Middle Fork John Day River Intensively Monitored Watershed

**Don't guess whether your river restoration achieved its goals: measure it.
We summarized 10 years of restoration and scientific monitoring.**

Middle Fork John Day River Forrest Conservation Area　　Photo credit: K. Handley

Key Findings from 10 Years of Monitoring (2008-2017)

FISH

- Stream temperature remained the most significant limiting factor for steelhead and Chinook populations in the Middle Fork John Day River (MFJDR) Intensively Monitored Watershed.
- Life cycle modeling can help prioritize actions by identifying which life stages of fish (juveniles vs. adults) are most limited by river conditions.

STREAM TEMPERATURE

- Although stream restoration has improved the quality and quantity of habitat, monitoring did not detect an increase in the fish population within the Middle Fork John Day River Intensively Monitored Watershed (MFIMW) time scale of 10 years. This is most likely due to high stream temperatures within the project reaches that require longer-term recovery.
- Tributary inputs of cold water to the mainstem MFJDR, rather than groundwater inputs from the mainstem floodplain, play the most important role in cooling the MFJDR.
- Solar radiation is the primary driver of temperature gain along the mainstem; therefore, channels with more surface area are more susceptible to temperature increases.
- Riparian plantings may reduce stream temperatures, but they require time and stewardship. Even when grazing livestock are absent, browsing pressure from deer and elk limited plant growth. Only ponderosa pine and thinleaf alder showed consistent growth; cottonwood and aspen were heavily browsed.

HABITAT

- The overall habitat index score had an improving trend for the majority of watershed-scale habitat monitoring sites; this result confirms the hypothesis that restoration actions would improve aquatic habitat at a watershed scale.
- Removal of livestock grazing on riverbanks allowed the spread of native bank-building and erosion-controlling vegetation, including torrent sedge. The increase in these plants caused beneficial changes to fish habitat by providing cover and helping to alter the river channel.
- Among the subset of projects monitored, channels did not significantly narrow and deepen or become more sinuous in response to restoration as hypothesized. Restoration projects in some locations did increase pool depth.

RESTORATION

- River restoration is a long-term investment. Given the lag time for riparian plantings to mature (15-40 years) and the 5-10 year life cycle of focal fish species, the limited fish responses to restoration actions are reasonable.

100 restoration projects implemented in the study area	**14** scientific reports on river restoration	**20** organizations participated in monitoring, restoration, and analysis	**17** student projects earned degrees at OSU, UO, PSU, and WSU	**213** jobs created from planning and project implementation	**$16.9** million brought into the local economy through projects

Study Area

Upper portion of the Middle Fork John Day River watershed ($2{,}088\ km^2$) in Oregon.

Focal Species

- Middle Columbia River steelhead (federally threatened)
- Spring Chinook salmon

MFIMW Goals

- Compare changes in watershed-scale productivity as a result of restoration actions in MFIMW for summer steelhead and spring Chinook salmon relative to the South Fork and Upper Mainstem John Day Rivers.
- Learn how specific restoration actions influence salmonid abundance, survival, and growth at the reach and project-scale.
- Understand how specific restoration actions impact instream habitat, riparian condition, and water temperature at the reach, project, and watershed scales.

RESTORATION ACTIONS

- Fish passage: 122 miles opened/improved
- Channel reconfiguration: 35 miles improved
- In-stream habitat: hundreds of complex wood structures
- Flow: 6 cfs instream increase
- Upland management
- Riparian fencing and plantings:
  - 21 miles of fencing
  - 15 miles of plantings

MONITORING ACTIONS

- Water temperature
- Fish production
- Macroinvertebrates
- Geomorphology
- Groundwater
- Socio-economic impact
- Models: Steelhead Lifecycle & HeatSource

Lessons Learned and Recommendations

Partners shared the following insights for ongoing planning, monitoring, and restoration efforts within the MFIMW. Many of these recommendations may translate to similar complex monitoring initiatives that include many partners and projects.

