WALLA WALLA BASIN
WATERSHED COUNCIL

Water Temperature Monitoring in the Walla Walla Basin

2021-2022 Water Year

FINAL REPORT

Submitted: February 2023

In Cooperation with:

DEQ
State of Oregon
Department of
Environmental
Quality

BONNEVILLE
POWER ADMINISTRATION

OREGON WATERSHED ENHANCEMENT BOARD
OWEB

Abstract

This project has 16 existing water temperature monitoring sites on the Walla Walla River on the Oregon portion of the Walla Walla basin in Umatilla County near Milton-Freewater. This project collects water temperature data on the Mainstem Walla Walla River from the Oregon and Washington state line to the North Fork and South Fork Walla Walla River confluence, on the South Fork up to Harris Park, and in the North Fork Walla Walla River. Data are needed to monitor groundwater and surface water interactions, provide data for fisheries managers, and inform local water management and habitat decisions. The Walla Walla Basin Watershed Council uses similar guidelines that the Oregon Department of Environmental Quality use for surface water monitoring and base our standard operating procedures on their guidelines.

Introduction

Overview

The WWBWC collected water temperature data on the Walla Walla River at 16 sites in Oregon; some monitoring sites have data sets going back 24 years. Water temperature data loggers were deployed in the late spring/early summer after water levels dropped to safe levels. Monitoring occurred in the Mainstem Walla Walla River from the Oregon and Washington state line to the North Fork and South Fork Walla Walla River confluence, on the South Fork up to Harris Park, and in the North Fork Walla Walla River. The uppermost monitoring site was located on the South Fork near the BLM boundary. Monitoring continues downstream, capturing changes in the river as it flows through the canyon. Monitoring locations also track temperatures as the river approaches the city of Milton-Freewater and enters the municipal levee with reduced vegetation. Sensors deployed through the leveed reach captured the highest water temperature values, while locations near the state line documented the cooling effects of groundwater returns below the levee system.

The primary objectives of the WWBWC Water Temperature Monitoring network are to:

- Monitor groundwater/surface water interactions
- Provide data for fisheries managers
- Inform local water management/habitat decisions

Walla Walla Basin Overview

The Walla Walla basin covers an area of approximately 1,760 square miles. It lies on the western side of the Blue Mountains, about 70 miles west of where the border between Oregon and Washington meets the Idaho border (Figure 1). The Walla Walla River flows westerly from its headwaters in the Blue Mountains into the Walla Walla Valley. The river then heads north, diverting a large portion of the flow into a distributary network that delivers winter and spring flows across the valley floor. Historically, these distributary channels provided off-channel habitat for fish and other wildlife, allowing a significant amount of water to seep into the soil and recharge the valley's unconfined shallow alluvial aquifer system. The decline of the shallow aquifer has been documented for several decades. It has led to substantial investment by local, state, and federal

entities in artificial aquifer recharge projects designed to restore historic function and provide for agricultural needs.

