WALLA WALLA BASIN
WATERSHED COUNCIL

Water Temperature Monitoring in the Walla Walla Basin

2024 Water Year

FINAL REPORT

Submitted: March 2025

In Cooperation with:

DEQ
State of Oregon
Department of
Environmental
Quality

BONNEVILLE
POWER ADMINISTRATION

OREGON WATERSHED ENHANCEMENT BOARD
OWEB

Table of Contents

Contents

Abstract

This project collected water temperature data at 26 sites 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. Findings are used 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 Oregon Department of Environmental Quality procedures for water temperature monitoring.

Introduction

Overview

The Walla Walla Basin Watershed Council (WWBWC) collected water temperature data on the Walla Walla River at 26 sites in Oregon in water year 2024; some monitoring sites have data sets going back 25 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 levee reach below Milton-Freewater captured the highest water temperature values, while locations near the state line documented the cooling effects of groundwater returns below the levee system. The lower levee reach, from Nursery Bridge to Tum-A-Lum Bridge, faces the most seepage loss of all the reaches. The lower levee reach has less flow and less riparian areas for shade, resulting in high water temperatures. The purpose of the analysis was to examine how the seasonal peaks from the current monitoring year and the previous years compared to the data collected during the Water Temperature TMDL project.

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

- Track water temperature trends as they relate to the Water Temperature TMDL.
- 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 at the Little Walla Walla Diversion in Milton-Freewater 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.

