



OREGON
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ENHANCEMENT BOARD

Agenda Item F

Middle Fork John Day River

Intensively Monitored Watershed

2024 Summary Report

Board Meeting October 22-23, 2024



Oregon

Tina Kotek, Governor



OREGON
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ENHANCEMENT BOARD

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Agenda Item F supports OWEB's Strategic Plan priority #6: Coordinated monitoring and shared learning to advance watershed restoration effectiveness.

MEMORANDUM

TO: Oregon Watershed Enhancement Board

FROM: Ken Fetcho, *Effectiveness Monitoring Coordinator*
Courtney Shaff, *Monitoring and Reporting Manager*

SUBJECT: Agenda Item F – Middle Fork John Day River Intensively Monitored Watershed (IMW) 2024 Summary Report
[October 22-23, 2024, Board Meeting](#)

I. Introduction

Staff and partners from the Oregon Department of Fish and Wildlife (ODFW) and the Confederated Tribes of Warm Springs Reservation of Oregon (CTWSRO) will present the results of the Upper Middle Fork John Day River Intensively Monitored Watershed (IMW) 2024 Summary Report. This presentation will provide background on the long-term monitoring project, summarize the key findings from monitoring, discuss lessons learned from the combined restoration and monitoring efforts in the Middle Fork John Day River, and lay out future restoration and monitoring needs of the IMW.

II. Background

The IMW is designed to evaluate the implementation of watershed restoration projects over a large area and extended period of time to describe the collective benefits provided to salmon and steelhead populations, habitat, and water quality. Funders include the National Oceanic and Atmospheric Administration (NOAA) Fisheries, via the Pacific States Marine Fisheries Commission (PSMFC), and OWEB. Partners in the IMW have coordinated their work together to evaluate and document watershed restoration actions and ecological conditions since 2008.

In 2008, OWEB began administering PSMFC funding for groups conducting monitoring in the IMW. OWEB was a key convener of the IMW in coordination with ODFW, CTWSRO, North Fork John Day Watershed Council, the Malheur National Forest, and other important partners. In 2017, a 10-Year Summary Report was completed. Since 2023, OWEB has worked with partners to identify eight contributing authors to complete their data analysis, synthesis, and interpretation of monitoring results to develop this summary report.

III. IMW 2024 Summary Report

[The 2024 summary report](#) builds off the 10-Year Summary Report completed in 2017 and represents additional years of work and voluntary reporting by a number of agencies and individuals, conducting restoration, research, and monitoring activities in the upper Middle Fork John Day River. On a voluntary basis, the principal investigators and their co-authors wrote individual reports, describing their recent research and findings. The reports were compiled, along with pertinent background information, to share the most current information and findings emerging from the IMW.

IV. Recommendation

This is an information item only.

V. Attachments

- A. Middle Fork John Day River IMW 2024 Summary Report – Executive Summary

MIDDLE FORK JOHN DAY RIVER

INTENSIVELY MONITORED WATERSHED

2024 Summary Report

PREPARED BY THE MIDDLE FORK IMW WORKING GROUP



Photo credit: CTWSRO

Oxbow Conservation Area below Granite Boulder in Phase 2 of the Mine Tailings Restoration Project.

Suggested Citation for Report: Middle Fork IMW Working Group. 2024. Middle Fork John Intensively Monitored Watershed Summary Report



Credit: OWEB

MFIMW partners discussing the future restoration activities in the upper MFJDR Phipps Meadow.

Executive Summary

The Middle Fork John Day River (MFJDR) basin, located in northeast Oregon, has experienced nearly two centuries of land management practices that have contributed to the decline of federally threatened Mid-Columbia summer steelhead *Oncorhynchus mykiss* and depressed spring Chinook Salmon *O. tshawytscha*. Activities such as beaver trapping, road construction, clear-cut logging, fire suppression, channel rerouting, floodplain and wetland drainage, grazing, and mining have all had a lasting impact on the MFJDR. While the most damaging of these practices have been curtailed, their enduring adverse effects persist, resulting in and now recognized as key limiting factors to steelhead and salmon recovery in the MFJDR (CBMRCD 2005; Carmichael and Taylor 2010). Limiting factors include degraded floodplain function and connectivity, reduced habitat quantity, quality, and diversity, increased water temperature, and altered hydrology and sediment routing. A primary strategy to address the conditions that hinder salmonid recovery in Columbia Basin tributaries, including the MFJDR, is habitat restoration. However, investments in salmonid habitat restoration oftentimes do not include effectiveness monitoring (Roni et al. 2002; Roni P. ed. 2005, Bernhardt et al. 2005), leaving project planners to rely upon anecdotal evidence to infer benefits to fish populations.

