization of the lower reaches of the watershed. Together, these reports provide a fairly comprehensive overview of the status of steelhead and stream habitat in this system. The FRR, in particular, was well done. This work combined remotely-sensed data with a detailed field assessment of the physical conditions in Rock Creek within the area that the EDT analysis had identified as the most promising for habitat actions.

As a second qualification, the ISRP requested that the project proponents provide a description of the process that will be used to incorporate scientific findings into a restoration strategy. The FRR provides a high-level description of how improved understanding of conditions in Rock Creek will be used to develop a restoration strategy (illustrated in Figure 117, Page 103). This strategy provides a pragmatic assessment of the enormous challenges associated with steelhead recovery in Rock Creek. One critical issue, addressed in the genetic and FRR report, is that 85% of the adult fish entering Rock Creek are strays from other systems, mostly Snake River stocks. This fact raises issues about the significance of the Rock Creek population to recovery of the Mid-Columbia Steelhead ESU. If further investigation indicates that the Rock Creek steelhead population is supported primarily by stray fish from out-of-ESU populations, this conclusion should be a major consideration in decisions about implementing future habitat restoration actions in this watershed intended to benefit the Mid-Columbia Steelhead ESU. As stated in the FRR:

“At this point in time, active instream investment in habitat actions for steelhead in Rock Creek seems premature. Realistic habitat goals and objectives that account for intrinsic watershed constraints and address the proper hierarchy of population controls should be developed. For example, if the steelhead run is exogenous and sustained purely by annual influx of out-of-basin adults, efforts to enhance rearing or spawning habitat may be superfluous.”

Even if it is determined that a native Rock Creek steelhead population still persists, it is unclear if there are any effective actions that can be implemented to address absence of late-summer flow, the primary factor limiting productivity of the fish. Any restoration plan for Rock Creek must realistically evaluate the feasibility of increasing flow both now and in the future. The lack of high elevation areas to accumulate snow pack, low precipitation, minimal water storage in the basin, climate change, and increasing human water demands raise serious questions about the feasibility of improving this situation. Lack of late summer flow also exacerbates the impact of other factors that contribute to fish mortality, including high water temperatures and predation. Until the issue with summer flow is addressed, it would not seem a wise use of resources to implement any costly habitat manipulations. This concern is echoed in the FRR:

“Given risks and uncertainties associated with channel behavior, ongoing and expected watershed changes, lack of protection of instream flows, and unresolved benefits to Mid-Columbia DPS steelhead, high unit-cost treatments such as ELJs [Engineered log jams] should generally be avoided. More distributed, lower unit-cost treatments may be anticipated to have some short-term success, but their effectiveness will ultimately depend on instream flow protections and proper identification of meta-population relationships.”

ISRP Comments

1. Monitoring and Evaluation (Reports A and B)

Reports A and B provide an adequate overview of past monitoring and evaluation efforts. However, these reports do not examine whether water withdrawals might contribute to the lack of late summer flow in Rock Creek. This deficiency is rectified in the FRR, which indicates that although surface water withdrawals are not significant in the Rock Creek watershed, the number of wells has increased dramatically over the last 40 years and may be exacerbating summer low flow. Given the overriding importance of low flow in determining steelhead production in this system, all reports should have provided some assessment of the contribution of human water use to this condition.

Reports A, B, and FRR illustrate the impressive amount of fish and habitat data that has been collected in the Rock Creek watershed. However, the presentation of these results would benefit from some clarification in several instances.

- 1) The computational process used to expand pool-level parr population estimates to full watershed estimates was not described. Was the estimate simply an expansion of average parr density in the sampled pools to the total summer pool area in the watershed? This approach assumes all pools are equal in terms of ability to support steelhead. It should be noted that there can be considerable variability in steelhead abundance among pools due to factors such as pool depth and cover. The fact that pools >120 cm deep were not sampled could have introduced some error into the estimate. Some discussion of this issue should be included in the report.
- 2) The age 0/age 1 length break was set at 95 mm (page A-13). However, figure A-16 suggests that this break may have been somewhat less than 95 mm in spring and a bit greater than that in autumn. How was the age class length break determined?
- 3) Figure B-1 indicates that relatively few coho redds were seen in 2010-11. More redds were found in 2009-10, 2011-12, and 2012-13. However, juvenile coho density in summer 2011 (product of 2010-11 spawners) was by far the highest. Are there any theories as to what caused the high abundance of coho parr in 2011?
- 4) Report B briefly discusses a sediment study conducted at three locations in the Rock Creek watershed. This study simply compares pebble-count results from 2008 and 2011 and assumes that differences between those two dates can be interpreted as a trend. A trend cannot be determined from two data points. One of the sites was established to evaluate changes in sediment levels associated with replacement of the Bickleton Highway Bridge. No upstream reference site was used in this assessment, so it is not possible to assign changes in sediment levels between 2008 and 2011 to the replacement of the bridge. The FRR does discuss the limitations of this study.
- 5) Some of the water quality values presented on page B-27 seem to be suspect. For example, O₂ concentration for November-December at Luna Creek averaged 15 mg/l. Temperatures during these months averaged from 8° to 10° C. The O₂ saturation at these temperatures would range from 11.3-11.8 mg/l; 15 mg/l represents substantial oversaturation, about 130%. This value seems unlikely unless the sample was drawn

from a location with extreme turbulence or very abundant aquatic plants. What quality assurance checks were used for the water quality data?