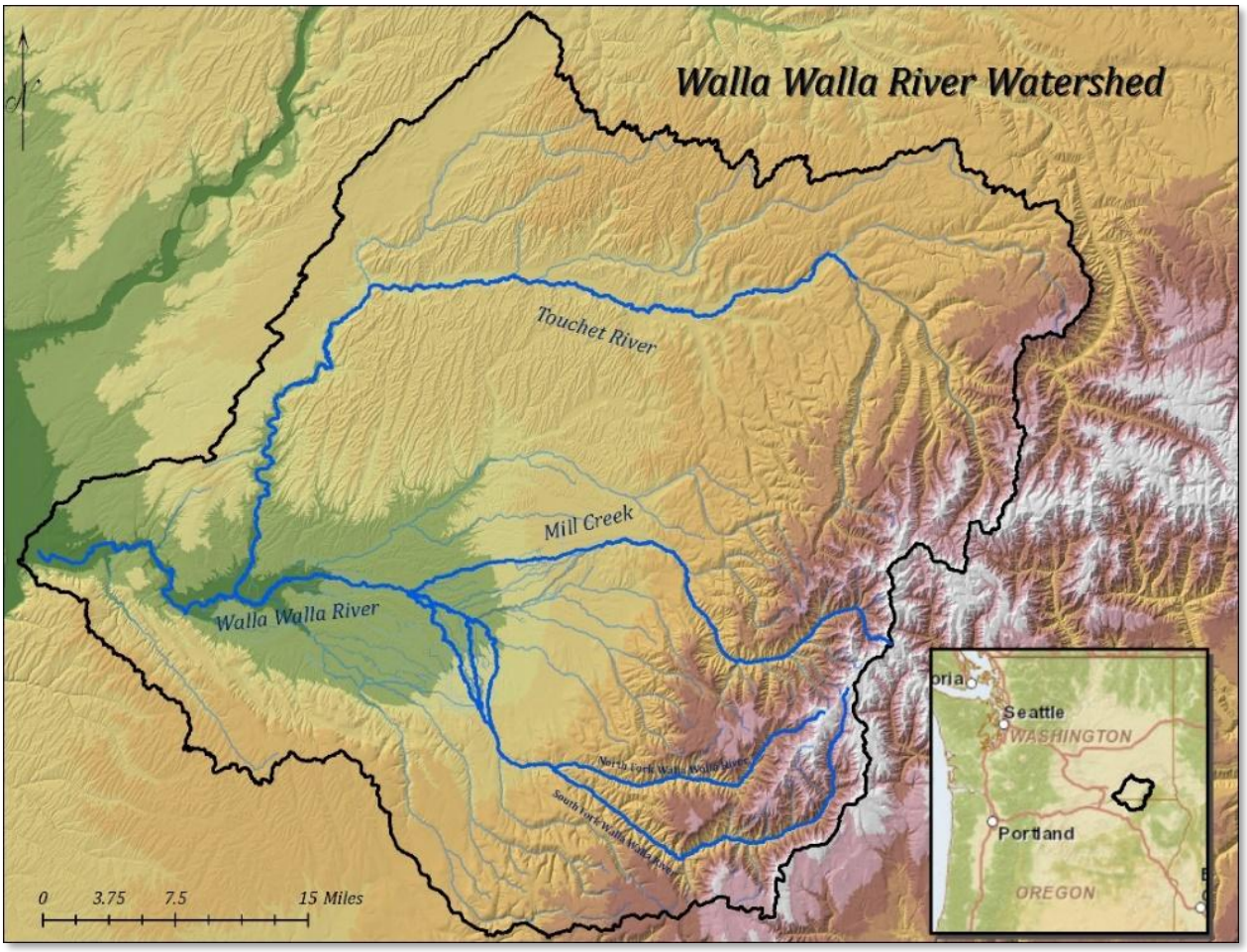

Figure 1. The Walla Walla Basin

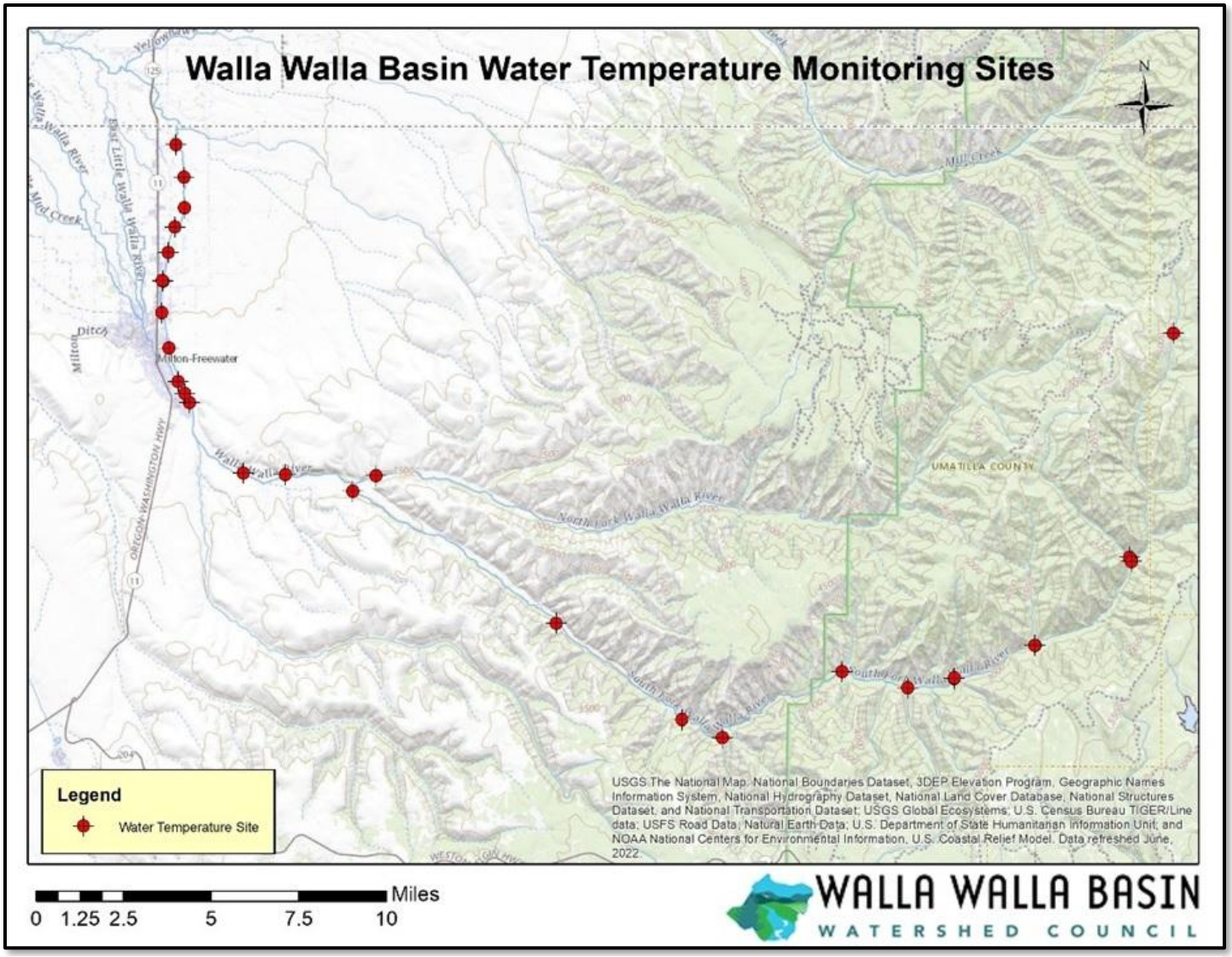

Figure 2. Map showing current water temperature monitoring sites as of September 2024.

Methodology

All monitoring is conducted according to the Oregon Department of Environmental Quality (ODEQ) standard operating procedure for Continuous Water Monitoring[1]. Data quality is achieved using ODEQ's Quality Assurance Project Plan for Volunteer Water Quality Monitoring[2].

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). Staff deploy an Onset Hobo data logger or In-Situ Leveltroll 300 pressure transducer (Figure 3) at each site, and 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 NIST-calibrated 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) according to WWBWC's 2018 Standard Operating Procedures[3]. 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] 2020, ODEQ Continuous Monitoring Standard Operating Procedures (SOP). DEQ20-LAB-0021-SOP Methods manual

[2] 2021, ODEQ Quality Assurance Project Plan; Volunteer Water Quality Monitoring. DEQ04-LAB-0047-QAPP Version 3.0 https://www.oregon.gov/deq/FilterDocs/VolMonQAProjPlan.pdf

[3] 2018, WWBWC Watershed Monitoring Program Standard Operating Procedures Version 1.3. https://wwbwc.org/images/Monitoring/SOP/WWBWC_SOP.pdf

Results

The seven-day average maximum (7dAM) graphs for the 2024 water year and all 15-minute water temperature data (.cvs format) are available on our website at: https://wwbwc.org/water-temp. 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).

During the summer of 2024, the Walla Walla River temperatures increased at most monitoring locations compared to recent years, with the exception of 2021, which was influenced by notably higher-than-average monthly air temperatures from January to July (Figures 4, 5,). Contributing factors for increasing stream temperature likely include increases in air temperature and changes to riparian cover in the upper watershed. July air temperature in 2024 was higher than in 2023 (Figure 5). Flood impacts to riparian areas on the South Fork Walla Walla River in 2020 reduced shade on the river, likely contributing to increased water temperatures observed since 2020 (Figure 4).

The 7dAM stream temperature is the metric used by the state to evaluate compliance with its biologically based temperature criteria by designated beneficial use for flowing fresh water. The spatial and temporal application of the temperature criteria are defined in ODEQ's 2005 Walla Walla Subbasin Stream Temperature Total Maximum Daily Load (TMDL) and Water Quality Management Plan[4] and shown in Table 1 and Figure 6.