To address this problem, an Intensively Monitored Watershed (IMW) program was created across the Pacific Northwest (PNW) to monitor fish population responses to restoration actions, evaluate restoration effectiveness, and better understand the relationships between fish and habitat. In 2008, the MFJDR joined the IMW network, with funding through the National Marine Fisheries Service (NMFS), in coordination with the Pacific States Marine Fisheries Commission (PSMFC), and the Oregon Watershed Enhancement Board (OWEB).

The primary goals of the Middle Fork Intensively Monitored Watershed (MFIMW) are to:

- A. Evaluate the overall impact of restoration actions to summer steelhead and spring Chinook Salmon in the Upper MFJDR, and
- B. Understand how specific restoration actions impact instream habitat, temperature, and salmonid metrics at the watershed, sub-watershed, and reach scales.

The MFIMW working group dedicated 2023 to evaluate and summarize:

- 1) Restoration actions and recommendations.
- 2) Findings from the MFIMW for ongoing research or new projects initiated since 2017, including eight individual research reports.
- 3) Adaptive management strategies implemented since the last MFIMW summary report was completed in 2017.

Additionally, we produced another set of lessons learned and recommendations from the members of the MFIMW working group to guide future restoration and monitoring approaches.

Restoration Actions

From 2008 to 2022, 149 restoration projects were implemented along the upper mainstem MFJDR and its tributaries, including 73 miles of instream habitat treated, removal of barriers that improved access to 135 miles of habitat, instream water leases that protect over 6 cfs of flow, and riparian planting and fencing along 39 stream miles. This habitat restoration work aimed to target key limiting factors, including decreased habitat complexity, degraded floodplain function and connectivity, and high water temperatures, (see [the restoration inventory table; Table 1](#)). Many of the restoration projects were multi-faceted and designed to simultaneously address multiple limiting factors, with the intent of maximizing ecosystem benefits from restoration investments. Restoration actions were applied throughout the basin ([restoration map; Figure 10](#)), with areas of concentrated restoration occurring on the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO)-owned Oxbow Conservation Area (OCA), Middle Fork Forrest Conservation Area (MFFCA), Dunstan Conservation Area (DCA) and the USFS-owned Camp Creek watershed. Restoration action types shifted slightly from the 2008-2016 to the 2017-2022 time periods, with more projects focusing on riparian improvement, floodplain connectivity, and instream restoration and fewer projects implementing instream flow restoration or fish barrier removals in the latter time period.

Key Findings

We found that approximately 86% of recommendations from the 2017 10-year Summary Report were addressed, have been partially addressed, or are part of ongoing efforts to address. These findings suggest that there was wide awareness of the recommendations and a deliberate intent to address them through improved planning, monitoring, and restoration efforts.

We are beginning to document signs of positive responses to restoration, despite the lack of a documented population-level increase in freshwater fish productivity. Areas of monitoring that are demonstrating positive responses include reach-scale fish response across multiple life stages, improvements in macroinvertebrate community assemblages, increases in riparian vegetation, increased stream channel and instream habitat complexity, and stabilization of water temperatures in some areas of the MFJDR where extensive restoration has occurred ([Chapters 1, 2, 3, 5, 6, 7, 8](#)).

Watershed scale Response of Salmonid Populations to Restoration Actions

We monitored watershed-scale summer steelhead and Chinook Salmon response to MFJDR restoration, including evaluating the underlying mechanisms driving observed responses. While abundance is an

important metric for population assessments, productivity estimates (measured as the number of out-migrating offspring (juveniles) produced per adult) are key indicators of population responses to watershed restoration activities and can help us understand drivers of population dynamics, factors limiting population productivity, and relationships between freshwater habitat and capacity ([Chapters 1, 2](#)).

