Walla Walla Basin Watershed Council

Water Temperature Monitoring in the Walla Walla Basin

2019-2020 Water Year

Final Report

Submitted: January 2021

In Cooperation with:

DEQ
State of Oregon
Department of
Environmental
Quality

BONNEVILLE
POWER ADMINISTRATION

OREGON WATERSHED ENHANCEMENT BOARD
OWEB

Introduction

Overview

The WWBWC collected water temperature data on the Walla Walla River at 18 sites in Oregon; some of the sites have data sets going back 20 years. Temperature data loggers were deployed in river in the late spring/early summer after water levels dropped to safe levels. Monitoring occurred on the South Fork Walla Walla River up to Harris Park, the Mainstem Walla Walla River to the Oregon and Washington state boundary and also captured inputs from the North Fork Walla Walla River. The uppermost site was located on the South Fork near the BLM boundary. Monitoring continued downstream, capturing changes in the river as it travels down the canyon. Monitoring locations also tracked 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 from its headwaters in the Blue Mountains into the Walla Walla Basin and then spreads out 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 and also allowed for 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 document for several decades and 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.

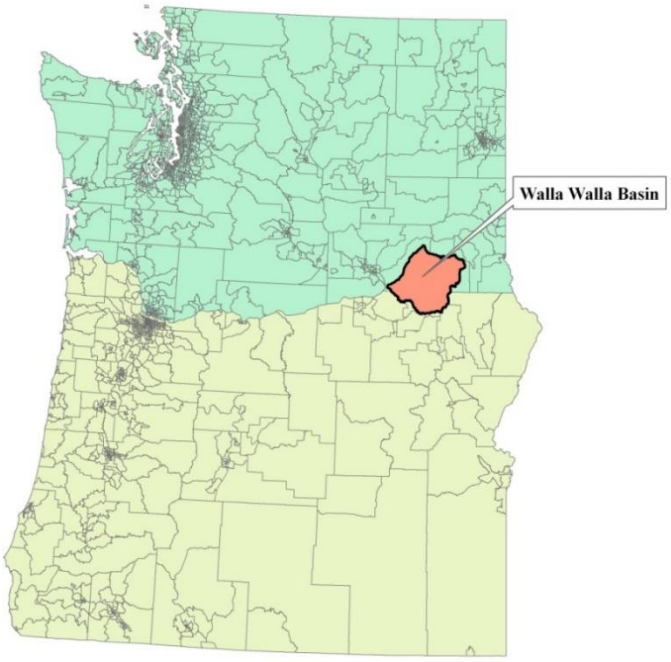

Figure 1. The Walla Walla Basin, a bi-state watershed.