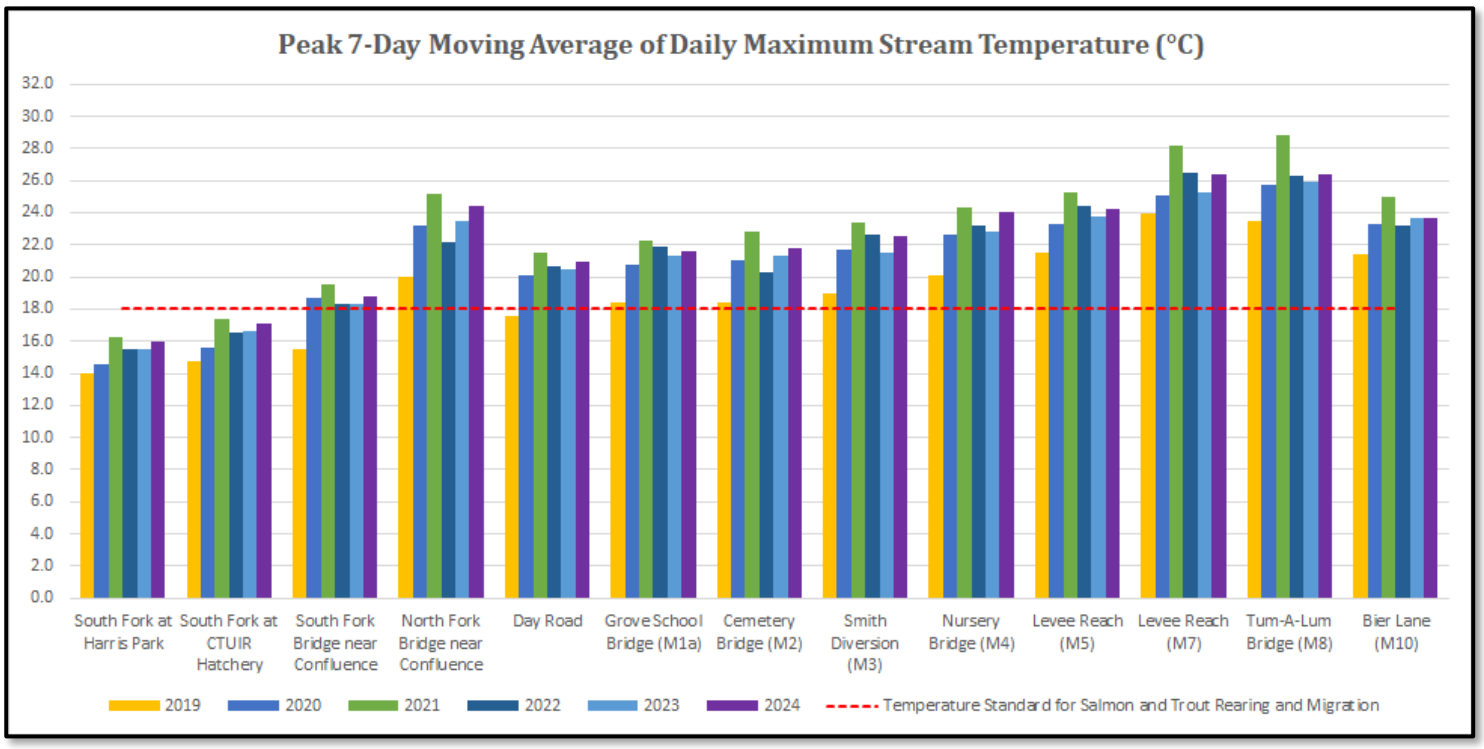

Figure 4. A comparison of seasonal peak 7-Day moving average of daily maximum stream temperatures for the lower South and North Forks of the Walla Walla River and downstream in the mainstem Walla Walla to the OR/WA state line over the last 6 years.

[4] https://www.oregon.gov/deq/FilterDocs/umaWWtmdlwqmp.pdf

Air temperature data from the National Centers for Environmental Information (NCEI) under the National Oceanic and Atmospheric Administration (NOAA) show that the 2024 monthly average temperatures exceeded the 40 and 90-year averages for most months except January, April, May and June (Figure 5).

