Approximately 60% of adult steelhead returning to the John Day River "overshoot" the John Day River mouth and are detected 119 km upstream at McNary Dam. After crossing McNary Dam, John Day steelhead must "fallback" in order to spawn in the John Day River. Overshoot creates direct (physical injury during dam fallback) and indirect (increased energy expenditure) risks to the survival and reproductive capacity of returning adults. Overshooting likely contributes to a 7-year mean Bonneville Dam to South Fork John Day conversion probability of 50%. This means that only half of the adult steelhead arriving at Bonneville Dam survive and return to their natal stream to spawn. Life-cycle models indicate substantial risk of quasi-extinction at this conversion probability. Model runs suggest quasi-extinction risk diminishes to near zero if conversion rate increases to 70%. A first step toward understanding the mechanisms driving overshoot and ultimately increasing conversion rate is to map migratory routes of John Day adult steelhead in the John Day Pool and determine if they enter the lower John Day River prior to overshoot.

Our research objectives are:

Objective 1: Quantitatively characterize the migration patterns of returning adult steelhead in the John Day-Columbia confluence area, and how those patterns influence the fate of each fish.

For this objective, we will use steelhead marked with acoustic and PIT tags to identify whether steelhead enter the John Day River prior to overshooting, and secondarily, use double tagged adults to estimate the proportion of overshoots that successfully return to the John Day River, without relying entirely on PIT tag detection as we do now. John Day PIT arrays (especially JD1) can have low detection efficiency during winter-spring high discharge. Having a group of acoustic and PIT tagged steelhead returning to the John Day should improve the precision of overshoot return estimates.

Objective 2: Estimate the proportion of acoustic tagged Wild A-Index steelhead that enter cold water refuge areas between Bonneville and John Day dams.

This objective informs ODFW’s management of Thermal Angling Sanctuary areas and also further supports Objective 1, as we will relate migration patterns and success to use or avoidance of cold water refuge areas.

To accomplish this, we will leverage the existing network of acoustic receivers in the John Day Pool (ODFW Sturgeon Research) and supplement this network with additional acoustic receivers in the John Day pool, John Day arm, John Day River, and at cold water refuge sites. Adult steelhead will be captured and acoustic tagged at Bonneville Dam in the Adult Fish Facility (AFF). Our work in the AFF will be fully integrated with CRITFC. We will process and collect identical data from each fish to ensure their utility to CRITFC’s ongoing monitoring. This will boost CRITFC sample sizes, which provide fishery management data (1f and 2c on p 43 of the US v. Oregon Management Agreement, III-F-2 on p 52 of the US v. Oregon Management Agreement). CRITFC has been under target sample size in recent years, our crew will help increase their sample size.

We will add acoustic and PIT tags in tall-dorsal adipose intact steelhead (dorsal height used to exclude un-clipped hatchery origin adults) that are < 78 cm to target adults returning to the John Day River. Adult steelhead that do not meet these criteria will be sampled per CRITFC’s direction using their protocol, but will not be acoustic tagged for this study. Recaptured adults originally PIT tagged in the John Day basin will also be tagged with gastric implant acoustic transmitters and integrated into the CRITFC sampling pool. We propose a “tiered” approach to acoustic tag distribution: reserve 20 tags for PIT tag recaptures (adults that were originally PIT tagged as juveniles in the John Day basin), allocate 180 for tagging of unmarked wild steelhead in proportion to the arrival timing distribution of John Day adults.  Acoustic tag deployment timing will, to the extent possible given temperature limitations on AFF operation, mirror the arrival timing distribution of John Day adults, which will be predicted from John Day adult PIT tag returns (n = 2,676). CRITFC will use genetic stock identification and sibship analysis (from 2017 brood samples ODFW collected throughout the John Day basin) to assign tagged adults to population groups. We estimated 13% of the tall dorsal adipose-intact steelhead PIT tagged at the AFF in 2017 ultimately ended up in the John Day basin. Through this strategy of post-hoc genetic assignment, in combination with some known-origin recaptures, we will gain useful data for the John Day River steelhead populations, as well as bolster the sample size and precision for monitoring of A-index steelhead at the Columbia Basin scale.

Anticipated tagging dates

Anticipated dates of operation at the AFF were determined from analyzing PIT tag data regarding the arrival timing of John Day origin summer steelhead at Bonneville Dam from 2002-2019. In order to account for sampling the entire run, we anticipate a start date of July 8th with an end date of September 30.

Mortality Estimation

Short-term post tagging mortality estimates for gastric implant procedures in adult salmonids are not readily available in the literature. Unsuccessful tagging studies are rarely reported and may occur more often than is reflected in the literature (Thiem et al. 2011). In studies involving surgical implant procedures of acoustic tags in pre-smolt *Oncorhynchus mykiss*, mortality for fish greater than 13 cm remained <10% (Welch et al. 2007). According to Michelle Rub (NOAA Fisheries), comparison of mortality between surgical and gastric implanted adult Chinook in the Columbia River found no difference based on tagging method. There was some mortality (likely due to pinniped predation) for both groups, but it was similar between methods (M. Rub, unpublished data). Survival from estuary tagging to Bonneville Dam of surgically tagged adult Chinook salmon reached 100% for some June tag groups. These groups were tagged in June when pinnipeds were absent and water temperature sometimes reached 15-17 C. On top of the standard 1% handling mortality estimate, we cautiously applied a short-term post tagging mortality of 3%, although the aforementioned evidence suggests that 3% may be too high.

For our study, anticipated acoustic tagging sample size of 300 wild adults would create an estimated 8 mortalities maximum (200 \* 0.04). This estimate represents a ‘worst case’ scenario. We anticipate that short-term mortality will be substantially lower. In the ‘worst case’ scenario, an 8 fish impact would represent .00024 (.024%) of the 2020 projected A Index wild return at Bonneville (33,300).

Take Reporting

Project Biologist Logan Breshears will provide a brief email each Monday to Ian Tattam (Project Leader), Jeff Whisler (ODFW TAC Coordinator) and Michele Weaver (ODFW Permit Coordinator). This email will summarize sampling by ODFW for the preceding week, quantifying: the number of wild steelhead handled, number of wild steelhead acoustic tagged, and the number of direct mortalities observed. If further updates or permit adjustment are required in-season, Ian Tattam will coordinate with Jeff Whisler as needed.

References

Thiem, J. D., Taylor, M. K., McConnachie, S. H., Binder, T. R. and Cooke, S. J. 2011. Trends in the reporting of tagging procedures for fish telemetry studies that have used surgical implantation of transmitters: a call for more complete reporting. Reviews in Fish Biology and Fisheries, 21: 117–126.

Welch, D. W., Batten, S. D., & Ward, B. R. (2007). Growth, survival, and tag retention of steelhead trout (O. mykiss) surgically implanted with dummy acoustic tags. Developments in Fish Telemetry (pp. 289-299). Springer, Dordrecht.