Middle Fork John Day River IMW Accomplishments Report

Overview

The Middle Fork John Day River Intensively Monitored Watershed (MFIMW) (Figure 1) was established in 2008 and in 2017 we completed a 10-Year summary report detailing monitoring, restoration, and scientific findings from research and restoration completed from 2006-2016. The 10-Year Summary Report and more details about the MFIMW can be found here: http://www.middleforkimw.org/. Since completion of the 10-year Summary Report, we have continued with restoration and research and methods have been adapted and updated based on our findings. This Report summarizes our accomplishments from 2017-2020.

Focal Species: Spring Chinook Salmon *Oncorynchus tshawytscha and ESA threatened* summer steelhead *O. mykiss*

Limiting Factors: Water temperature, degraded floodplain habitat and channel structure, altered hydrology and sediment routing

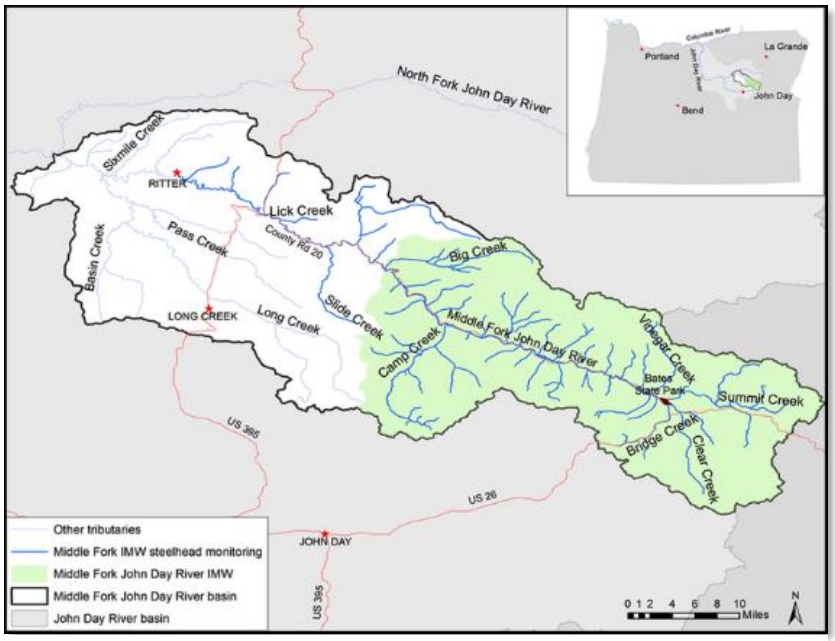

Figure 1: Middle Fork John River Intensively Monitored Watershed area. Inset shows the MFIMW area in relation to the Middle Fork John Day River basin, the John Day basin, and the state of Oregon.

***Restoration Strategy*:** Owing to the diversity of our partnership and adaption to past actions, our efforts increasingly focus on ecological process by approaching restoration through floodplain reconnection and riparian development. This approach allows us to broadly address both ecosystem function as well as habitat form as it relates to improving fish populations. The larger John Day Basin Partnership with Oregon Watershed Enhancement Board (OWEB) Focused Investment Partnership funding has further improved collaboration and coordination amongst MFIMW researchers and restoration practitioners. Since 2008, over 125 restoration projects have been implemented.

Restoration Accomplishments

From 2017-2020 partners completed or implemented over 25 major restoration projects within the MFIMW area including treatment of 29 miles of instream habitat; improving or protecting 14 miles of riparian habitat and removing or replacing 58 fish passage barriers. Additionally, partners initiated a Riparian Planting Group to focus and prioritize riparian planting efforts.

Figure 2. Examples of restoration in the MFIMW. ***Left*** – Holistic restoration of Bear Creek, tributary to the Middle Fork John Day River (MFJDR) included reconnection of Bear Creek to the MFJDR, removal of a fish passage barrier, and planting of 6000 hardwoods. Photo Credit: NFJDWC ***Right*** – EXAMPLE of riparian growth within an exclosure on Camp Creek, a tributary to the MFJDR. Photo credit: USFS-MNF

MONITORING RESULTS 2017-2020

Watershed Scale Fish – Monitoring efforts have not yet detected a change in steelhead or Chinook Salmon productivity compared to reference watersheds (Figure 3), and it will likely take several salmonid life-cycles (20-30 years) before improvements in productivity can be detected.