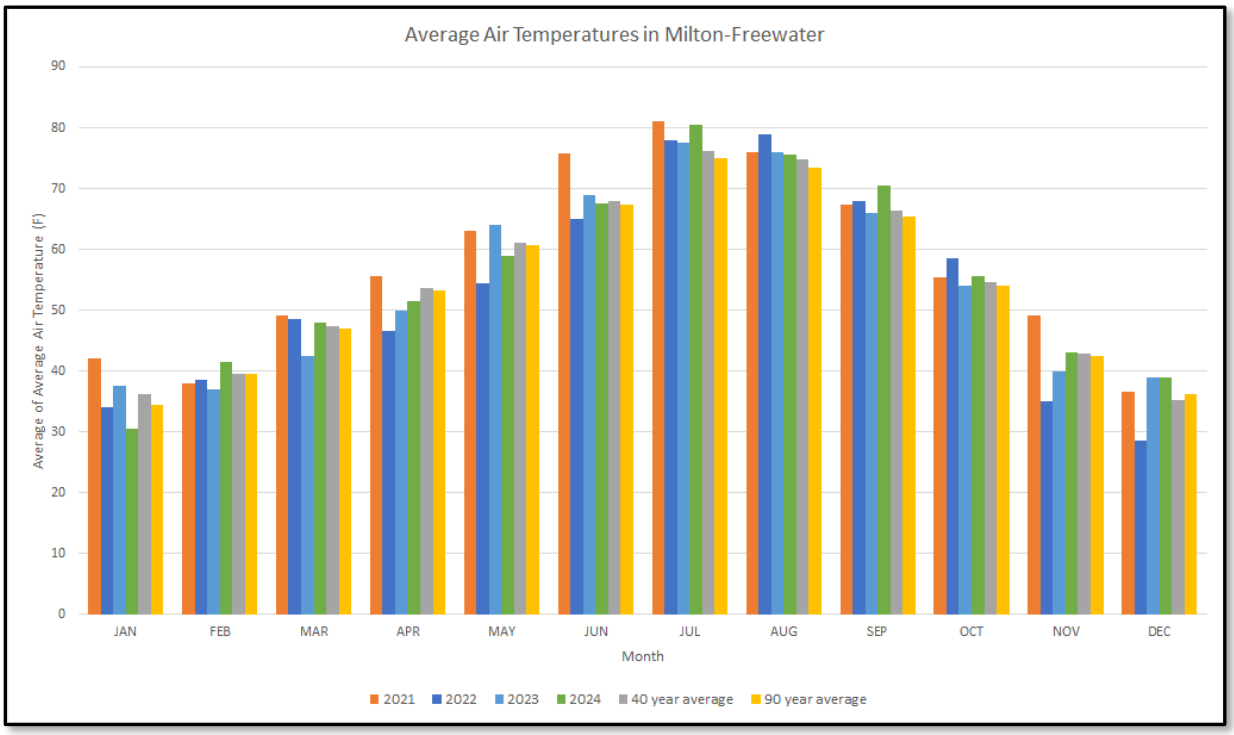

Figure 5. Monthly average air temperatures in Milton-Freewater in 2021, 2022, 2023 and 2024 compared to the 40-year and 90-year monthly averages.

Table 1. ODEQ temperature criteria by designated beneficial use.

Beneficial Use	Numeric Criterion	Applicability
Salmon and trout rearing and migration	18.0 °C (64.4 °F)	Year round unless superseded by cooler criterion
Core cold water habitat criterion	16.0 °C (60.8 °F)	Year round in waters draining to the mainstem Walla Walla, except where cooler criteria apply simultaneously
Salmon and steelhead spawning criterion	13 °C (55.4 °F)	Stateline to above Milton-Freewater. January 1-June 15
Bull trout spawning and juvenile rearing	12 °C (53.6 °F)	During times of spawning and rearing*

*Timeframe not defined in the TMDL, but bull trout spawning ground surveys in the South Fork Walla Walla River typically occur from Sept-Nov.

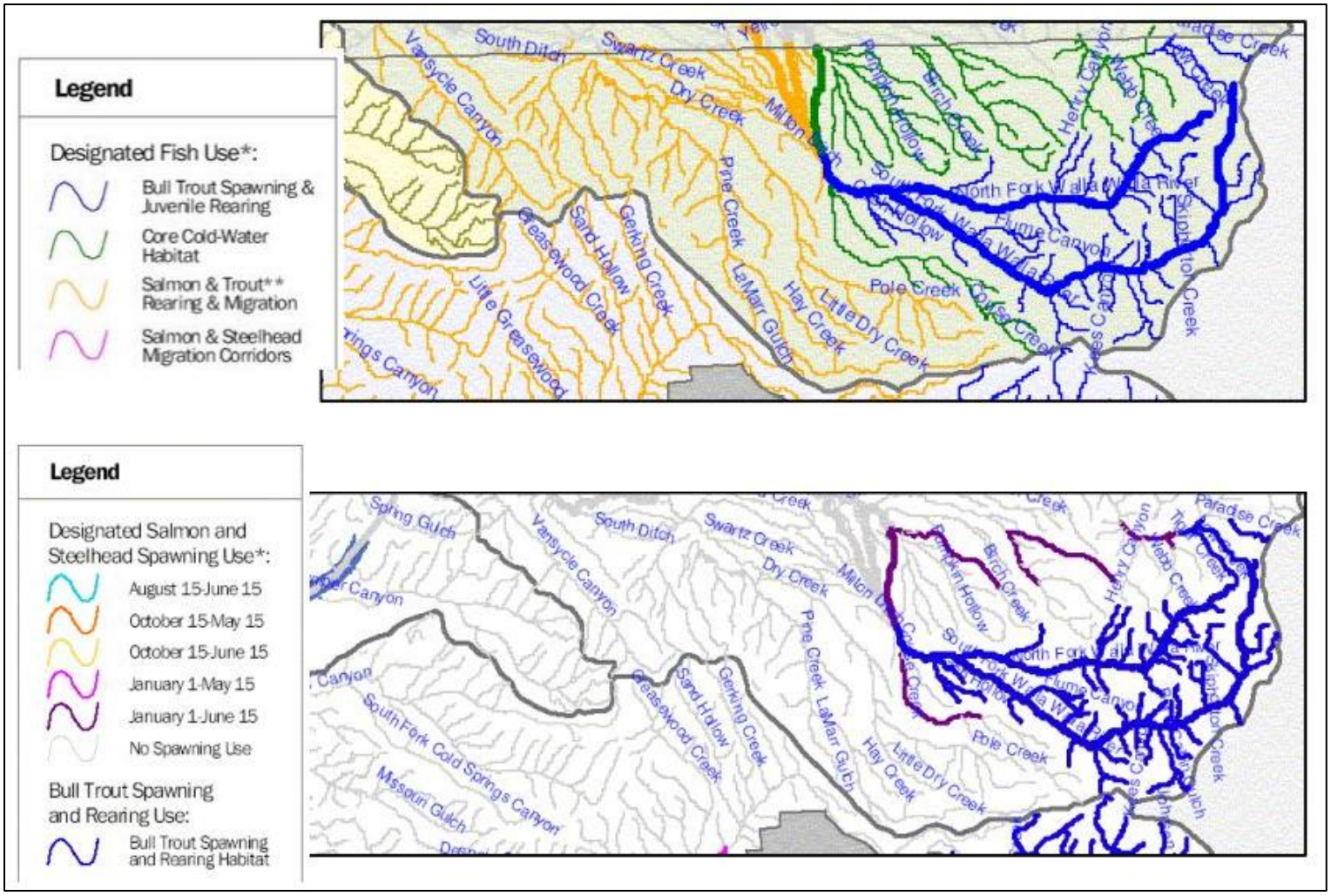

Figure 6. Map from the 2005 stream temperature TMDL document showing the spatial application of various criteria.