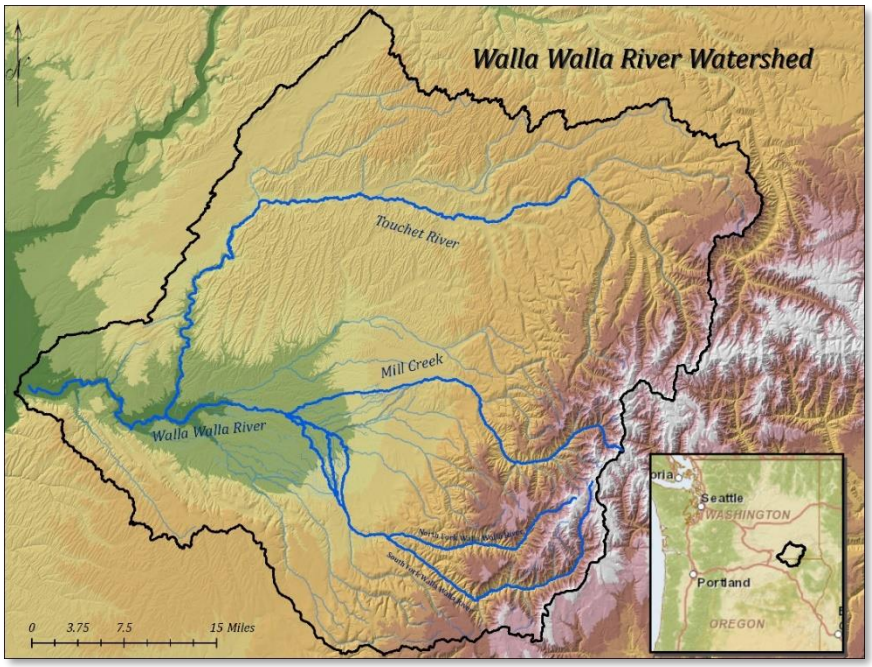

Figure 2. The Walla Walla Basin

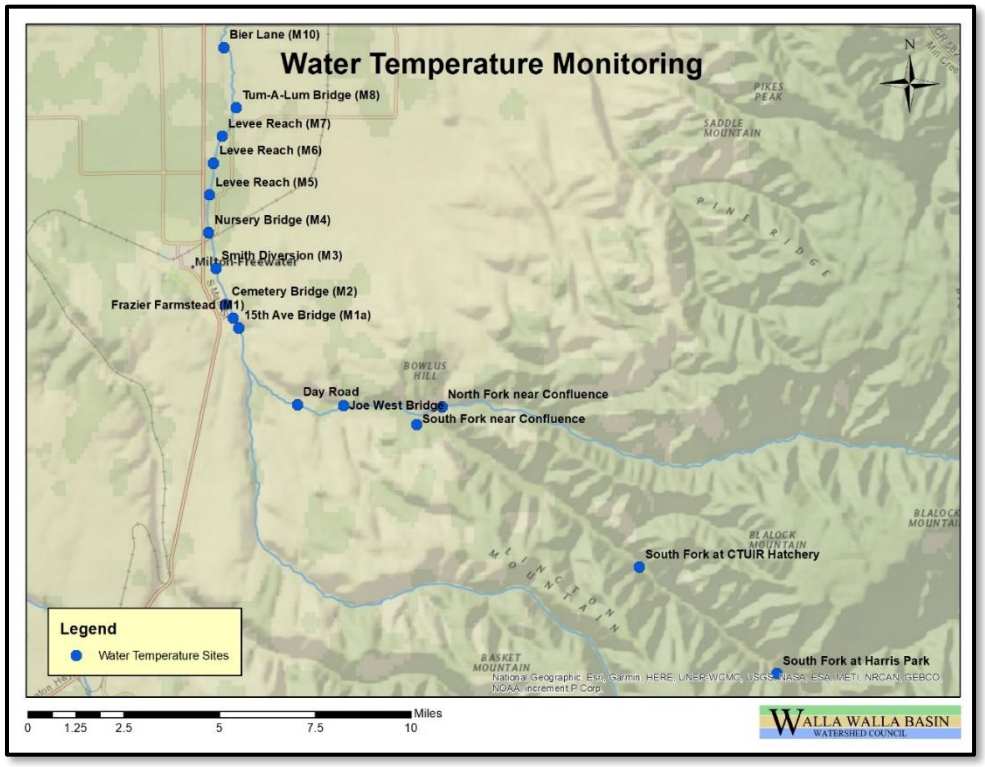

Figure 1. Map showing current water temperature monitoring sites as of September 2022.

Methods

All monitoring is conducted according to our standard operating procedures[1] based on Washington and Oregon state methods for water temperature monitoring.

Water Temperature Monitoring Sites

Since the early 2000s, the WWBWC has monitored water temperature along the Oregon portion of the Walla Walla River (Figure 2). For a complete explanation of methods, please see the WWBWC's Standard Operating Procedures – Version 1.3, available at www.wwbwc.org. Each site has deployed an Onset Hobo data logger or In-Situ Leveltroll 300 pressure transducer (Figure 3). Data are recorded every 15 minutes. Pre and Post-deployment quality checks are completed for all water temperature loggers. Field checks are conducted with either a NIST-traceable VWR thermometer or a YSI-30 water temperature meter.