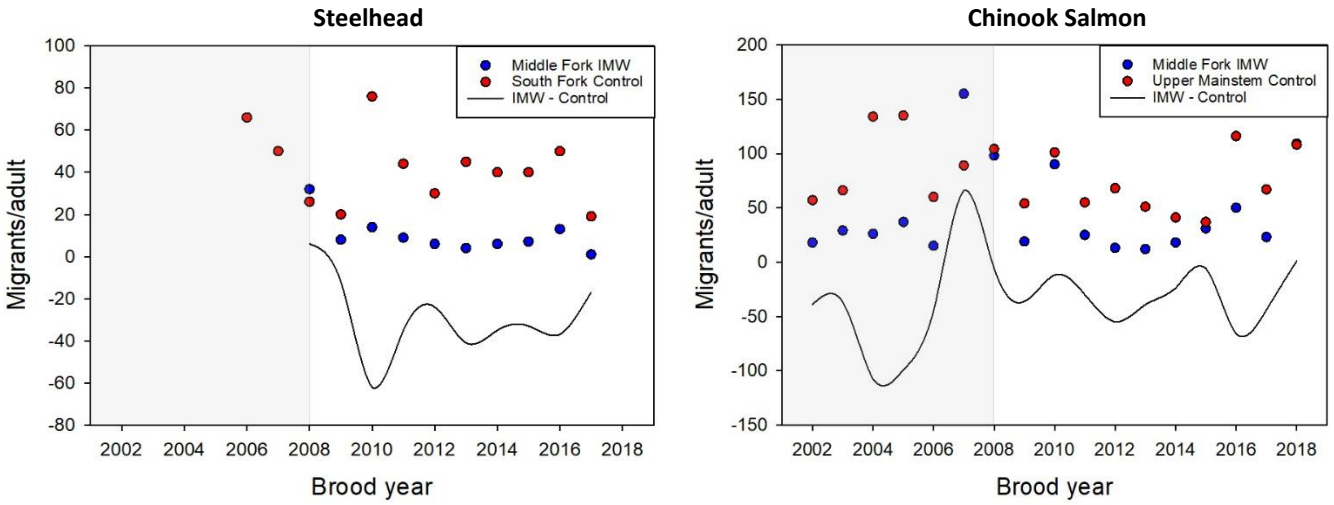

Figure 3. Steelhead and salmon productivity measured as outmigrants per adult spawner. Productivity measured in the MFJDR represented by blue dots; red dots represent productivity measured in reference watersheds (Upper Mainstem John Day River for Chinook Salmon; South Fork John Day River for steelhead). The black line represents the difference between MFIMW and reference productivity. Pre- and post- IMW implementation is represented by the grey and white shading, respectively.

Habitat – In 2019, we resampled 15 sites in the MFJDR and 10 sites in Camp and Lick creeks established in 2009/2008 and resampled in 2014 to track watershed-scale stream habitat condition changes following the Pacfish/Infish Biological Opinion Effectiveness Monitoring Program (PIBO) sampling methods. For complete analysis and results please read the full **PIBO report.**

Across all sites, temporal trends in cumulative physical habitat index scores were not statistically significant, but trends do indicate that for most metrics stream habitat is improving. However, analyses showed an increase in pool tail fines, across all sites, trending in the opposite direction than desired. This finding is likely a response to sediment sorting and an increase in fines due to the increased hydrologic complexity from large woody debris inputs during restoration.

MFJDR – Analyses show that the median particle size and macroinvertebrate Observed/Expected metrics increased and were trending in the desired direction. The temporal trend for median particle size is statistically significant.

Camp and Lick creeks – Analyses show that large wood frequency, residual pool depth, and percent pools increased and results are statistically significant. Both residual pool depth and percent pools are approaching reference conditions.

Figure 4. Photos for a PIBO site on the MFJDR showing subtle vegetation changes over three sampling events from 2009-2019.