Detecting restoration responses in the MFIMW has been challenging given the size, diversity, and long-time span of restoration actions in the basin. The first 10 years of watershed-scale salmon and steelhead evaluation showed relatively little change in abundance or productivity when compared to reference watersheds (South Fork John Day (SFJD) population for steelhead, and John Day River Upper Mainstem portion (JDUM) for Chinook Salmon). Key findings for steelhead and Chinook Salmon are presented below:

Steelhead:

While steelhead productivity in the MFJDR has not increased since 2008, it also has not declined over the past 5 years, whereas the SFJD reference steelhead population has. The stable trend observed in the MFJDR potentially indicates either a positive response to improved habitat conditions or inherently more climate-resilient conditions for steelhead rearing in the MFJDR than in the SFJDR. Results at the watershed scale show that steelhead recovery is hindered by density dependence at the juvenile life stage likely due to limited rearing habitat and high stream temperatures. Density-dependent processes occur when population growth and survival are influenced/regulated by the density of the population, such that increasing adult production results in decreasing additional juvenile production ([Chapter 1](#)).

Chinook Salmon:

Chinook populations experienced very low adult and juvenile abundances in multiple years, likely due to environmental conditions including high water temperatures and low flow, which negatively affected freshwater productivity. The MFJDR population of adult Chinook Salmon experienced significant pre-spawn mortality in five of the last fifteen years because of low stream flows coupled with high temperatures in early summer. While Chinook abundance and productivity have not significantly increased since the inception of the MFIMW, freshwater productivity measured as smolts per redd show an increasing trend in the MFIMW when compared to the reference watershed population in the Upper John Day River mainstem from brood year 2016 to 2019. In addition, Chinook adults are redistributing spawning activity to restored reaches along the mainstem MFJDR. This result indicates that further restoration may create more desirable spawning locations for Chinook Salmon and may create population resilience by distributing spawning locations across the watershed. Improved spawning habitat coupled with targeted restoration to improve juvenile rearing habitat and reduce water temperatures will benefit Chinook abundance and productivity. Elevated stream temperature conditions must be improved before we expect to see any response to restoration actions targeted to reduce density dependence through increased habitat quality ([Chapters 1, 2, 3, 4](#)).

Mechanistic Understanding of Restoration Actions

- Long-term (20+ years) habitat trend monitoring showed that positive habitat responses including deeper residual pool depths, narrower channel widths, increased habitat complexity, and higher large wood densities, were greater in some reaches where both passive and active restoration

approaches were applied compared to reaches where only passive restoration or adaptive grazing management was implemented ([Chapter 5](#)).

- Long-term monitoring is critical because changes to water temperature, habitat, ecosystem dynamics, vegetation, and geomorphology in response to restoration can be slow, often taking more than a decade to realize ([All Chapters](#)).
- The active placement of wood into streams “jump-started” an otherwise slow, long-term process (i.e., natural wood recruitment), yielding increases in large wood in active treatments that were not observed in reaches where only passive restoration treatments were applied ([Chapter 5](#)).
- Long-term ecological monitoring suggests that the active placement of in-stream wood and the passive-induced (i.e. reduced grazing) expansion of streamside vegetation, along with shifts in species composition (especially, *C. nudata*), were both contributing to enhanced habitat complexity ([Chapter 5](#)).
- In adaptive grazing lands (i.e. private ranches), some of the metrics assessed were also moving in a positive direction toward restoration goals, suggesting that adaptive grazing practices are indeed evolving over time, although responses were not as strong as shifts on lands where restoration was the key priority and our observation is based on a small sample size ([Chapter 5](#)).
- Though plantings have been intensively installed, the OCA riparian area remains sparsely vegetated by woody stems with little canopy cover present. The vegetation study conducted on the OCA in 2021 showed low survival of installed plants, with almost a fifth of the plants being lethally browsed by small rodents within the first-year post-installment ([Chapter 6](#)).
- Raising the groundwater elevation was a fundamental goal of the OCA restoration project to encourage groundwater recharge to the stream and to increase the duration of floodplain inundation. Results show increased water elevation levels at one well and more consistent ground water elevation levels throughout the summer months at another well ([Chapter 6](#)).