Figure 3. The equipment used to collect the water temperature data

Data Processing

Data are processed using the AQUARIUS time series software (www.aquaticinformatics.com). The water temperature recorded by data loggers is graphed with manual water temperature readings collected using a NIST-calibrated thermometer. If needed, offsets and drift corrections are applied to align logger data with manual measurements. All data corrections are documented within the software and annually reviewed for approval. Data are graded according to the alignment of logger data with field check measurements as well as pre and post-season quality control checks.

[1] Patten, T.M., Baker, T.W. 2018. *WWBWC Standard Operating Procedures – Version 1.3.* Walla Walla Basin Watershed Council. www.wwbwc.org.

Results

The seven-day moving average (7-DAD Min/Med/Max) graphs for the 2022 water year and all 15-minute water temperature data (.cvs format) are available on our website at: http://wwbwc.org/walla-walla-river-temperature-monitoring.html. All water temperature data are submitted to the Oregon Department of Environmental Quality (ODEQ) for inclusion in the state Ambient Water Quality Monitoring System (AWQMS). The seven-day moving average (7-DAD Min/Med/Max) is used to determine if the 7-DADMax water temperature exceeded 18°C at any time during the monitoring season. Oregon's current temperature standard was adopted by the Oregon Environmental Quality Commission, with revisions by the Environmental Protection Agency and the Oregon Department of Environmental Quality. The 18°C criterion is based on the Oregon Department of Environmental Quality's document: Temperature Water Quality Standard Implementation.

The South Fork Walla Walla River monitoring location at Harris Park continues to meet the Walla Walla River's upper-temperature criterion of 18°C. The newly constructed Confederated Tribes of the Umatilla Indian Reservation (CTUIR) spring Chinook hatchery had a peak seven-day moving average of daily maximum water temperature of 16.5°C, a decrease of 2.5°C from the year before (Figure 4). The South Fork Walla Walla River near the confluence exceeded the 18°C threshold; this exceedance was the third year in a row. The monitoring data collected at the South Fork Walla Walla River at the confluence site documented an approximate water temperature decrease from the 2021 data of 2.2°C (Figure 4). In contrast, the other South Fork sites saw an approximate reduction of almost 1.4 to 2.5°C compared to 2021, based on the peak seven-day moving average of daily maximum water temperatures (7-DADMax) (Figure 4). The North Fork Walla Walla River near the confluence continued to exceed the 18°C criterion but also saw the peak seven-day moving average of daily maximum decrease by 4.1°C compared to 2021 (Figure 4).

During the summer of 2022, the Walla Walla River also saw decreased temperatures at all monitoring locations compared to 2021. The mainstem sites had an average decrease of 2.6°C compared to 2021 (Table 1). This decrease is likely due to lower air temperature compared to 2021. Flood damage to riparian areas on the upper part of the river in 2020 has contributed to the loss of shade on the river. The upper part of the river doesn't have as much shade compared to previous years, causing the water temperature to be abnormally hotter as the water reaches the Mainstem Walla Walla River for 2020 and 2021. Between Cemetery Bridge (M2) and the Smith Diversion (M3) is the primary Oregon side irrigation diversion (Little Walla Walla River Diversion); a significant amount of surface flow is diverted, which dramatically reduces instream flows in the Walla Walla River. Low flows and limited vegetative cover in the levee reach result in higher water temperatures, which in 2022 reached a peak 7-DADMax of 26.3°C at Tum-A-Lum Bridge (M8) (Figure 4). All of the mainstem sites were above the 18°C threshold.

Water temperature data from 16 monitoring sites collected during the 2022 water year were compared with values published in a 2005 Walla Walla Subbasin Stream Temperature Total

Maximum Daily Load (TMDL) and Water Quality Management Plan.[2] The TMDL was prepared in partnership with the Oregon Department of Environmental Quality and the Walla Walla Basin Watershed Council. The report lists seasonal peak temperatures at monitoring sites throughout the Walla Walla river system. It states that results indicate widespread exceedance of Oregon's 18°C temperature standard for salmon and trout rearing and migration. The analysis aimed to examine how the seasonal peaks from the previous three years compared to the data collected during the TMDL project.

