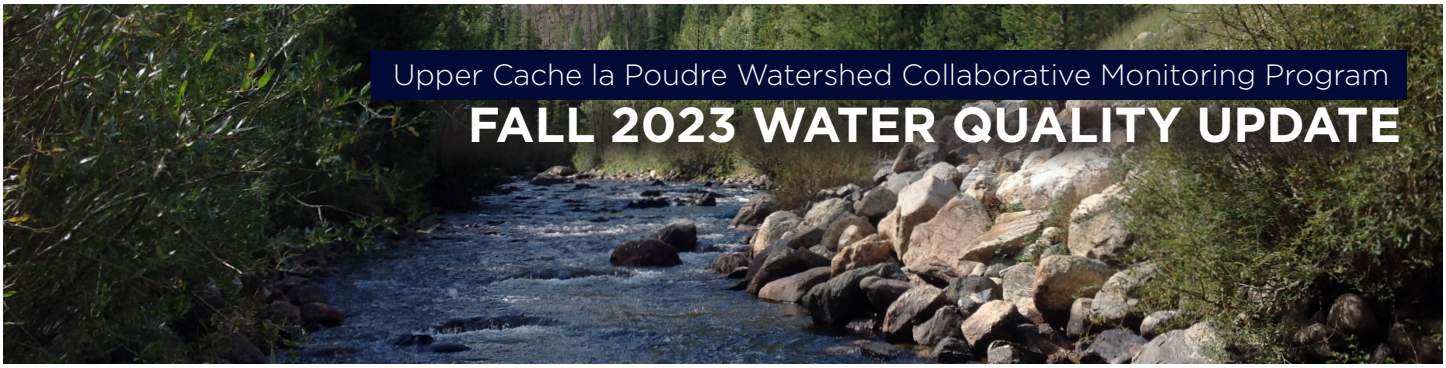

Upper Cache la Poudre Watershed Collaborative Monitoring Program

# FALL 2023 WATER QUALITY UPDATE

## Source Water Monitoring

The Upper Cache la Poudre (CLP) Watershed Collaborative Water Quality Monitoring Program was established in 2008 between the cities of Fort Collins, Greeley and Soldier Canyon Water Treatment Authority, to help meet present and future drinking water treatment goals. The City of Thornton joined the collaborative as a full partner in 2022.

Water quality monitoring of our raw, CLP River drinking water supply is conducted from April through November. Monitoring sites are strategically located throughout the Upper CLP watershed. Water quality data provide valuable information about the health of our source watershed and quality of the CLP raw water supply.

The Fall 2023 Water Quality Update provides a seasonal summary of watershed conditions in the Upper CLP watershed by highlighting weather, drought, streamflow, and water quality conditions over the fall season (September – November).

Routine water quality monitoring results are reported for six key monitoring sites located throughout the Upper CLP watershed, which capture water quality conditions above and below major tributaries and near water supply intake structures (Figure 1). Fall 2023 water quality data are compared to baseline water quality data, collected between 2008 to 2012.