Restoration Impacts to Macroinvertebrate Related Findings

- We are seeing some positive responses across some metrics in areas of intensive restoration for example, benthic macroinvertebrate data analysis suggests that the MFJDR supports more diverse and species-rich assemblages of benthic communities that are less tolerant to fine sediment and thermal stress than those in the SFJDR ([Chapter 7](#)).
- Macroinvertebrate benthic and drift data indicated positive post-restoration changes in ecological conditions at one site located in the DCA. The DCA is a conservation property operated by the CTWSRO that has had several passive and active restoration actions implemented over a long period of time. In addition, the long-term monitoring of vegetation and habitat conditions in the DCA performed by McDowell et al. (2018) demonstrated improving conditions including narrowing channel widths, increasing wetland vegetation presence, LWD amounts, and stream habitat complexity (Chapters [5](#) and [7](#)).
- Of the 14 drift sites evaluated, 8 showed significant increase in the number of mayflies and 4 showed significant increase in drift concentration, of which 3 of those 4 also showed a significant increase in drift biomass, collectively indicating improved food availability for juvenile salmonids.

These 3 sites are in the DCA and OCA and have had several large-scale restoration actions implemented over time ([Chapter 7](#)).

- No consistent relationship was detected between restoration intensity and macroinvertebrate community response. A general lack of consistent temporal trends or consistent pre/post-restoration changes in benthic and drift communities suggests that ecological conditions have remained largely unchanged in the MFIMW over the 2010-2022 monitoring period ([Chapter 7](#)).

Temperature Related Findings

- Focused parr-to-smolt survival monitoring across the riverscape identified a central zone within the MFJDR where high water temperatures negatively impact juvenile Chinook Salmon survival. Restoration effectiveness will be maximized when information on the impact of temperature, at the reach-scale, is incorporated into a restoration prioritization framework. ([Chapter 2](#) and see [Juvenile Chinook Limiting Factors map figure](#)) (Figure E1).
- Chinook Salmon parr originating in sections with high water temperatures dispersed to cooler mainstem or tributary reaches, demonstrating that high water temperatures were a primary driver of Chinook Salmon parr dispersal in 2021 ([Chapter 4](#)).
- Mainstem MFJDR Chinook Salmon parr density was negatively associated with maximum July water temperatures. While the estimated total parr abundance within the mainstem accounted for 71% of all parr within MFJDR, the highest estimated parr densities were in Granite Boulder Creek, and mean density was greater in six of the nine tributaries compared to the mainstem ([Chapter 4](#)).
- Water temperatures over the life of the MFIMW have remained stable with no consistent warming or cooling trend during a period of increasing average air temperature and decreasing annual mean streamflow ([Chapter 8](#)). The stable water temperature trend as air temperatures were warming and streamflow was decreasing suggests that additional factors such as restoration actions and passive riparian regrowth may be stabilizing or otherwise mitigating for expected warming with increased air temperature and decreased flow ([Chapter 8](#)).
- Significant trend results for unadjusted water temperature metrics were dominated by tributary locations (over mainstem locations). Significant water trend results were relatively evenly split between increasing and decreasing trends. Fewer decreasing trends were significant for locations within restoration reaches compared to unrestored reaches ([Chapter 8](#)).
- Across all water temperature metrics there were 34 sites that demonstrated a decreasing trend in water temperature, 14 sites were located in restoration reaches and 8 were located in the OCA ([Chapter 8](#)).

Restoration Recommendations

We recommend implementing restoration aimed at reducing high temperature effects (Figure E1). Specific actions include:

- Convert long ‘fast non-turbulent’ (FNT) habitat units into a series of pool/riffle habitat units.
- Narrow the channel through island formations.
- Reconnect the stream to the floodplain to facilitate the re-establishment of a riparian corridor and promote floodplain-derived hyporheic exchange.
- Develop and execute a planting strategy that prioritizes planting species that will grow quickly and provide stream shade (i.e., alders), followed by those that will create a diverse and sustainable riparian community and will be able to contribute large wood to channels in future years (i.e., willows and cottonwoods etc.). In some areas (i.e, mainstem MFJDR in the OCA), rodent-proofing young plantings, even when inside an 8-foot elk exclusion fence, is important for maximizing early-life plant survival.
- Maintaining the riparian fence downstream of river kilometer (rkm) 95.0 and continuing to invest in a viable planting strategy.