The South Fork Walla Walla River monitoring location at Harris Park continues to meet the salmon and trout rearing, migration, and spawning criterion throughout the summer. It meets the bull trout criterion (12 °C from Sept-Nov) except for the first half of September (Figure 7).

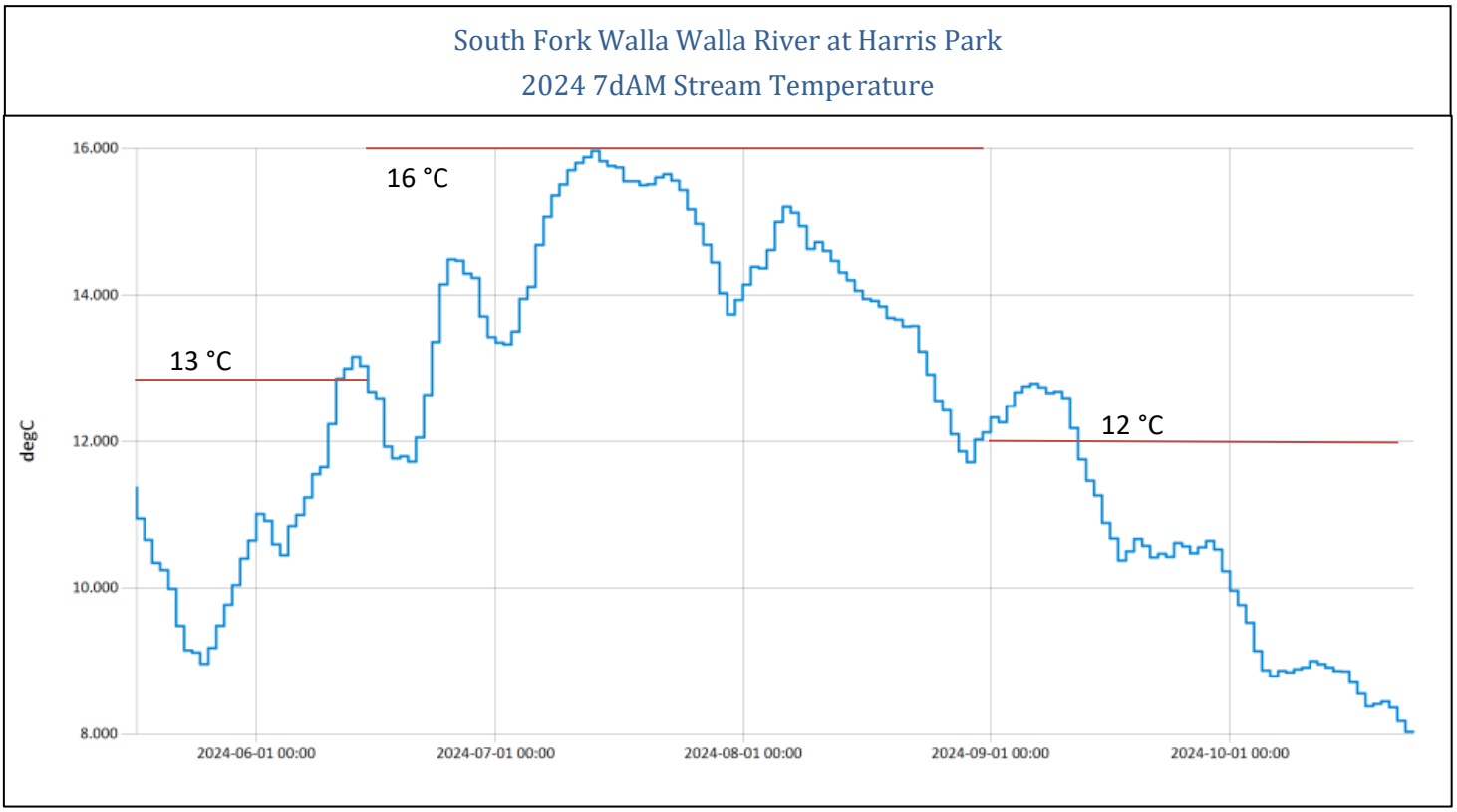

Figure 7. The 7-day average maximum stream temperatures during the 2024 monitoring season at South Fork Walla Walla River at Harris Park. Seasonal criterion for salmon and trout spawning (13 °C), migration and rearing (16 °C), and bull trout spawning (12 °C) are shown with red lines.

Data from the South Fork of the Walla Walla River near the confluence of the forks (S-103) shows the highest peaks in summertime water temperatures in the last five years since WWBWC began monitoring in 1999 (Figure 8). Peak temperatures rose notably following the 100-year flow event of 2020.

Rolling average of Peak Water Temperature in the South Fork Walla Walla River near the Confluence (S-103) from 1999-2024.