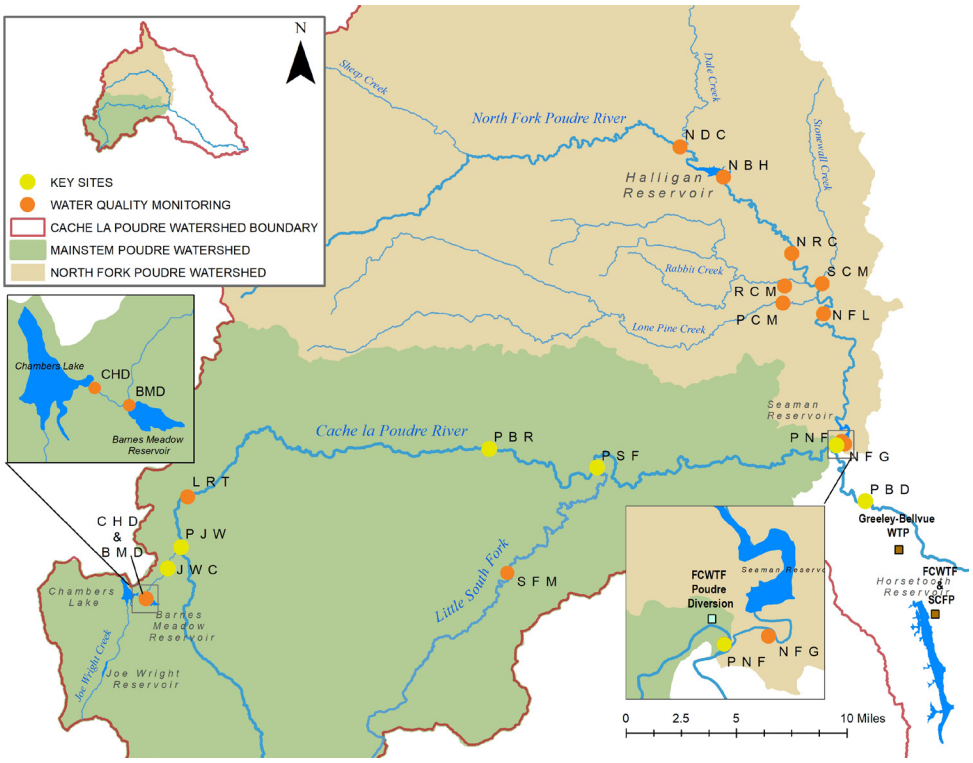


**Figure 1** – Upper Cache la Poudre Watershed Collaborative Monitoring Program water quality sampling sites.

**JWC** - Joe Wright Creek above the confluence with the Poudre River

**PJW** - Poudre River above the confluence with Joe Wright Creek

**PBR** - Poudre River below Rustic

**PSF** - Poudre River below the confluence with the Little South Fork

**PNF** - Poudre River above the confluence with the North Fork at the City of Fort Collins' Intake

**PBD** - Poudre River below the confluence with the North Fork at the Bellvue Diversion

## Temperature

Air temperature measured at the Joe Wright Snowpack Telemetry (SNOTEL) station over the 2023 fall season was 2.6°F warmer than the long-term average and ranked as the 8th warmest fall on record (out of 34 years). Monthly mean air temperature was above average in September and October and well above average in November. The month of November was 4.1°F warmer than the long-term average and ranked as the 10th warmest on record (Table 1).

| | Temperature | | | |
|---|---|---|---|---|
| | 2023 (°F) | Average (°F) | Departure (°F) | 2023 Rank |
| September | 46.9 | 44.7 | +2.2 | 14th (H) |
| October | 36.5 | 34.7 | +1.8 | 12th (H) |
| November | 28.9 | 24.8 | +4.1 | 10th (H) |
| Fall | 37.4 | 34.9 | +2.6 | 8th (H) |

**Table 1** – Monthly mean air temperatures measured at the Joe Wright SNOTEL over the fall months of 2023 compared to the long-term average (1991 – 2020)

*Note:* H = hottest and C = coldest

## Precipitation

Precipitation measured at the Joe Wright SNOTEL over the 2023 fall season was below average and ranked as the 2nd driest fall on record (out of 45 years). Precipitation was below average in all months. The month of November was particularly dry and ranked as the fourth driest on record. Precipitation measured only 45% of the average in November (Table 2). Drought conditions returned to the Upper CLP watershed over the fall season due to above average temperatures and below average precipitation measured from September-November. Drought conditions intensified from no drought at the start of the fall season to abnormally dry conditions in the northern portion of the CLP watershed by the end of the fall season (Figure 2).

**Table 2** – Monthly accumulated precipitation totals measured at the Joe Wright SNOTEL over the 2023 fall season compared to the long-term average (1991 – 2020).