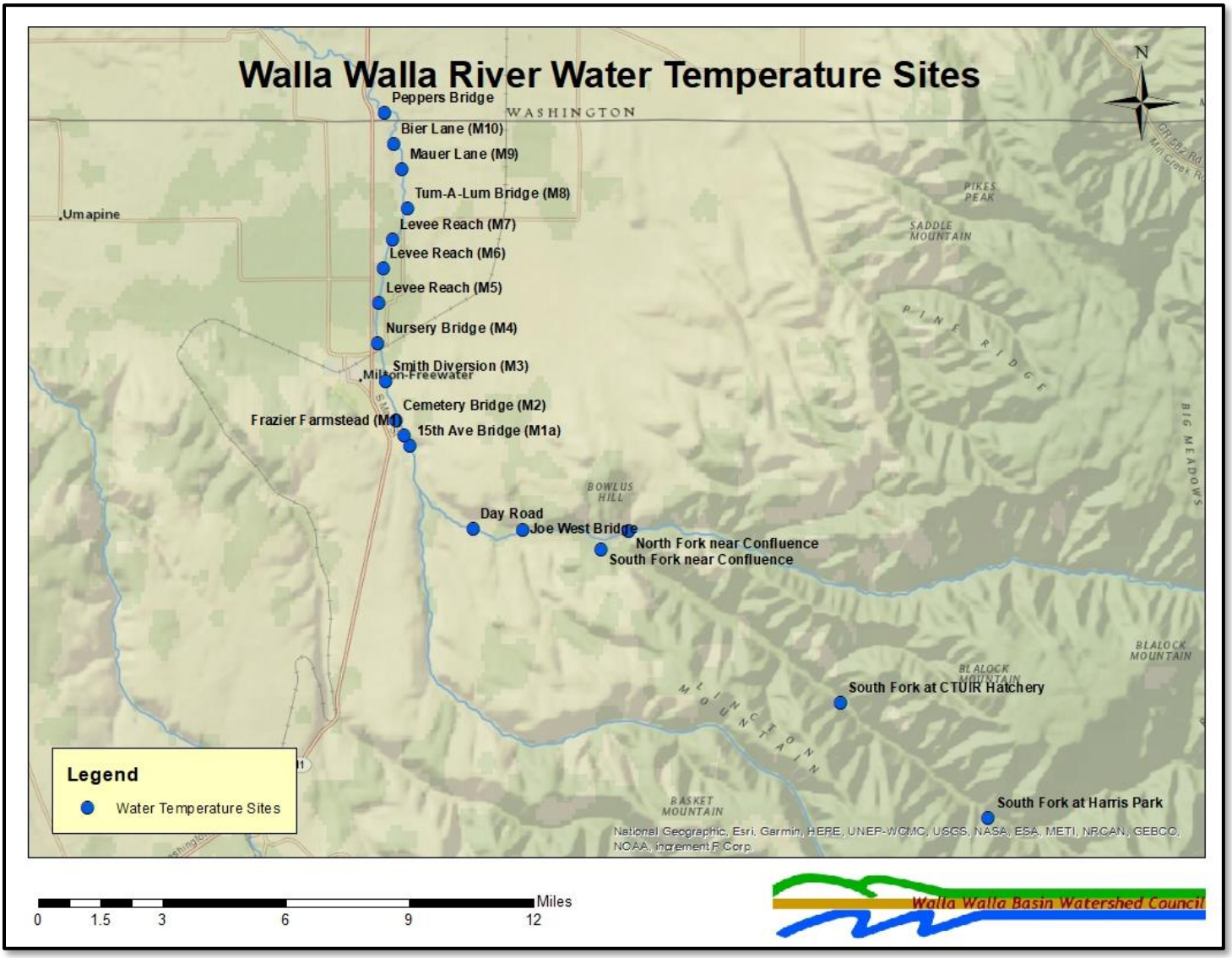

Figure 2. Map showing current water temperature monitoring sites as of September 2020.

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 conducted water temperature monitoring along the Oregon portion of the Walla Walla River (Figure 2). For complete explanation of methods please see the WWBWC's Standard Operating Procedures – Version 1.3 available at www.wwbwc.org. Each site has either an Onset Hobo data logger, Solinst EDGE pressure transducer or an In-Situ Level Troll 300 pressure transducer deployed (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.

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

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). Water temperature recorded by data loggers are graphed with manual water temperature readings collected using a NIST calibrated thermometer. In needed, offsets and drift corrections are applied to align logger data with manual measurements. All 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.

Results and Analysis

The seven-day moving average (7-DAD Min/Mean/Max) graphs for the 2020 water year as well as 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 will be submitted to the Oregon Department of Environmental Quality (ODEQ) for inclusion into the state water quality database.

The South Fork Walla Walla River monitoring locations at Harris Park and CTUIR Hatchery continue to meet the Walla Walla River's upper temperature criterion of 18°C. The South Fork Bridge near the confluence exceeded the 18°C threshold for the first time since 1999. The South Fork Bridge site documented an approximate increase of 4°C while the other South Fork sites saw an approximate increase of almost 1°C from 2019 to 2020 based on the peak seven-day moving average of daily maximum water temperatures (7-DADMax) (Table 1). The North Fork continued to exceed the 18°C criterion and also saw an approximate increase of 4°C compared to 2019 (Table 1).