Water Temperature **–** Elevated summer water temperature continues to be the limiting factor of greatest concern. Lack of mature riparian vegetation, and thus shade, is likely an important driver of elevated summer water temperatures that limit juvenile fish rearing capacity in the MFIMW. A large temperature monitoring network exists in the MFIMW, including 150 water temperature loggers located in both the mainstem MFJDR and tributary streams. Results of trend analyses show some areas of cooling, but the majority of locations display no significant trends. Since 2017 we improved management of loggers and water temperature data with an oversight group, dedicated data management system, and a shift to year-round temperature monitoring. These improvements have allowed the MFIMW to readily analyze and share water temperature data with partners and regional groups like NorWeST. These data have allowed restoration practitioners to identify and prioritize riparian vegetation improvement projects in areas of critical need where riparian vegetation is deficient and water temperature is above critical thresholds (Figure 5).

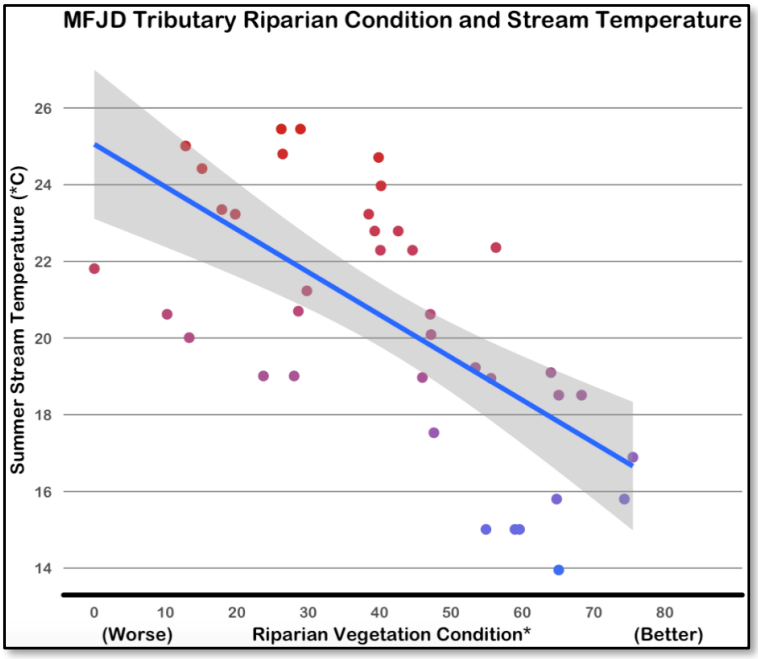

Figure 5. Riparian Vegetation Condition: Percent of area within a 60-foot buffer with vegetation 6 feet or taller. Points represent 80 measurements along segments within 38 tributaries to the MFJDR. Y-axis is the August average of the 7-day average daily maximum water temperature (7DADM) for 2017 when riparian condition was measured.

Adaptive Management and Research

How and what is being monitored now that we have over 10 years of data?

The 10-Year Summary Report resulted in a long list of lessons learned and recommendations for future restoration, research and monitoring, with a strong emphasis on the need to address water temperature, the limiting factor of greatest concern. Recent research has been focused on monitoring for localized near-term restoration responses. From 2017 to 2020, researchers examined the effects of water temperature and riparian shade on juvenile fish distribution and assessed spatial patterns in adult Chinook Salmon spawning before and after restoration. While average redd counts and spawner abundance remained static, Chinook Salmon redd density (redds/km) on the Confederated Tribes of Warm Springs' Oxbow Conservation Area more than doubled after restoration, as spawning shifted from upstream reaches to restored reaches (Figure 6).