PLANNING

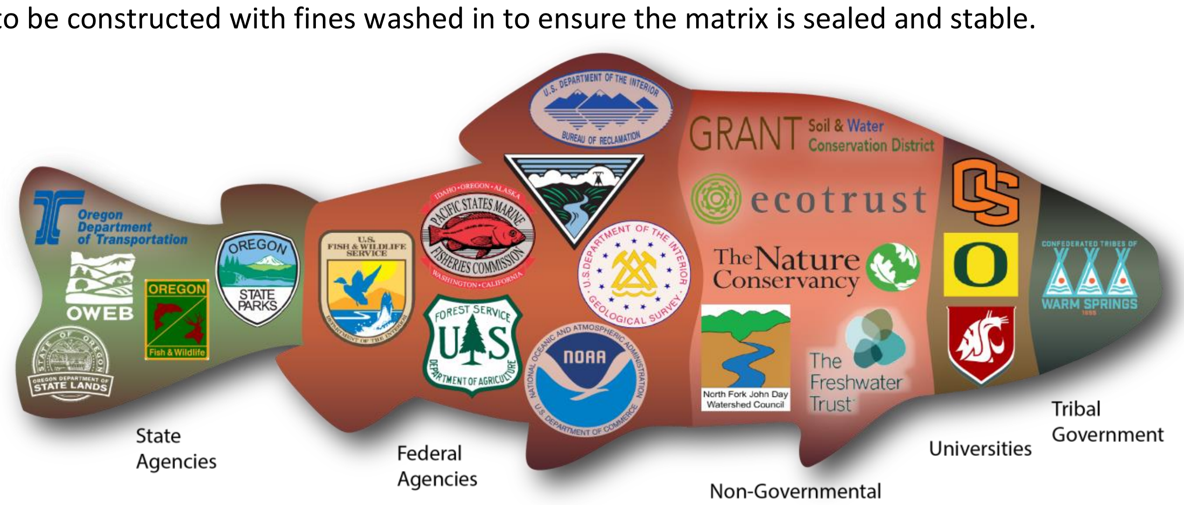
- Completely review all monitoring activities each year prior to the field season and before subsequent restoration activities occur to protect the integrity of the monitoring framework and research.
- Carefully consider the potential trade-offs between restoration actions during planning and design phases. Keep in mind the long-term benefits of increasing habitat quality/quantity and vegetation recovery with other factors, such as short-term elevated stream temperatures.
- Prior to implementation, determine whether restoration plans will increase stream surface area at low flow; models show that greater surface area could further elevate water temperatures.
- Identify socio-economic indicators and outcome measures in consultation with local officials and the community.

MONITORING

- Ideally, monitor both treatment and control locations for multiple years prior to restoration. This can help detect differences between natural background variation versus changes due to restoration actions.
- Data collection efforts should have established protocols across both temporal and spatial scales. A monitoring plan will help researchers determine which sampling sites are most important to sample consistently over time.
- Use life cycle modeling to predict the expected magnitudes and timing of fisheries responses from restoration, and to enhance the probability of success in detecting responses to restoration actions.

RESTORATION

- Expectations for restoration outcomes should be tempered with a realistic understanding of the rate at which natural systems can recover and account for relatively rare episodic events.
- Given the importance of temperature in habitat quality, focus riparian revegetation efforts in streams where shade is currently limited. Give careful attention to stewardship of plantings to maximize growth. Salvage and re-plant all existing on-site vegetation when possible and hire a full-time vegetation care specialist.
- Consider installing elk-proof fencing on major restoration efforts to protect riparian plantings if browsing will reduce plant vigor.
- To maximize potential for stream temperature reductions, consider the magnitude and location of cold-water inputs from tributaries and groundwater upwellings in restoration designs. Connecting known groundwater sources to the channel could create cooler habitats.
- Place wood that interacts with low-flow conditions, and consider side channels and other human features that constrain valley processes. Consider treating the entire reach and valley.
- Design channels with a profile where the riffle crest or head is the highest feature in the substrate. In streams subject to fish passage issues at low flows, riffles need to be constructed with fines washed in to ensure the matrix is sealed and stable.



This fact sheet provides highlights only. For details on restoration and monitoring, review the Middle Fork John Day River Intensively Monitored Watershed Final Summary Report (114 pages), available at www.middleforkimw.org.