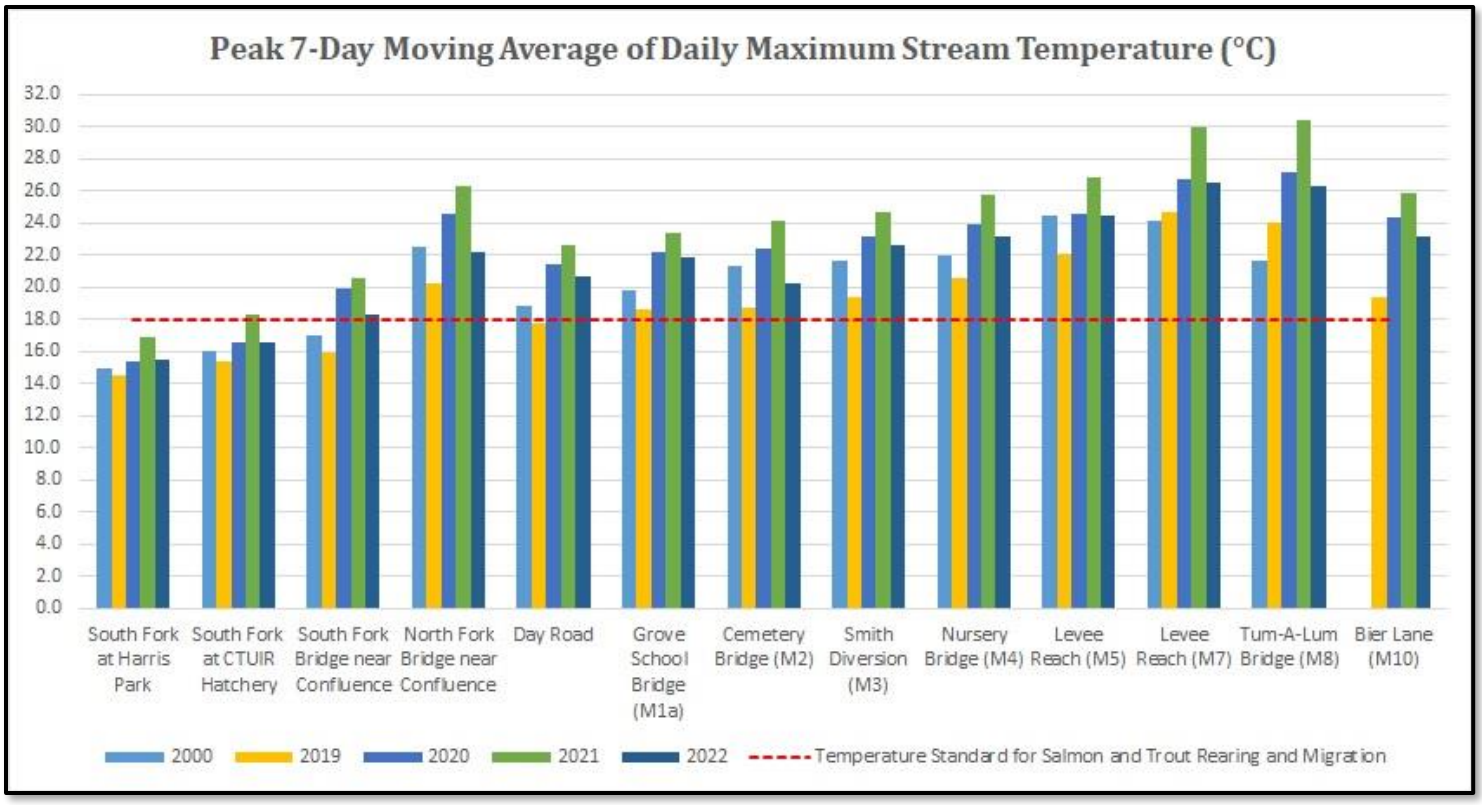

Figure 4. A comparison of seasonal peak 7-Day moving average of daily maximum stream temperatures over the last 22 years.

[2] "Walla Walla Subbasin Stream Temperature Total Maximum Daily Load and Water Quality Management Plan", by Don Butcher (ODEQ), and Bob Bower (WWBWC), 2005.