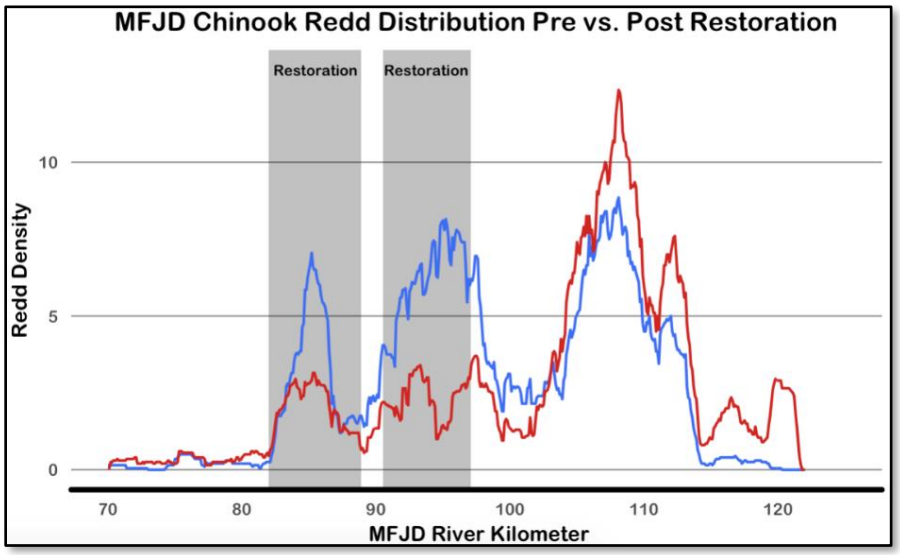

Figure 6. Chinook salmon redd density in the MFIMW area by river kilometer. The Red line represents average density of redds for pre-restoration years (2003-2010) and the blue line represents average redd density during post-restoration years (2011-2019). Grey bars show the location of major restoration activities on the MFJDR including the Oxbow project.

The detected changes in Chinook Salmon redd distribution demonstrated local and reach level effects of restoration, and in turn, inspired further investigation into juvenile salmon and steelhead movement and use of restored areas of the MFIMW in comparison to non-restored areas. Researchers are investigating whether juvenile density is actually increasing in restoration reaches or whether juvenile distribution is just shifting to restored areas. Recent juvenile movement tracking efforts suggest an over-summer survival bottleneck and tracking data will be used to identify survival patterns for restored and unrestored reaches.

Future MFIMW Monitoring and Research

Figure 7. Installation of a channel spanning PIT-tag array near Ritter, at the downstream end of fish monitoring in the MFJD. Photo Credit: ODFW

We continue to upgrade and refine recently installed channel spanning PIT-tag arrays to better detect fish movement and provide alternate methods for estimating population numbers (Figure 7). Juvenile movement and density data collection will continue, and we are evaluating differential survival and fish-habitat relationships at restored and unrestored sites where habitat was intensively measured at a reach scale. Efforts are underway to gain insight into the Chinook Salmon fry life stage using innovative sampling techniques, including parentage monitoring. A significant effort began in fall 2020 to collect genetic samples on Chinook Salmon carcasses and, in spring 2021, Chinook Salmon fry. This work aims to assign juveniles captured in the spring and summer back to their natal redds to document dispersal of juveniles from redds into the surrounding habitats. Tracking dispersal patterns from redds is yet another step in understanding how fish are utilizing available habitat and how restoration and changes in water temperature (due to restoration or climate change) influence movement and survival of juvenile salmonids. As restoration implementation efforts continue, ongoing research to assess shifts in movement patterns, reach use, and ultimately survival of juvenile salmon and steelhead in relation to specific locations and types of restoration will be key for determining effectiveness and guiding implementation of restoration projects. In conjunction with the parentage monitoring, researchers have estimated Chinook Salmon hatch timing using developmental models and observed water temperature data. We are sampling Chinook Salmon fry to assess emergence timing and duration to both ground-truth developmental models and repeat a 40-year old emergence timing study. In addition, a number of water temperature products are under development including a spatial stream network model which will predict reach scale average summer stream temperatures across the MFIMW area, and a model that will forecast water temperature and utilizes flow data from the MFJDR at Camp Creek gage. Stream temperature models tailored to produce biologically relevant variables at a reach- scale resolution will allow us to better track and evaluate changes in water temperature throughout the MFIMW area, allowing restoration practitioners to target projects in areas of highest impact. Finally, PIBO habitat monitoring will be repeated at 5-year intervals with the next sampling event occurring in 2024.

Partnerships & Funding

Collaborative funding for monitoring and restoration has supported the MFIMW Working Group since 2008. This diverse consortium of funders, restoration implementers, researchers, landowners, and agencies continue to work together to measure the effects of river restoration projects on salmon and steelhead at the watershed scale.