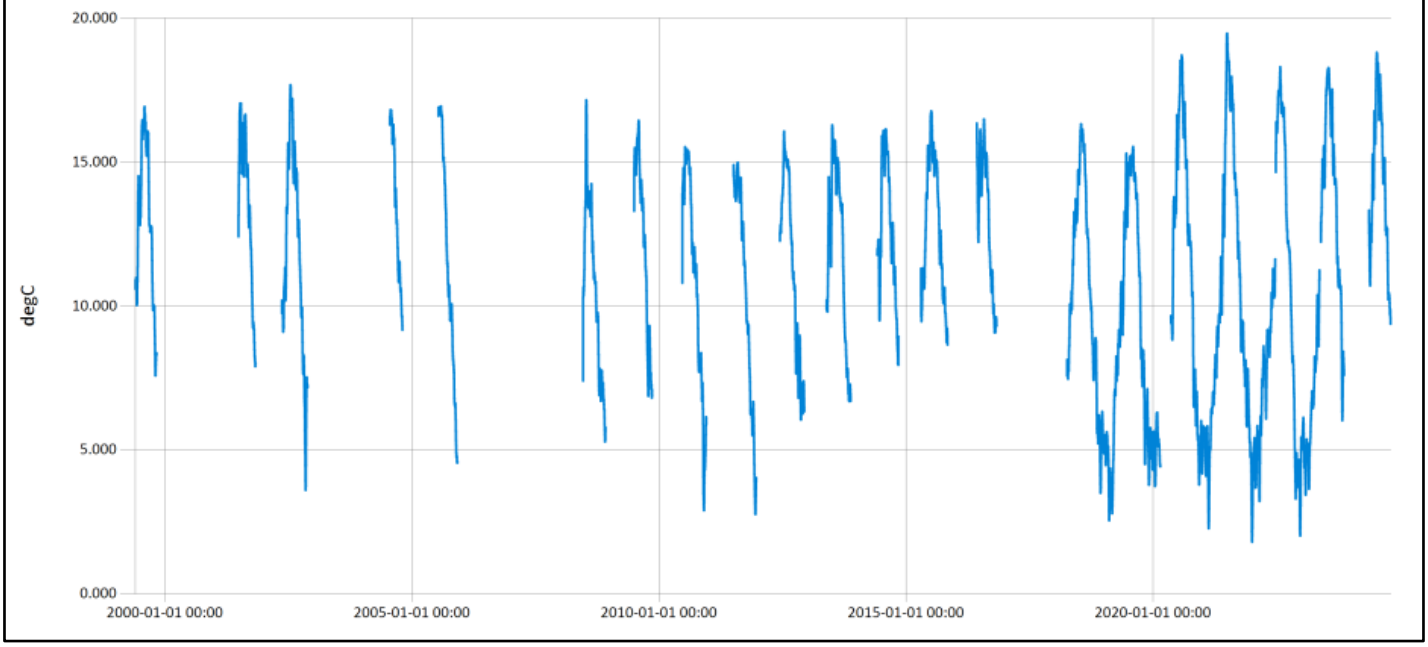

Figure 8. South Fork Walla Walla River temperatures near the mouth from 1999-2024. Summer 2020, 2021, 2022, 2023 and 2024 had the highest summertime max temperatures during the monitoring period.

Peak 7dAM at the South Fork near the confluence site was 18.8°C, an increase of 0.5°C from 2023 (Figure 4). The North Fork Walla Walla River near the confluence continued to exceed the 18°C criterion for most of the summer and had a peak 7dAM water temperature of 24.4 °C, a 0.9°C increase compared to 2023 (Figure 4). Downstream on the mainstem Walla Walla River, water temperature above the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) spring Chinook salmon hatchery had a peak 7dAM water temperature of 17.1°C, an increase of 0.5°C from 2023 (Figure 4).

Flow conditions change and peak water temperatures increase notably below Cemetery Bridge (M2) in Milton-Freewater as irrigation water is diverted into the Little Walla Walla Distributary system, often leaving only the protected instream water right in the Walla Walla River to flow through the levee reach. Low flows and limited vegetative cover in the levee reach result in higher water temperatures, which in 2024 reached a peak 7dAM of 26.4°C at Tum-A-Lum Bridge (M8) (Figure 4).

Historical Comparison

Water temperature data collected during the 2024 water year were compared with values published in the stream temperature TMDL document. The analysis aimed to examine how the seasonal peaks from the previous three years compared to the data collected during the TMDL project in 2000 and 2002. In almost every case, recent peak temperatures are the same or higher than the values documented in 2000 and 2002 (Table 2).

Table 2. A comparison of seasonal peak 7-Day moving average of daily maximum stream temperatures over the last 3 years compared to the data collected during the TMDL project (2000 and 2002).

