

Effectiveness Monitoring at Multiple Temporal and Spatial Scales to Quantify Biotic and Abiotic Responses to Stream Enhancement

¹Nicolas Romero, ²David Lindley, and ³Will Conley

¹Fisheries Biologist, Yakama Nation Fisheries Program – Klickitat M&E, PO Box 215, Klickitat, WA 98628, 509-369-3565, nromero@ykfp.org

²Habitat Restoration Specialist, Yakama Nation Fisheries Program – KWEP, PO Box 215, Klickitat, WA 98628, 509-369-3568, dlindley@ykfp.org

³Hydrologist, Yakama Nation Fisheries Program – KWEP, PO Box 215, Klickitat, WA 98628, 509-369-3183, will@ykfp.org

The Tepee Creek/IXL Meadows Restoration Project was completed in 2007 to address channel incision along a 573 meter stream reach. The treatment involved importing gravels to raise the channel bed elevation and addition of LWD structure to enhance in-channel habitat conditions for rearing *Oncorhynchus mykiss*, spawning steelhead, and restore flood plain-channel connectivity.

To validate study design, effectiveness monitoring of the IXL Meadows site is designed to evaluate multiple spatial and temporal scales within the context of *O. mykiss* life history requirements. Repeated surveys of residual pool depth and shallow groundwater wells monitor water quality conditions for *O. mykiss* during low flow limiting conditions. Single-pass electrofishing surveys are conducted annually to compare *O. mykiss* relative abundance estimates within the IXL Meadows and seven additional monitoring sites in Tepee Creek. Steelhead redd surveys are completed annually in Tepee Creek to compare redd densities in the IXL Meadows site to Tepee Creek at-large. Passive Integrated Transponder (PIT) technology is used to quantify the proportion of *O. mykiss* displaying residualized vs. anadromous life history, site fidelity, and population source-sink dynamics.

Results indicate pools have persisted perennially in all four years since construction within a reach that dried in 4 of 5 years pre-project. *O. mykiss* relative abundance estimates in the past three years were highest in the IXL Meadows site compared to the seven other monitoring sites in Tepee Creek. In addition, the number of *O. mykiss* out-migrating to the Klickitat River was greatest from the IXL Meadows site. These data suggest that *O. mykiss* show a preference towards the restored reach. Given the comparatively higher rate of out-migrants from the IXL Meadows site, the reach does not appear to be a population sink.

Post-treatment monitoring of the IXL Meadow site is an ongoing effort. Lessons learned from the IXL Meadows Restoration Project have been applied to develop a more comprehensive pre-and-post effectiveness monitoring study design for Tepee Creek Phase 2. A brief introduction of Phase 2 pre-treatment monitoring activities that incorporates a Before-After-Control-Impact (BACI) food web study will be presented.