



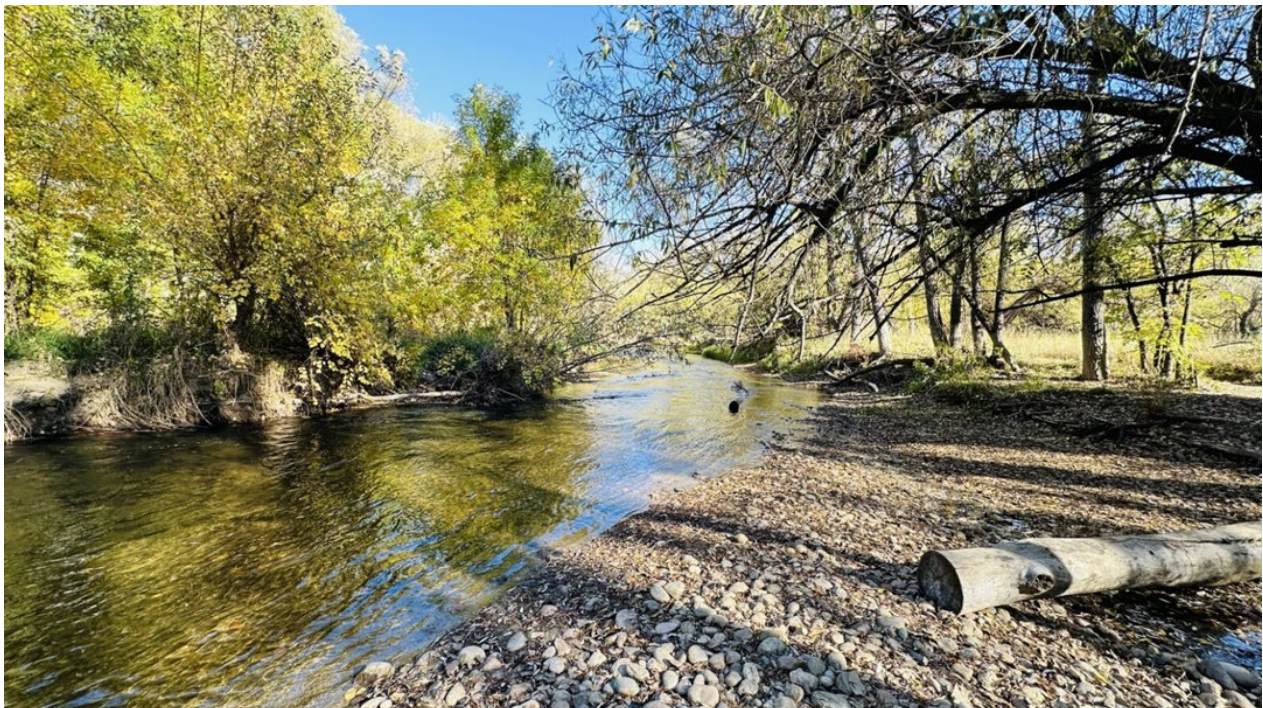
Poudre River Water Temperature Monitoring Program

Water Quality Department

The following describes the Northern Water's Poudre River Water Temperature Monitoring Program. This program began in 2014 to establish a baseline dataset representative of conditions prior to construction of the Northern Integrated Supply Project (NISP).

The objectives of this program are to:

- Provide a consistent, high-quality dataset.
- Track changes in water temperature over time.
- Provide data to support NISP-related water quality mitigation measures and adaptive management efforts.
- Assess compliance with state water temperature standards.
- Collect water temperature data in the transition zone to allow for spatial characterization of water temperature in the river.
- Maintain compliance with permit requirements for NISP.



MONITORING LOCATIONS

The Poudre River Water Temperature Monitoring Program includes monitoring locations covering approximately 50 miles of river starting upstream of the Munroe Canal (Cold Stream Tier II) and ending east of Interstate 25, downstream of the confluence with Fossil Creek and the New Cache Canal diversion (Warm Stream Tier I). Most sites are located in the mainstem of the Poudre River with two monitoring sites in Poudre River tributaries: the North Fork and Fossil Creek (Table 1).