Date and Value: Peak 7-Day moving average of daily maximum stream temperature (°C)																
Site ID	Site Name	River KM	2000		2002		2021		2022		2023		2024	
S-101	South Fork at Harris Park	97.68	7/29/2000	14.9	7/13/2002	15.8	7/1/2021	16.3	7/31/2022	15.5	7/21/2023	15.5	7/14/2024	16.0
S-127	South Fork at CTUIR Hatchery	92.16	7/23/2000	16.0	Not Available		7/1/2021	17.4	7/31/2022	16.5	7/22/2023	16.6	7/14/2024	17.1
S-103	South Fork Bridge near Confluence	84.02	8/1/2000	17.0	7/13/2002	17.7	7/3/2021	19.5	7/31/2022	18.3	7/22/2023	18.3	7/14/2024	18.8
S-104	North Fork Bridge near Confluence	0.83	7/31/2000	22.5	7/13/2002	28.8	7/3/2021	25.2	8/1/2022	22.2	8/18/2023	23.5	7/14/2024	24.4
S-122	Joe West Bridge	81.37	Not Available		Not Available		7/3/2021	21.2	7/31/2022	20.1	7/21/2023	19.8	7/14/2024	20.4
S-123	Day Road	79.82	8/1/2000	18.8	7/14/2002	19.1	7/3/2021	21.5	7/31/2022	20.7	7/22/2023	20.5	7/14/2024	20.9
S-105	Grove School Bridge (M1a)	76.61	8/3/2000	19.8	7/14/2002	20.3	7/3/2021	22.3	7/31/2022	21.9	7/25/2023	21.3	7/14/2024	21.6
S-153	Frazier Farmstead (M1)	76.29	Not Available		Not Available		7/3/2021	22.5	7/31/2022	21.4	7/22/2023	21.1	7/14/2024	21.3
S-128	Cemetery Bridge (M2)	75.82	8/1/2000	21.3	7/13/2002	21.8	7/3/2021	22.8	8/18/2022	20.3	7/22/2023	21.3	7/14/2024	21.8
S-129	Smith Diversion (M3)	74.7	8/1/2000	21.6	7/13/2002	21.9	7/3/2021	23.4	7/31/2022	22.6	8/18/2023	21.5	7/14/2024	22.5
S-106	Nursery Bridge (M4)	73.63	7/31/2000	22.0	7/13/2002	22.8	7/3/2021	24.3	7/31/2022	23.2	7/22/2023	22.8	7/14/2024	24.0
S-110	Levee Reach (M5)	72.52	7/31/2000	24.4	7/13/2002	23.1	7/1/2021	25.3	7/31/2022	24.4	7/25/2023	23.8	7/14/2024	24.2
S-154	Levee Reach (M6)	71.59	Not Available		Not Available		7/1/2021	26.8	7/31/2022	25.9	7/25/2023	25.3	7/14/2024	25.3
S-112	Levee Reach (M7)	70.75	6/28/2000	24.1	7/13/2002	26.8	7/1/2021	28.2	7/31/2022	26.5	7/25/2023	25.3	7/14/2024	26.4
S-107	Tum-A-Lum Bridge (M8)	69.8	6/25/2000	21.6	7/23/2002	24.1	7/1/2021	28.8	8/1/2022	26.3	7/25/2023	25.9	7/14/2024	26.4
S-151	Bier Lane (M10)	67.84	Not Available		Not Available		7/4/2021	25.0	8/1/2022	23.2	7/26/2023	23.7	7/14/2024	23.7

Upper Watershed Monitoring

Since 2020, the WWBWC has collected water temperature data in the upper South Fork Walla Walla River and its tributaries. The data loggers were deployed when the snow has melted and staff were able to hike through the mountains to the sites, usually in June. Since the sites are so remote, manual check are usually done when the data loggers are deployed and when they are retrieved at the end of the data collection season. Water temperature at these upper watershed sites is typically cool throughout the summer (Figure 9).

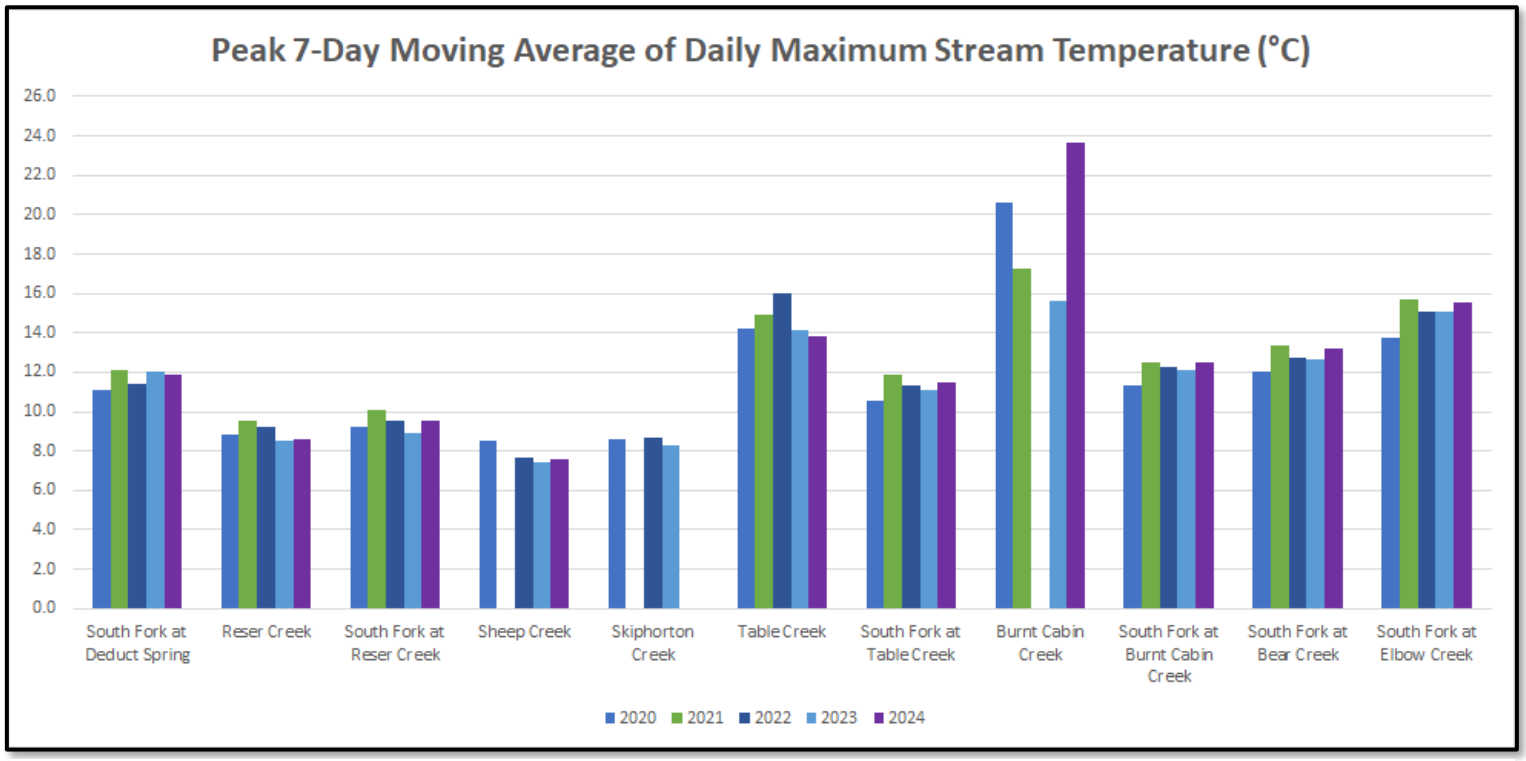

Figure 9. A comparison of seasonal peak 7-day average maximum stream temperatures over the last 5 years in the upper South Fork Walla Walla River at the headwaters (South Fork at Deduct Spring), five downgradient sites, and also in five perennial tributaries.