During the summer of 2020 the Walla Walla River also saw increased temperatures at all monitoring locations. The mainstem sites had an approximate average increase of 3°C from 2019 to 2020 (Table 1). This increase is likely due to flood damage to riparian areas along the river, although the role of air temperatures should not be discounted. Between Cemetery Bridge (M2) and the Smith Diversion (M3) is the primary Oregon side irrigation diversion (Little Walla Walla River Diversion), dramatically reducing instream flows. Low flows and limited vegetative cover in the levee reach result in higher temperatures, which reached a peak 7-DADMax of 27.2 °C at Tum-A-Lum Bridge (M8) (Table 1). All of the mainstem sites were above the 18°C threshold.

Water temperature data from 18 monitoring sites collected during the 2019-2020 water year on the Oregon side of the basin were compared with values published in a 2005 Walla Walla Subbasin Stream Temperature Total

Maximum Daily Load (TMDL) and Water Quality Management Plan[2] prepared in partnership by 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 and states that results indicate widespread exceedance of Oregon's 18°C temperature standard for salmon and trout rearing and migration. The purpose of the analysis was to examine how the seasonal peaks from the previous three years compared to the data collected during the TMDL project. Table 2 shows 7-DADMax temperatures from the last 20 years. Except for the lower levee (M7 and M8), maximum temperatures were lower in 2018-2019 than during the TMDL study in 2000-2002. Data from 2020 however, show the highest temperatures of the dataset.

Table 1. A comparison of seasonal peak 7-Day moving average of daily maximum stream temperatures over the last 20 years.

Site Name	River KM	Date and Value: Peak 7-Day moving average of daily maximum stream temperature (°C)									
		2000		2002		2018		2019		2020	
South Fork at Harris Park	97.68	7/29/00	14.9	7/13/02	15.8	7/12/18	14.4	7/12/19	14.5	8/1/20	15.4
South Fork at CTUIR Hatchery	92.16	7/23/00	16.0	Not Available		Not Available		7/24/19	15.4	8/1/20	16.5
South Fork Bridge near Confluence	84.02	8/1/00	17.0	7/13/02	17.7	7/28/18	15.9	7/13/19	15.9	8/1/20	19.9
North Fork Bridge near Confluence	0.83	7/31/00	22.5	7/13/02	28.8	7/30/18	20.7	8/8/19	20.2	8/1/20	24.5
Joe West Bridge	81.37	Not Available		Not Available		7/30/18	17.4	7/24/19	17.1	8/1/20	20.7
Day Road	79.82	8/1/00	18.8	7/14/02	19.1	7/28/20	17.9	7/24/19	17.7	8/1/20	21.4
Grove School Bridge (M1a)	76.61	8/3/00	19.8	7/14/02	20.3	Not Available		7/24/19	18.6	8/1/20	22.2
Frazier Farmstead (M1)	76.29	Not Available		Not Available		Not Available		8/8/19	18.3	7/22/20	21.5
Cemetery Bridge (M2)	75.82	8/1/00	21.3	7/13/02	21.8	Not Available		8/8/19	18.7	8/1/20	22.4
Smith Diversion (M3)	74.7	8/1/00	21.6	7/13/02	21.9	Not Available		8/8/19	19.4	8/1/20	23.1
Nursery Bridge (M4)	73.63	7/31/00	22.0	7/13/02	22.8	7/28/18	20.7	8/8/19	20.6	8/1/20	23.9
Levee Reach (M5)	72.52	7/31/00	24.4	7/13/02	23.1	7/28/18	21.3	7/24/19	22.1	8/1/20	24.6
Levee Reach (M6)	71.59	Not Available		Not Available		Not Available		7/2/19	25.0	8/1/20	26.1
Levee Reach (M7)	70.75	6/28/00	24.1	7/13/02	26.8	7/14/18	24.4	7/24/19	24.7	8/1/20	26.7
Tum-A-Lum Bridge (M8)	69.8	6/25/00	21.6	7/23/02	24.1	7/28/18	24.2	8/8/19	24.0	8/1/20	27.2
Mauer Lane (M9)	68.71	Not Available		Not Available		Not Available		8/8/19	22.2	8/1/20	23.9
Bier Lane (M10)	67.84	Not Available		Not Available		Not Available		8/8/19	19.4	8/1/20	24.3
Peppers Bridge	66.35	7/30/00	24.1	7/27/02	23.9	7/28/18	23.1	8/8/19	23.1	8/1/20	25.1