*Note:* W = wettest and D = driest

| | Total Precipitation | | | |
|---|---|---|---|---|
| | 2023 (inches) | Average (inches) | % of Average | 2023 Rank |
| September | 1.4 | 2.8 | 50% | 11th (D) |
| October | 3.0 | 3.9 | 77% | 15th (D) |
| November | 1.9 | 4.2 | 45% | 4th (D) |
| Fall | 6.3 | 10.8 | 58% | 2nd (D) |

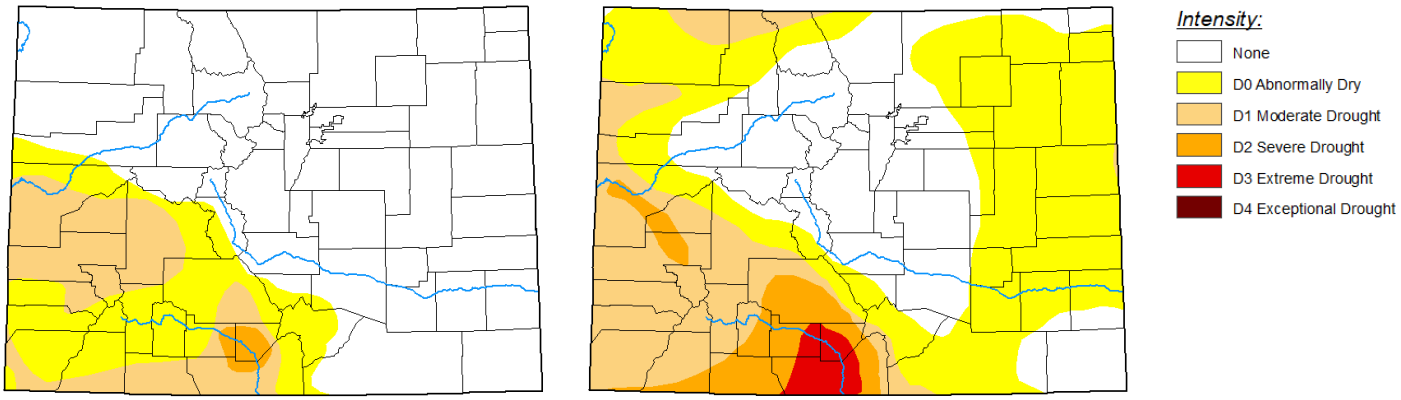


**Figure 2** – Drought conditions for the state of Colorado as monitored by the United States Drought Monitor on August 29, 2023 (left) and November 28, 2023 (right). (Map source: https://droughtmonitor.unl.edu/)

## Streamflow Conditions

Streamflow at the Cache la Poudre River near the Canyon Mouth (CLAFTCCO) stream gage measured 11,458 acre-feet of water over the fall season, which was 63% of the long-term average (calculated over the 1881 – 2022 measurement period). The total amount of water measured near average in November, below average in October, and notably below average in September when streamflow measured only 40% of average (Figure 3). The low September flows could be due to a combination of below average precipitation, high temperatures leading to increased evapotranspiration, and changes in high elevation water storage within the Upper CLP. Additionally, the monthly average flow varied by only ~200 acre-feet between the fall months, which is notably lower than the long-term variation (Figure 3). This discrepancy alludes to changes in high elevation water storage and increased water demand. Stream gages below each high elevation reservoir (LAPLODCO, JWCCHACO, CLANSECO) confirm that Long Draw Reservoir releases ceased in October, Chambers Reservoir releases ramped down in October, and Seaman Reservoir releases remained constant through the fall months. The demand for treated water was also high due to dry, hot conditions resulting in increased raw water diverted from the Poudre River at Fort Collins and Greeley's intakes located upstream of the Canyon Mouth gage.