In addition, specific restoration actions should be implemented to protect and expand cool-water thermal refugia, thereby maximizing restoration effectiveness. Within the MFJDR, thermal refugia is found within and at the confluences of cool water tributaries (i.e., Granite Boulder, Vinegar, Davis, Dead Cow and Deerhorn creeks etc.) and several kilometers in the MFJDR downstream of RKM 95.0 (Granite Boulder Creek confluence) (Figure E1). Specific restoration actions to protect and expand cool-water thermal refugia include:

- Strategically place wood structures to deflect mainstem water and capture tributary water at confluences, with the goal of expanding the volume of cool-water plumes created at confluences.
- Maintain or improve connectivity to cool-water tributaries (i.e, Caribou Creek, Vinegar Creek and Bridge Creek).

Increasing the amount of high-quality physical habitat to reduce density dependence (alternatively viewed as increasing juvenile carrying capacity) among stream salmonids may be an effective strategy within the confines of suitable stream temperatures; especially considering these recommendations:

- Of the sites examined in chapter 2 (RKMs 94.5 to 114.2), restoration to alleviate density-dependent growth factors is hypothesized to be most effective near rkm 106.6 (~1.3 km upstream of Caribou Creek) and 107.7 (~0.5 km downstream of Dead Cow Gulch), and least effective around river kilometers 105.9 (0.6 km upstream of Caribou Creek) and 109.7 (0.3 km downstream of Vinegar Creek) (Figure E1).
- Restoration targeting Chinook fry carrying capacity should activate floodplain features within 1 km of high-density spawning areas. Activated floodplain features should be designed to maintain

connectivity with mainstem channels during low flows to avoid fry stranding and allow juveniles to access and benefit from floodplain food resources and favorable thermal conditions (Figure E1).