[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 that started on February 6th, 2020 was one of the biggest Walla Walla River high flow events on record. Flood flows caused erosion along the banks, washing away important riparian areas that help provide shade on the river. Data from the South Fork of the Walla Walla near the forks confluence (S-103) shows the highest peak in summertime water temperatures since WWBWC began monitoring in 1999 (Figure 4).

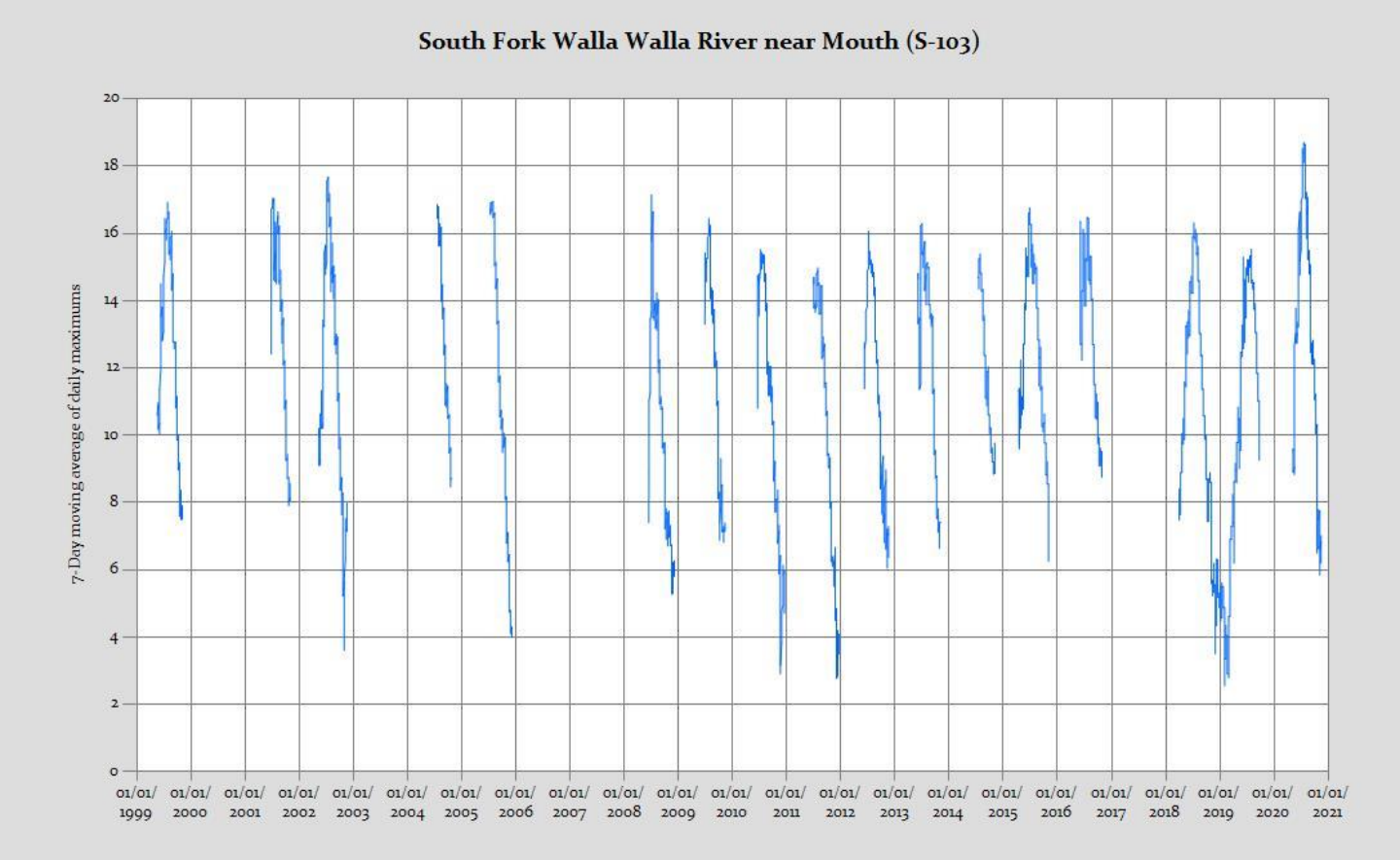