- 6) The FRR indicates frequent, recurrent bed load movement due to winter high flow in the lower reaches of Rock Creek, where most steelhead spawning occurs. There was no discussion in the reports of the possibility that bed instability might be a persistent factor limiting spawning success.

2. EDT Modeling (Report C)

The EDT model runs described in this report did not yield highly specific results, and those results must be interpreted with full appreciation for the limitations of the model output. This fact was acknowledged in the report as it mentions that EDT model results contain considerable uncertainty and this uncertainty should be considered in identifying limiting factors and prioritizing habitat restoration actions. According to the proponents:

“Ecosystem models, such as EDT, have the ability to combine many environmental variables to identify habitat limitations and prioritize restoration activities. However, due to the large number of variables and the variability and uncertainty associated with each variable (particularly relating to historical conditions), there can be large uncertainties regarding the outputs.”

Moreover, the report does not provide much discussion of how this uncertainty might affect decisions about limiting factors or priority locations for habitat actions. A more detailed treatment of how the uncertainty was addressed in the interpretation of the EDT results would have been worthwhile.

It is not clear that EDT is appropriate to address a system such as Rock Creek that goes dry over much of its length each year. The manner in which EDT models food availability is especially problematic. EDT assumes that aquatic invertebrates are the primary food item used by fish. In the case of Rock Creek, it is very likely that aquatic invertebrates are essentially unavailable during the summer. Riffles are the locations of highest productivity for aquatic invertebrates, but these habitats appear to be mostly dry over much of Rock Creek in late summer and autumn. Moreover, drifting invertebrates that salmonid fishes typically rely on cannot drift without surface flow. Thus, it is likely that the primary food source for fish in isolated pools is terrestrial invertebrates, which are not included in the EDT model. In addition, Appendix A (page 23) indicates that the macroinvertebrate data input to the EDT model were primarily IBI scores. These scores mostly reflect invertebrate community diversity and do not provide a very good indication of food availability for fish. As food is a major determinant of the capacity of a system to support fish, the EDT projections of population metrics for steelhead should be viewed as very uncertain.

It is not clear what assumptions were made about historical flow levels for the “template” scenario in the EDT analysis. As no data were presented in reports A or B about factors

impacting flow (e.g., water withdrawals), how were estimates of pre-European hydrology generated?

Despite these concerns, the FRR exercise appears to have used the EDT output appropriately. EDT identified lack of flow as an attribute that limits the steelhead population in nearly every reach. This result seems reasonable although an EDT simulation was really not required to reach this conclusion. EDT also indicated that the reaches of Rock Creek with the greatest potential to support steelhead were in the lower 14 miles of Rock Creek and Squaw Creek, a major tributary. As a result, a detailed channel assessment was conducted on these reaches, reported in the FRR. The FRR combined field surveys with remotely-sensed data to identify site-specific factors limiting steelhead production and to identify possible restoration actions. Essentially, the EDT results were used to locate areas of the watershed where more intensive evaluations would be most valuable—an appropriate application of this modeling tool.

3. Genetics (Report D)

The information included in this report raises important questions about the value of restoring habitat for steelhead in Rock Creek. The proponents concluded that:

“Despite routine observation of large numbers of spawning steelhead, PIT-tag and genetic analyses suggest the vast majority were out-of-basin strays and the population is highly introgressed with the Snake River DPS. The consequences of this are unclear at this time pending determination of productivity and self-sustainability by ongoing PIT-tagging work by fisheries investigators.”

The only areas in the Rock Creek watershed that supported rainbow/steelhead trout with genetic characteristics distinct from Snake River stocks were located above natural migration blockages. The fact that fish collected below barriers were genetically dissimilar to fish from blocked areas indicates that fish spawning above the barriers contribute relatively little to the anadromous adult returns, perhaps because they produce few juveniles. The ISRP agrees that continuing research in this area, including the PIT tagging effort, will be valuable as it will perhaps help to resolve if the Rock Creek steelhead population should be considered a component of the Mid-Columbia steelhead ESU. The outcome of this work should be a major consideration in decisions about implementing future habitat restoration actions in this watershed.

4. Revegetation

Planting riparian areas at five locations along lower Rock Creek occurred from 2008 through 2012. The stated purpose of revegetation was to provide shade, thereby reducing summer water temperature, and providing a future source of large wood. Since lack of summer flow is the dominant factor impacting steelhead productivity, it is unclear why riparian planting was selected as the initial restoration project. This work seems premature.

The revegetation report was quite brief and lacked detail as to how revegetation sites were selected and provided little information about the physical characteristics of these sites. The FRR indicates that much of the channel of lower Rock Creek is highly mobile, with active bank cutting, channel migration, and avulsions occurring in response to high flows. Areas where high rates of channel movement are occurring would not be good potential candidates for revegetation projects. It is not clear if the projects implemented from 2008 to 2012 avoided these locations or not.

More significantly, the revegetation report fails to discuss the possible impact of denser riparian vegetation on summer flow. The FRR does discuss the role riparian trees may play in reducing groundwater input to the channel. Although the FRR restricts consideration of this concern to introduced, black walnut trees, it applies equally to any plant species with relatively deep roots. Some consideration of the trade-off between the potential benefits of denser riparian vegetation, at the cost of reduced water delivery to the channel, should be included in the design of a revegetation strategy for Rock Creek. As the FRR correctly points out, the ability to make informed decisions regarding these trade-offs will require a more complete understanding of groundwater/surface water dynamics in the Rock Creek watershed. If a major habitat enhancement effort is launched in the Rock Creek watershed, this topic should be a major element in a research and monitoring program.

5. Appendices

Covered above.