The flood in February 2020 was one of the record's most significant Walla Walla River high flow events. Flood flows caused erosion along the banks, washing away important riparian areas that help provide shade on the river. Data collected in 2022 suggests the loss of shade from the flood is still impacting the water temperature. Data from the South Fork of the Walla Walla near the confluence of the forks (S-103) shows the highest peaks in summertime water temperatures in the last three years since WWBWC began monitoring in 1999 (Figure 5).

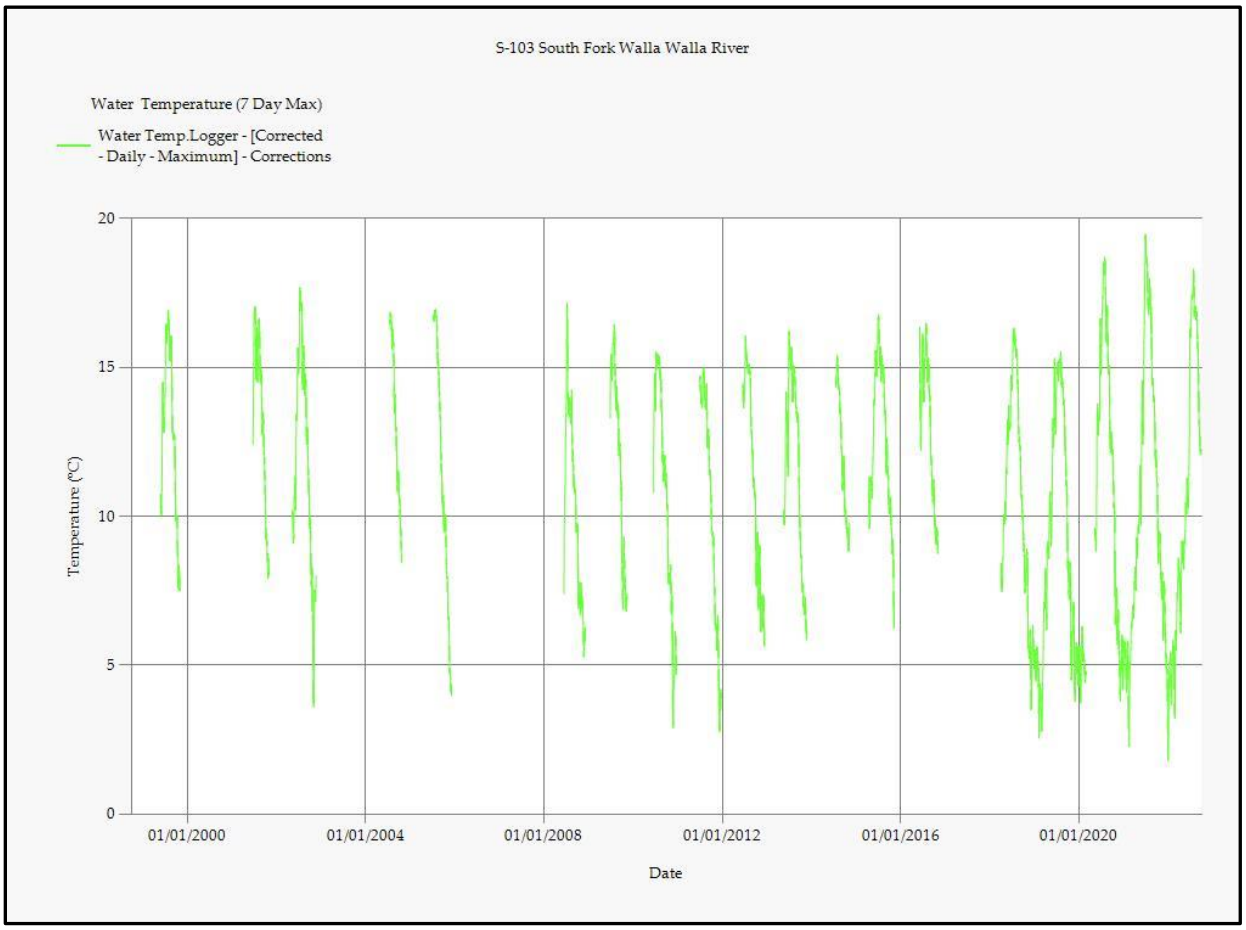

Figure 5. South Fork Walla Walla River temperatures near the mouth from 1999-2022. Summer 2020, 2021, and 2022 had the highest summertime max temperatures during this monitoring period.