Figure 4. South Fork Walla Walla River temperatures near the mouth from 1999-2020. Summer 2020 had the highest summertime max temperatures during this monitoring period.

Higher air temperatures also affect river temperature. Data from the Western Regional Climate Center (wrcc.dri.edu) show that 2020 monthly average temperatures exceeded both the 40 and 90 year averages in every month except March (Figure 5). Figure 6 shows the long term temperature trends from July-October.

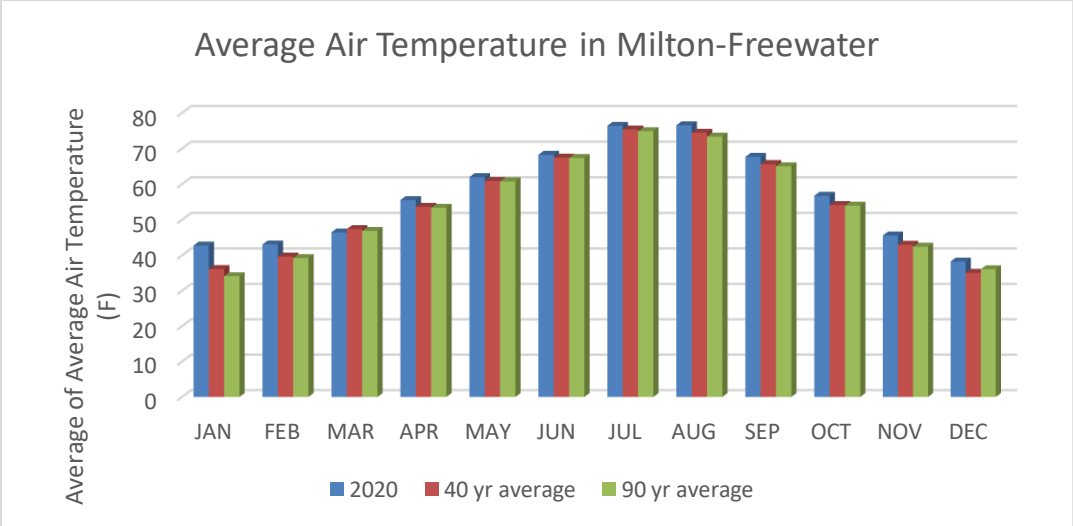

Figure 5. Monthly average air temperatures in Milton-Freewater in 2020 compared to the 40 year and 90 year monthly averages.