Summary

Temperature data from Walla Walla River monitoring sites show increases in water temperature throughout the system during the summer of 2024. Likely, above-average air temperatures and reduced riparian vegetation in the upper reaches of the North and South Forks contributed to higher seasonal peak water temperatures both upriver and in the low-flow levee reach. 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, 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 data to:

- Track water temperature trends as they relate to the Water Temperature TMDL.
- Monitor groundwater/surface water interactions
- Provide data for fisheries managers
- Inform local water management/habitat decisions

Resource managers, irrigators, and other basin residents 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

APPENDIX A

Monitoring Site Locations

Note: GPS coordinates are in decimal degrees

Site ID	Site	Lat	Long
S-101	South Fork Walla Walla River at Harris Park	45.8305	-118.17087
S-103	South Fork Walla Walla River near mouth	45.896048	-118.306741
S-104	North Fork Walla Walla River	45.900503	-118.297254
S-105	Walla Walla River at Grove bridge	45.92143	-118.37410
S-106	Walla Walla River at M4 below Nursery Bridge	45.94731	-118.3856
S-107	Walla Walla River at M8 Tum-a-Lum Bridge	45.97735	-118.37631
S-110	Walla Walla River at M5 Lower Levee	45.95629	-118.38506
S-112	Walla Walla River at M7 Lower Levee	45.97177	-118.38025
S-122	Walla Walla River at Joe West Bridge	45.90086	-118.33454
S-123	Walla Walla River at Day Rd	45.90121	-118.35189
S-127	South Fork Walla Walla River at CTUIR Hatchery	45.85814	-118.22273
S-128	Walla Walla River at M2 above Cemetery Bridge	45.92753	-118.37888
S-129	Walla Walla River at M3 Smith Diversion	45.93713	-118.38267
S-130	M5 Spring	45.95652	-118.38547
S-151	Walla Walla River at M10 Bier Lane	45.99536	-118.37983
S-152	Walla Walla River at M9 Mauer Lane	45.98605	-118.37651
S-153	Walla Walla River at M1 Frazier Farmstead	45.9241	-118.37614
S-154	Walla Walla River at M6 Lower Levee	45.96447	-118.38297
S-156	South Fork Walla Walla River at Burnt Cabin	45.839617	-118.077709
S-160	South Fork Walla Walla River at Elbow Creek	45.825299	-118.154185
S-161	South Fork Walla Walla River at Bear Creek	45.844286	-118.104744
S-162	Burnt Cabin Creek	45.839582	-118.077691
S163	South Fork Walla Walla River above Table Creek	45.842288	-118.05845
S-164	Table Creek	45.842468	-118.058333
S-165	South Fork Walla Walla River above Skiphorton	45.85178	-118.025112
S-166	Skiphorton Creek	45.851823	-118.025149
S-167	South Fork Walla Walla River above Reser Creek	45.876329	-117.98538
S-168	Sheep Creek	45.87579	-117.985281
S-169	Reser Creek	45.877147	-117.98618
S-170	South Fork Walla Walla River below Deduct Spring	45.941362	-117.968006

APPENDIX B

Explanation of Data Gaps during the 2024 Water Year

Note: Data were collected between 05/15/2024 to 11/07/2024

Site ID	Site Name	Gap Dates	Explanation
S-106	Walla Walla River at M4 below Nursery Bridge	06/21/24 – 06/25/24	Sensor was out of the water. Dry data were deleted.
S-107	Walla Walla River at M8 Tum-a-Lum Bridge	06/22/24 – 06/25/24	The river went dry. Dry data were deleted.
S-112	Walla Walla River at M7 Lower Levee	06/22/24 – 06/25/24 09/09/24 – 09/11/24	The river went dry. Dry data were deleted. Sensor was out of the water. Dry data were deleted.
S-122	Walla Walla River at Joe West Bridge	05/15/24 – 06/21/24	Datalogger programming error. No data
S-129	Walla Walla River at M3 Smith Diversion	09/23/24 – 11/07/24	Sensor was stolen. No data
S-130	M5 Spring	05/15/24 – 11/07/24	Site was dry for the season. Data were not collected.
S-152	Walla Walla River at M9 Mauer Lane	5/25/23 – 11/14/23	No access to site. Data were not collected.
S-161	South Fork Walla Walla River at Bear Creek	07/19/24 – 09/11/24	Sensor was out of the water. Dry data were deleted.
S-165	South Fork Walla Walla River above Skiphorton	05/15/24 – 11/07/24	Site is remote and hard to get to. Data were not collected.
S-166	Skiphorton Creek	05/15/24 – 11/07/24	Site is remote and hard to get to. Data were not collected.
S-167	South Fork Walla Walla River above Reser Creek	05/15/24 – 06/11/24	Site is remote and hard to get to. Data were not collected.
S-168	Sheep Creek	05/15/24 – 06/11/24	Site is remote and hard to get to. Data were not collected.
S-169	Reser Creek	05/15/24 – 06/11/24	Site is remote and hard to get to. Data were not collected.
S-170	South Fork Walla Walla River below Deduct Spring	05/15/24 – 06/13/24 08/19/24 – 11/07/24	Site is remote and hard to get to. Data were not collected. Sensor could not be located. Data were not recovered.