The summer of 2021 was one of the hottest recorded summers in the Walla Walla Basin. The higher air temperatures also affected river temperature. Since there is less riparian vegetation from the 2020 flood, the less upper river is shaded during the hot summer months. The air temperatures for the 2022 WY weren't as high as in 2021 for the early spring/summer months but were higher in August-November. Data from the Western Regional Climate Center (wrcc.dri.edu) show that 2022 monthly average temperatures exceeded the 40 and 90-year averages for most months except January, February, April, May, and June (Figure 6). Figure 7 shows the long-term temperature trends from July-October.

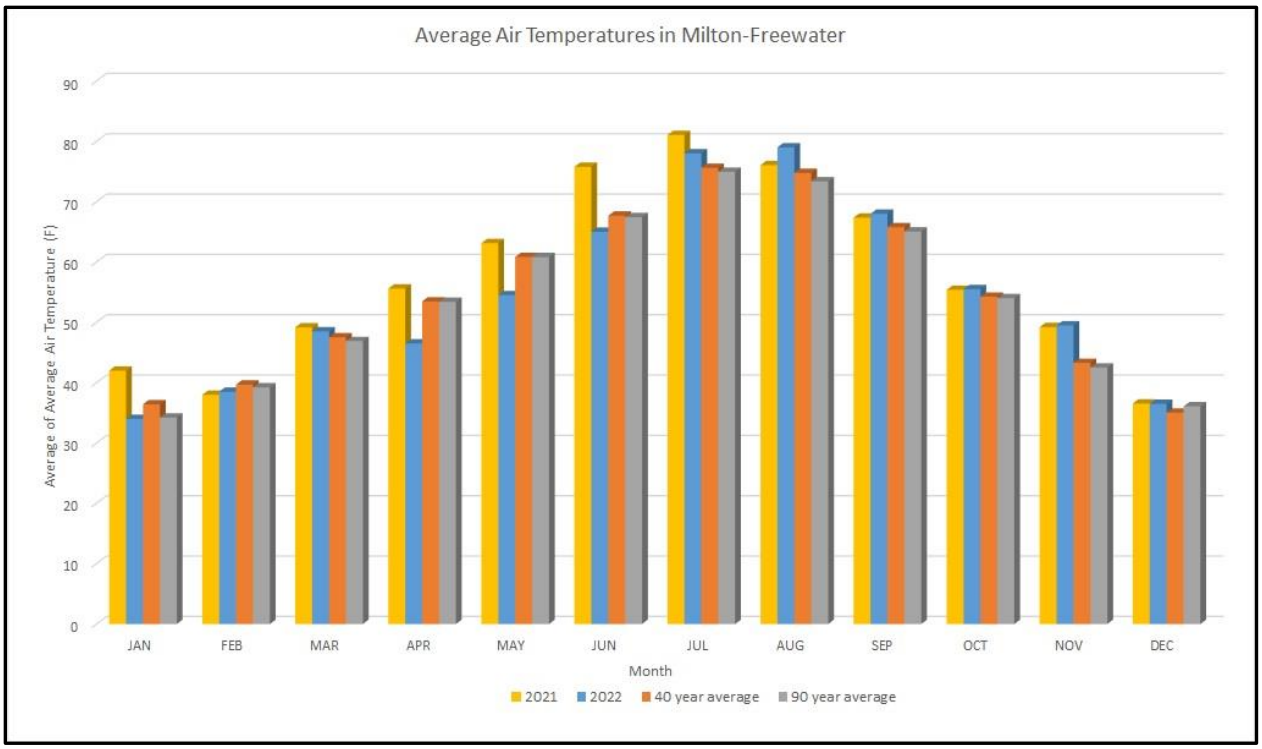

Figure 6. Monthly average air temperatures in Milton-Freewater in 2021 and 2022 compared to the 40-year and 90-year monthly averages.