The locations in the mainstem are upstream or downstream of major inflows or at locations important from a regulatory standpoint. Nine of these locations are required to support several conditions in the Rationale for Conditional 401 Certification of the Northern Integrated Supply Project (NISP 401 Certification). The sites above and below the inflow from the Hansen Supply Canal were historically part of the C-BT and Windy Gap Water Temperature Monitoring Program. These sites have a long period of record and were added to the Poudre River Water Temperature Monitoring Program in 2020 to comply with their inclusion in the NISP 401 certification. Sites required by the NISP 401 Certification are noted in *Table 1*.

Table 1 - Poudre River temperature monitoring sites.

Station	Description	Temp. Tier	401 Cert.	Latitude	Longitude
PR-MCU	Poudre River upstream of the Monroe Canal	CS-II		40.69237	-105.2584
PR-NFU	Poudre River upstream of the North Fork	CS-II		40.70322	-105.2425
NF-PRU	North Fork upstream of the Poudre River	CS-II		40.70154	-105.2404
PR-NFD	Poudre River downstream of the North Fork	CS-II		40.6973	-105.2448
CLAFTHCO	Poudre River at Canyon mouth gauge	CS-II	X	40.6645	-105.2231
PR-HSCU	Poudre River upstream of Hansen Supply Canal	CS-II	X	40.6601	-105.2094
PR-HSCD	Poudre River downstream of Hansen Supply Canal	CS-II	X	40.6606	-105.2032
PR-WAT	Poudre River by Watson Lake upstream of Laporte	CS-II	X	40.63489	-105.1678
PR-LION	Poudre River at Lions Park in Laporte	CS-II	X	40.6239	-105.1420
PR-SHI	Poudre River at Shields Street in Fort Collins	CS-II	X	40.6033	-105.0962
PR-MWWU	Poudre River at Lincoln Ave upstream Mulberry WWTP	CS-II	X	40.5889	-105.0700
PR-TIM	Poudre River at Timberline Road	CS-II		40.57847	-105.0354
PR-SCD	Poudre River at Prospect Road in Fort Collins	CS-II	X	40.5673	-105.0271
PR-BCU	Poudre River upstream of Boxelder Creek	WS-I	X	40.55201	-105.0112
PR-BCD	Poudre River downstream of Boxelder Creek	WS-I		40.53784	-104.9998
FC-PRU	Fossil Creek upstream of Poudre River	WS-I		40.4976	-104.9853
PR-FCD	Poudre River downstream of Fossil Creek and New Cache Ditch diversion	WS-I		40.5013	-104.9673