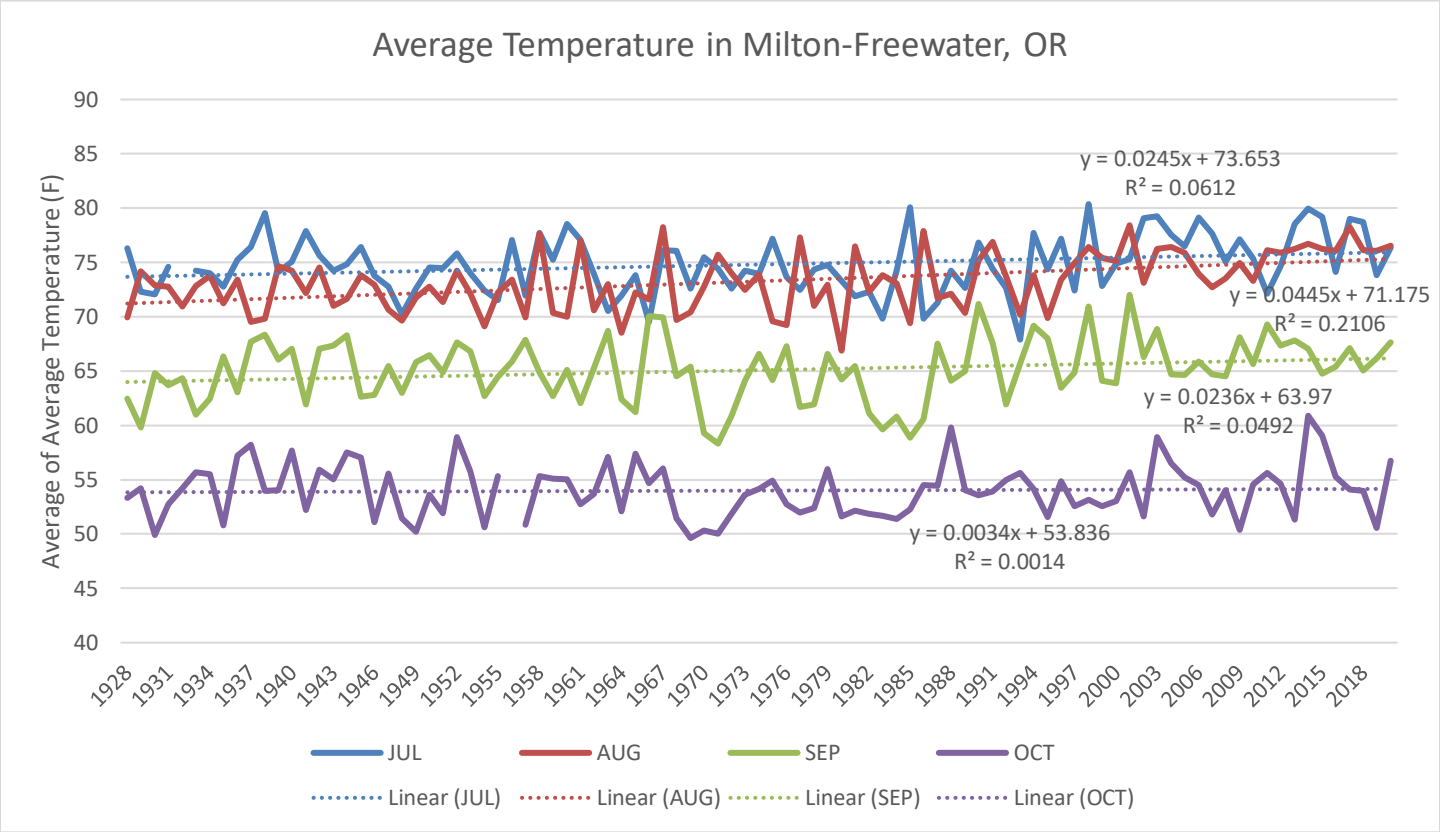

Figure 6. Long term monthly average air temperature trends in Milton-Freewater, OR.

Data collected under this grant agreement will also be used in the completion of a heat source modeling project that the WWBWC is currently working on under a grant agreement with ODEQ. The model will be complete in 2021 and results will be available from the WWBWC by request and/or via the Watershed Council's website.

Summary

Data from Walla Walla River temperature monitoring sites show abnormal increases in water temperature throughout the system during the summer of 2020. Earlier in the year, the Walla Walla Basin witnessed severe damage to riparian areas from the February 2020 flood along with higher than average air temperatures. WWBWC water temperature monitoring efforts continue to provide high quality data to track the trends and guide water management and habitat improvement decisions. Fish managers (local, state and federal) and other basin residents continue to benefit from the availability of reliable water temperature data in the Walla Walla Basin.

Acknowledgements

Without the support of the Walla Walla Basin Watershed Council's partner agencies and private landowners, this project would not be possible. Their involvement and support is 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