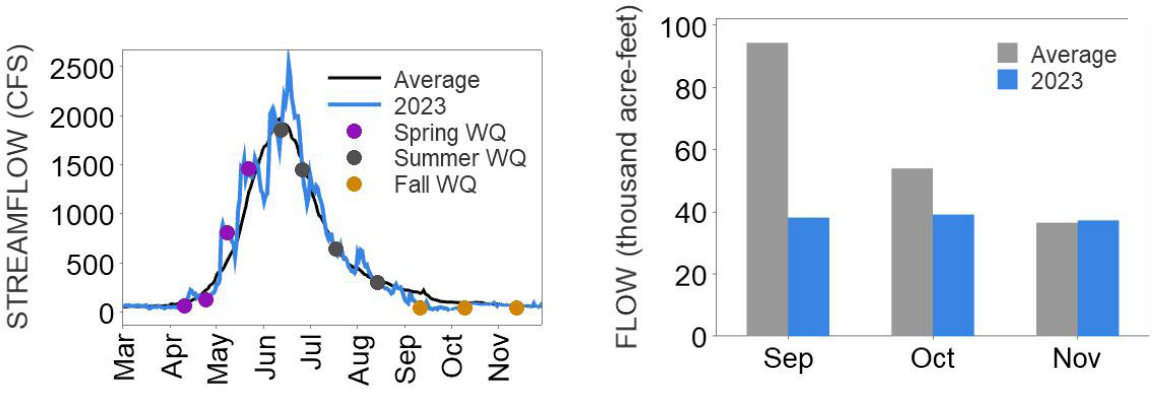


**Figure 3** – Streamflow conditions on the Poudre River over the 2023 fall season (left) and monthly total water volume measured over the summer season (right).

## Water Quality Indicators

The Upper CLP Collaborative Water Quality Monitoring Program uses several key water quality indicators, including pH, conductivity, temperature, and turbidity, which act as surrogates for other parameters (Table 3). These indicators provide a snapshot of water quality conditions and are useful for identifying trends or changes in water quality. Significant changes in these water quality indicators may provide an early warning of potential water pollution.

**Table 3** – Water quality indicators measured as part of the Upper Cache la Poudre Collaborative Water Quality Monitoring Program.

| Water Quality Indicator | Explanation |
|---|---|
| Temperature | Water temperature influences other water quality parameters and is a major driver of biological activity and algal growth in rivers, including certain phytoplankton species that produce the taste and odor compounds, geosmin and 2-methlyisoborneol. |
| pH | pH is an important water quality parameter to monitor, because it influences the solubility and biological availability of chemical constituents, including nutrients and heavy metals. pH near 7 is considered neutral, with more acidic conditions occurring below 7 and more basic, or alkaline, conditions occurring above 7. |
| Specific Conductivity | Conductivity is an index of dissolved ionic solids in water. Conductivity is used as a general measure of water quality. Significant increases in conductivity can be used as an indicator of increased pollution. |
| Turbidity | Turbidity is monitored to track changes in water clarity. Clarity is influenced by the presence of algae and/or suspended solids introduced to surface waters through various land use activities, including runoff and erosion, urban stormwater runoff and drainage from agricultural lands. For water treatment, turbidity is an important indicator of the amount of suspended material that is available to harbor pollutants, such as heavy metals, bacteria, pathogens, nutrients and organic matter. |

Fall monitoring captures water quality as streamflow on the Poudre River transitions to baseflow (or low flow) conditions. During this time of the year water quality is generally stable throughout the watershed. Water releases from high elevation water storage reservoirs and storm events may cause changes in streamflow and water quality through September and early October, although these events are temporary. Substantial water releases in the Upper CLP watershed typically cease (depending on demand) in October, and storm events this time of year are more uncommon, as precipitation in the Upper CLP shifts from rain to snow. Most water quality constituents begin to concentrate under baseflow conditions and water temperature decreases, especially in the higher elevations of the watershed.

Over the fall months of 2023, all water quality indicators at key sites along the CLP River were within the baseline range of values (Figure 4). Water temperature was above normal at all key monitoring sites – normal is defined as the median value over the baseline period of record. pH was at or slightly below normal at higher elevation monitoring sites on Joe Wright Creek (JWC) and the Poudre River above Joe Wright Creek (PJW). pH measured slightly above normal from the Poudre below Rustic (PBR) downstream to the City of Greeley's raw water intake (PBD). Specific conductivity was higher than normal at all key sites. Turbidity measured within the baseline range of values at all monitoring sites. Lower than average flow conditions in September and October likely contributed to the increase in water temperature, pH, and conductivity observed in the fall months.

Diana Schmidt, Watershed Specialist with the City of Fort Collins, collects water samples from the mainstem Cache la Poudre River (PNF).