MAP OF MONITORING LOCATIONS

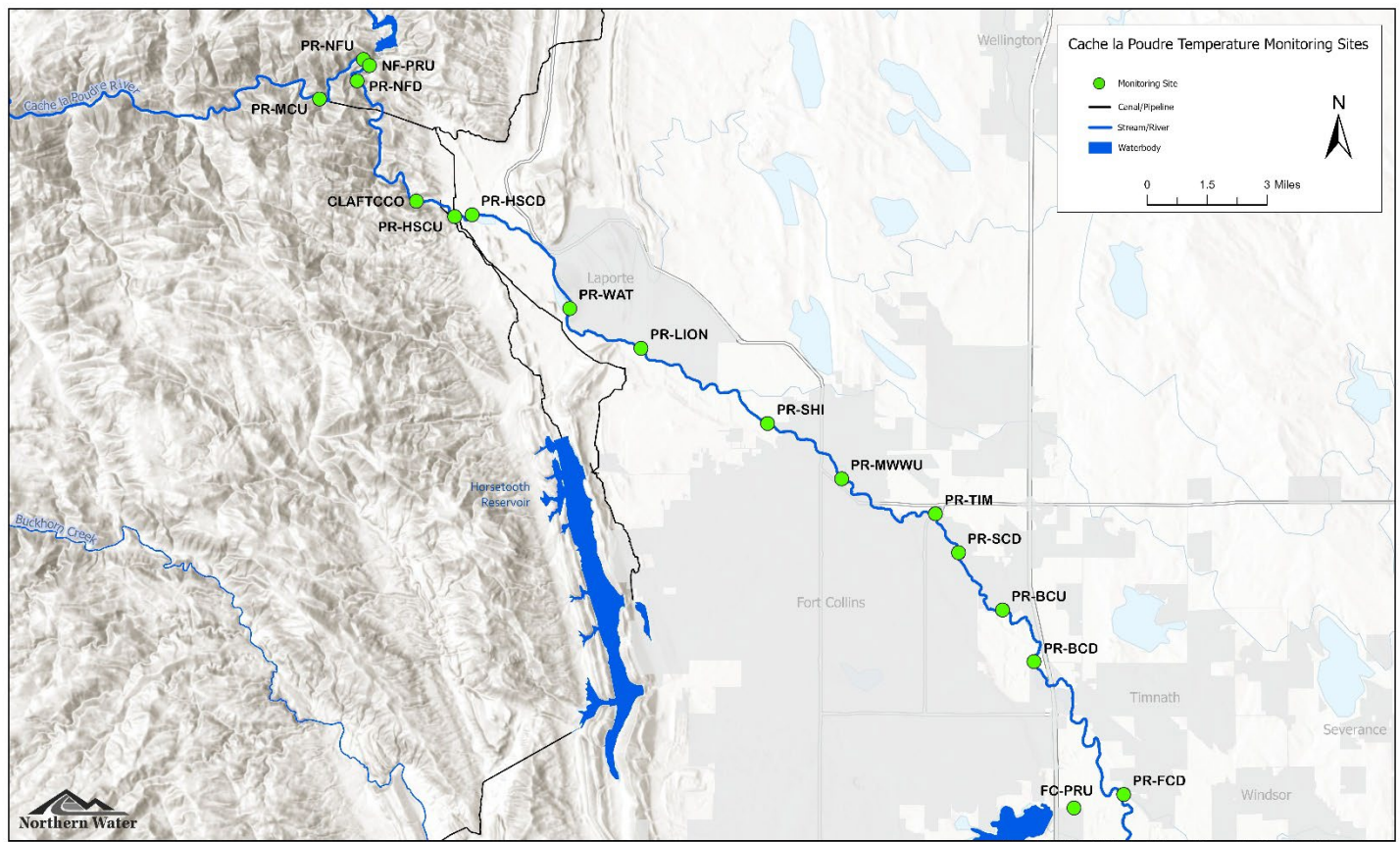


Figure 1 - Poudre River temperature monitoring sites.

STATION OPERATION AND MAINTENANCE

Northern Water maintains all temperature stations within the Poudre Temperature Monitoring Program. HOBO Pro v2 temperature loggers are utilized at all sites where data is not transmitted in real-time. The Hobo loggers record temperature at fifteen-minute intervals, 24 hours a day, while deployed. Each station is equipped with two HOBO data loggers: a primary and a secondary logger. The redundancy provides validation of the recorded temperature data and guards against gaps in the data set in case of sensor malfunction.

At all sites, except FC-PRU, the logger is placed in the thalweg of the stream per Northern Water's Standard Operation Procedure (SOP) for Water Temperature Monitoring. At FC-PRU access to the water is limited, therefore the logger is attached to a bridge from which it hangs into the water.

Northern Water's Field Services staff visit the HOBO temperature monitoring sites once a month (or as conditions allow) to download the data, take a manual water temperature measurement for comparison, and clean and inspect the equipment. Data are collected year-round at all sites except FC-PRU where data are collected beginning in early spring (the earliest conditions that allow for equipment installation) through late fall.

Data from Hobo dataloggers are processed and uploaded into Northern Water's WISKI database. All the data are then validated and finalized during the winter following the sampling season. The final data are available upon request.