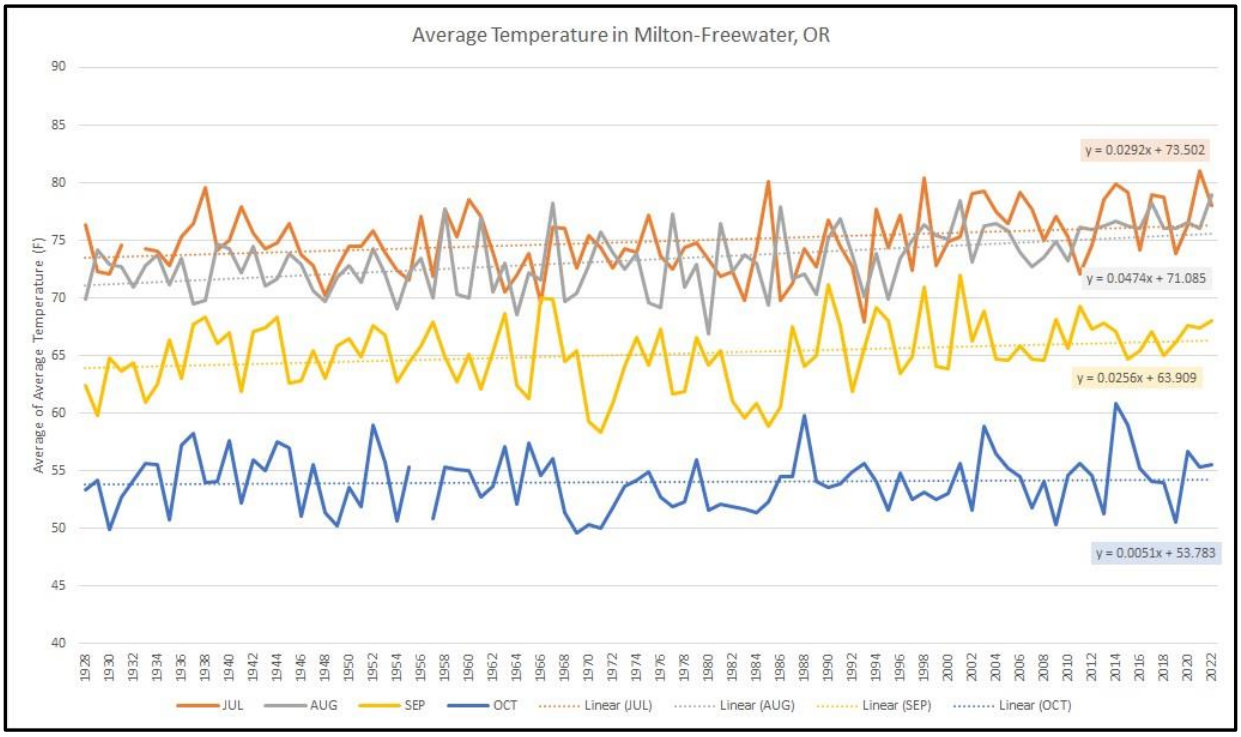

Figure 7. Long-term monthly average air temperature trends in Milton-Freewater, OR.

Discussion/Conclusion

Temperature data from Walla Walla River monitoring sites show decreases in water temperature throughout the system during the summer of 2022. Based on the data collected, above-average air temperatures and reduced riparian vegetation in the upper reaches of the North Fork and South Fork contributed to higher upriver water temperatures cascading to higher Walla Walla River water temperatures. WWBWC water temperature monitoring efforts continue providing high-quality data to track the trends and guide water management and habitat improvement decisions. Fish managers, Federal, State, and local agencies, along with basin residents, continue to rely on the availability of quality water temperature data for the North Fork, South Fork, and Mainstem Walla Walla Rivers.

Adaptive Management and Lessons Learned

The WWBWC's water temperature monitoring efforts continue to provide high-quality data utilized to:

- Monitor groundwater/surface water interactions
- Provide data for fisheries managers
- Inform local water management/habitat decisions

Resource managers, irrigators, and other basin residents continue to rely on the availability of reliable streamflow data in the Walla Walla Valley. Without the support of the WWBWC's funding agencies, partners, and private landowners, this project would not be possible. Their involvement and support are very much appreciated.

- Oregon Watershed Enhancement Board
- Oregon Department of Environmental Quality
- Bonneville Power Administration
- U.S. Fish & Wildlife Service
- Confederated Tribes of the Umatilla Indian Reservation