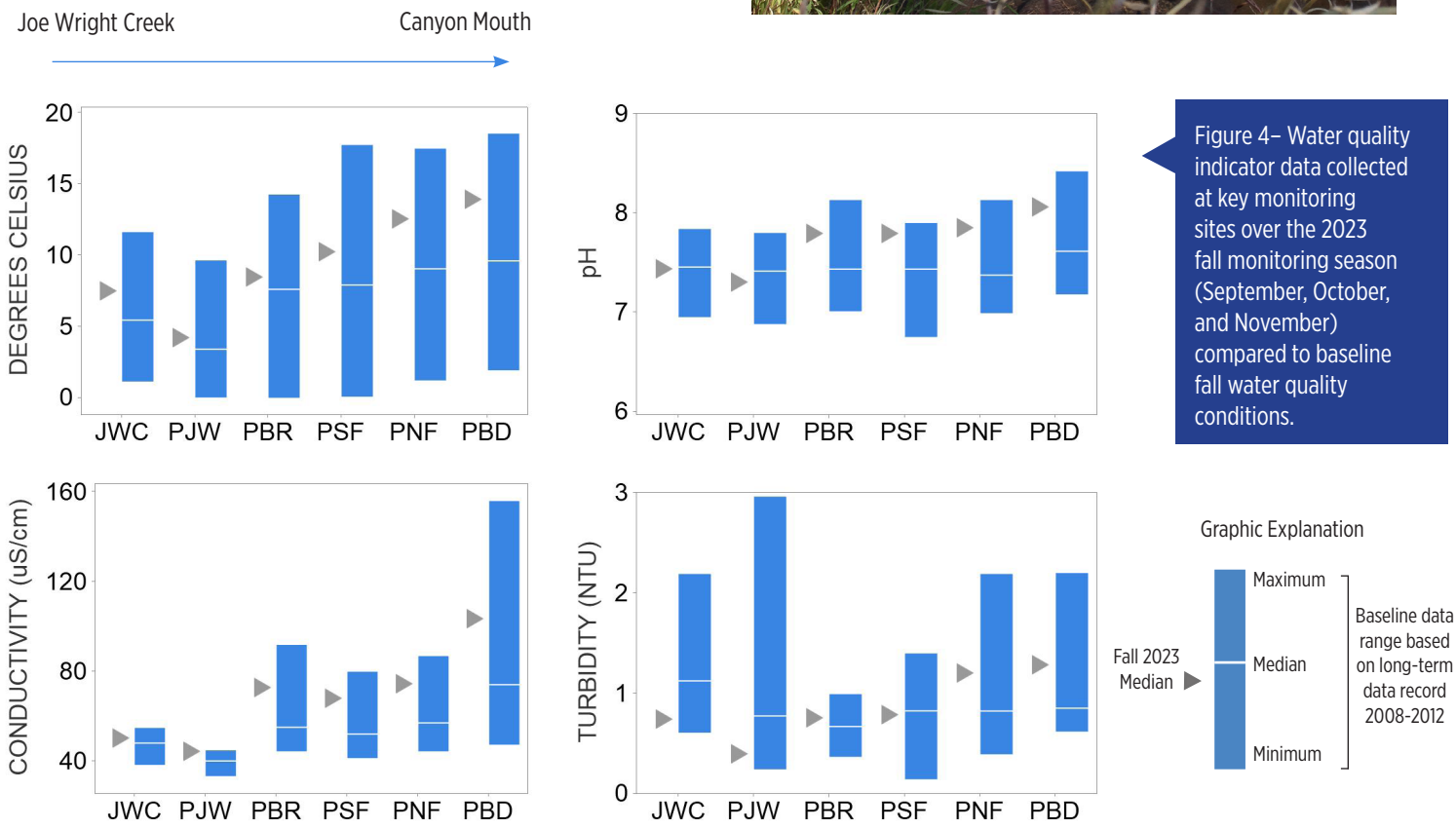


Figure 4– Water quality indicator data collected at key monitoring sites over the 2023 fall monitoring season (September, October, and November) compared to baseline fall water quality conditions.

## Summary

The Upper CLP experienced hotter and drier than average conditions during the fall months of 2023. Combined with high elevation water storage and increased treated water demand, these conditions likely exacerbated the low flow conditions observed at the Poudre Canyon mouth during September and October. During all fall months, water quality indicators at key sites along the CLP River were within the baseline range of values. Though within the baseline, increases in water temperature, conductivity, and pH (at lower elevation sites) were observed across the Upper CLP. This departure from the baseline is likely due to the observed low flow conditions.

## Learn More

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