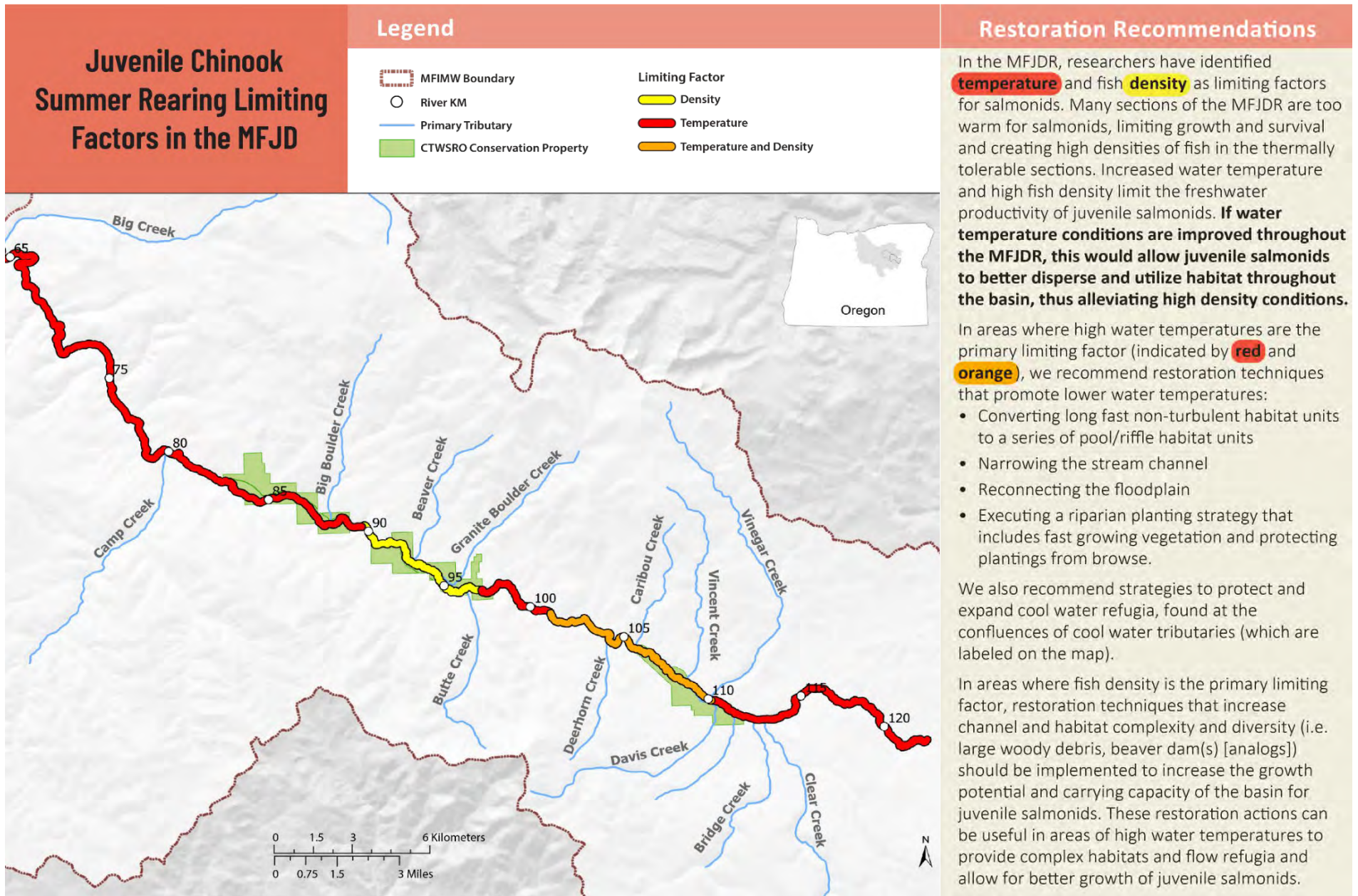


Figure E1: Map of restoration recommendations in the MFJDR.

Adaptive Management

Adaptive management is an important tool that should be used to guide restoration actions and be integrated within an IMW framework (Bouwes et al. 2016). Eighty-six lessons learned and recommendations emerged from the [2017 10-Year Summary Report](#). Using an adaptive management framework, the MFIMW Working Group evaluated how many recommendations were addressed by MFIMW partners from 2018-2023. We asked the researchers and restoration practitioners to reflect on the lessons learned and recommendations based on their involvement with the MFIMW, and recorded the number of recommendations that had been addresses, partially addressed, or not addressed overall and within the categories of planning, monitoring, and restoration. Results show approximately 86% of recommendations from the 10-year Summary Report (2017) were addressed, have been partially addressed, or are part of ongoing efforts to address, and suggest wide awareness and deliberate intent by MFIMW partners to incorporation recommendations through adjusting planning, monitoring, and restoration efforts.

To capture additional lessons learned and recommendations since 2018, we asked each contributing author and restoration practitioners to respond to a series of questions. These responses were summarized, and we grouped paired lessons learned and recommendations into three main topics: Planning, Monitoring, and Restoration. These lessons learned and recommendations provide valuable insights for ongoing planning, monitoring, and restoration efforts within the MFIMW and similar restoration efforts in the Mid-Columbia Basin. Full results of the new lessons learned and recommendations that were captured since 2018, and examples of how adaptive management was applied by MFIMW partners can be found in the [Adaptive Management Section](#).

Next Steps

The MFIMW Working Group compiled a list of next steps to best utilize the list of lessons learned and recommendations and how to efficiently disseminate the information gained through this report.

Efforts include:

- 1) Examining and implementing new lessons learned and recommendations
- 2) Evaluating consistency of lessons learned from the current Summary Report with the 10-Year Summary Report
- 3) Developing an outreach strategy to report MFIMW key findings to a variety of audiences, ranging from basin-wide partnership meetings to conference presentations
- 4) Updating the MFIMW public website with Summary Report findings and content
- 5) Initiating conversations with partnering agencies (ex. NMFS, PNAMP, additional IMWs) to reflect on the MFIMW findings across the broader IMW network and determine additional next-steps for encouraging implementation of lessons learned and recommendations to decision-makers and practitioners

Through these efforts, we hope to improve communication and implementation of lessons learned and recommendations for future evaluations.