Data at the CLAFTCCO monitoring site is collected and transmitted in real-time using a Campbell Scientific Model 109 Temperature Probe connected to a Campbell datalogger. The Campbell datalogger records temperature data from the 109 Temperature Probe at one-minute intervals and averages the one-minute data every 15 minutes, 24 hours a day, year-round. These data are collected and transmitted in real-time via telemetry to Northern Water's website. The real-time data are provisional. These data are validated in Northern Water's WISKI database during the winter and are available upon request.



Figure 2 - Temperature monitoring equipment.

APPENDIX 1 – HISTORY OF PROGRAM CHANGES

Year	Description of Change
2016	PR-NFU, NF-PRU, PR-NFD, and PR-SHI sites installed
2017	PR-TIM site installed mid-season 2017 to collect paired temperature and fish data. CPW conducts annual fish surveys at this site.
2019	SP-PRU site removed due to site access and safety issues
2020	Modified program objectives to include supporting NISP related water quality mitigation measures, complying with 401 certification and assessing compliance with state temperature standards.
2020	CLAFTCCO real-time site was added as a monitoring location. It was noted that data is not collected in compliance with Northern's SOP for temperature monitoring and the site will be moved to a location that meets the requirements of the SOP in the future
2020	PR-HSCU, PR-HSCD and PR-LION sites were moved into Poudre Temperature Monitoring Program per NISP 401 Certification. Northern Water has been collecting data at PR-HSCU and PR-HSCD since 2007 as part of the C-BT Temperature Monitoring Program and at PR-LION since 2016 as part of the Poudre River Temperature Transition Zone Monitoring Program. The NISP 401 requires that data collection continues at these locations; therefore, they are now included as part of the Poudre River Temperature Monitoring Program. There are no changes to the operation or locations of these sites.
2020	PR-MWWU site established. This site is required by the NISP 401 Certification and was installed in late 2020.
2021	SF-PRU site was removed on 9/29/2021 due to restrictions on Forest Service land. It will not be installed.
2023	CLAFTCCO site moved. This site has historic temperature data that was collected as part of Northern Water's Salinity Monitoring Program and reported in real-time to Northern Water's database. Real-time data collection at this site will continue as a requirement for NISP 401 Certification. Since this monitoring location has not historically been a part of Northern Water's Temperature Monitoring Program, the installation of the temperature sensor did not follow Northern Water's Standard Operation Procedure (SOP), "Protocols for Representative Temperature Monitoring of Rivers and Streams." Therefore, in Spring 2023 the station was reinstalled following the SOP, approximately 0.05 river miles downstream.
2023	Final approval was received to install PR-NAT upstream of the initially proposed location in the NISP 401 certification and rename "PR-SCD". Data collection was initially scheduled to begin at these locations by January 2021, but the initial location requirement in the NISP 401 Certification did not allow for installation per Northern Water's Water Temperature Monitoring SOP. It is anticipated that the site will be installed in 2024.
2024	PR-SCD site installed in April 2024.

2024	Remaining sites in Poudre River Temperature Transition Zone Monitoring Program were moved into the Poudre Water Temperature Monitoring Program to consolidate the two programs into one. Two of the remaining sites were PR-WAT and PR-TIM, which will be required or necessary for FWMEP or 401 Certification monitoring. The remaining four sites were PR-SFU, PR-SFD, PR-AWC and PR-MCU.
2024	FC-PRU is moved. The original FC-PRU site was attached to a bridge hanging into Fossil Creek. During summer 2024, the housing was vandalized and removed. On August 27 th , 2024, the site was reinstalled just downstream, secured to the bottom of the canal with a concrete block per protocol.
2024	PR-SFU (40.68274, -105.4614), PR -SFD (40.68776, -105.433), and PR-AWC (40.69081, -105.3428) stations were removed in late 2024. These three sites supplemented temperature data collected downstream to sufficiently characterize the transition zone, where temperature changes occur along the river as the elevation decreases. These sites were added in 2016 to support the development of an appropriate temperature standard for the Poudre River. Data at these locations was no longer necessary for the temperature program or useful for collaborative organizations.

