

Collaborative Upper Cache la Poudre Monitoring Program

Water Quality Update | Fall 2021

Monitoring and Protecting Our Water Sources

SOURCE WATER MONITORING

The Upper Cache la Poudre (UCLP) Watershed Collaborative Monitoring Program was established in 2008 between the City of Fort Collins, the City of Greeley and Soldier Canyon Water Authority, to help meet present and future drinking water treatment goals.

Water quality monitoring of our raw, Cache la Poudre 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 raw water supply.

The *Fall 2021 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).

Water quality begins to stabilize following peak snowmelt runoff and routine monitoring is reduced to monthly sampling. Routine water quality monitoring results are reported for six key monitoring sites located throughout the Upper Cache la Poudre watershed, which capture water quality conditions above and below major tributaries and near water supply intake structures (**Figure 1**). Present water quality conditions are compared to baseline water quality conditions collected over the period of 2008 to 2012.

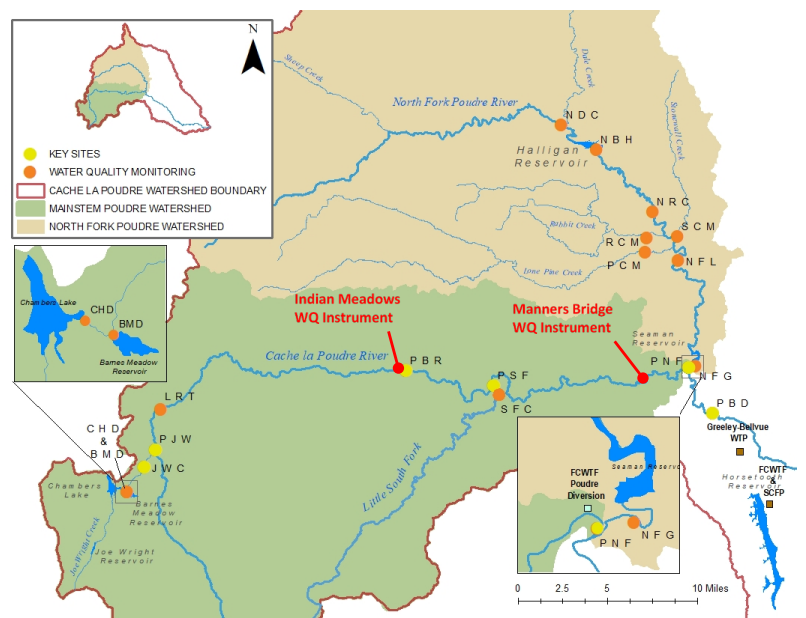


Figure 1 - Upper Cache la Poudre Watershed Collaborative Monitoring Program water quality sampling sites and real-time water quality instrument locations.

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 the Town of 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 SNOTEL over the 2021 fall season was 4.1°F warmer than the long-term average and ranked as the second warmest fall on record (32 years). Monthly mean air temperature was above average from September through October. The months of September and November were very warm and measured 4.3°F and 7.2°F above average. Temperature observed over the month of October was less extreme but still warmer than average (**Table 1**).

Table 1 – Monthly mean air temperatures measured at Joe Wright SNOTEL over the fall months of 2021 compared to the long-term average (1991–2020). Note: H = hottest and C = coldest

Period of Record	Temperature			
	2021 (°F)	Average (°F)	Departure (°F)	2021 Rank
September	49.0	44.7	4.3	2 nd (H)
October	36.0	34.7	1.3	12 th (H)
November	32.0	24.8	7.2	2 nd (H)
Fall	39.0	34.9	4.1	2 nd (H)

PRECIPITATION

Precipitation measured at the Joe Wright SNOTEL over the 2021 fall season was 96% of average and ranked as the 21st driest fall on record (43 years) (**Table 2**). Precipitation recorded over the month of September measured well below average and experience the largest precipitation deficit over the fall season. In contrast, precipitation measured above average for the month of October and near average for the month of November. Although precipitation was near average over the fall season, the above average temperatures that persisted through the fall season and precipitation deficit from the spring and summer seasons resulted in the expansion of moderate to severe drought throughout portions of the Upper CLP watershed and a continuation of abnormally dry conditions near the headwaters (**Figure 2**).

Period of Record	Total Precipitation			
	2021 (inches)	Average (inches)	% average	2021 Rank
September	1.7	2.8	61%	13 th (D)
October	4.6	3.9	118%	14 th (W)
November	4.1	4.2	98%	22 nd (D)
Fall	10.4	10.8	96%	21 st (D)

Table 2 – Monthly accumulated precipitation totals measured at the Joe Wright SNOTEL over the 2021 fall season compared to the long-term average (1991–2020). Note: W = wettest and D = driest

Drought Classification

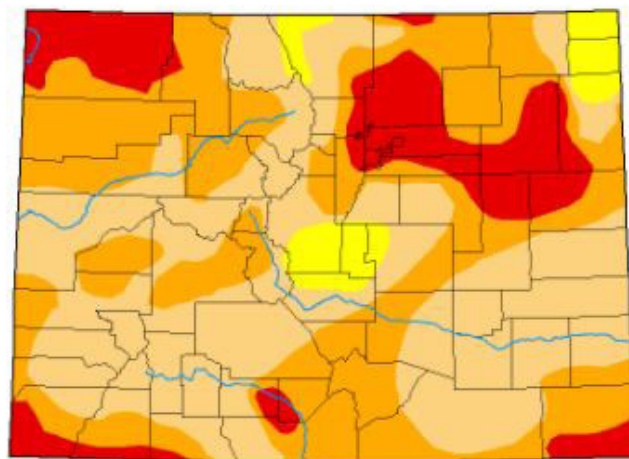
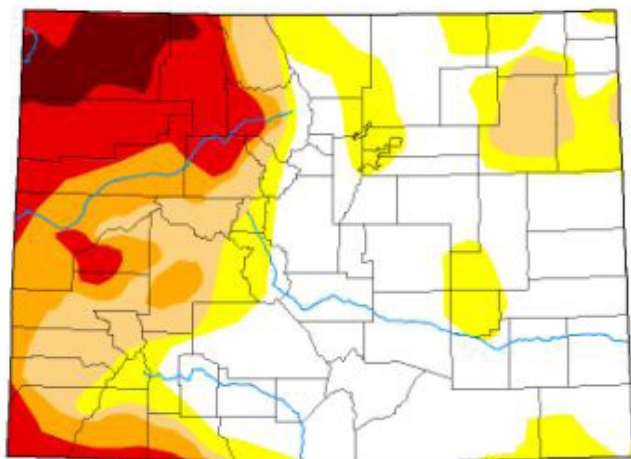


Figure 2 – Drought conditions for the state of Colorado as monitored by the United States Drought Monitor on September 7 (left) and November 30, 2021 (right). (map source: <https://droughtmonitor.unl.edu/>)

STREAMFLOW CONDITIONS

Streamflow at the Cache la Poudre River near the Canyon Mouth (CLAFTCCO) stream gage measured 16,162 acre-feet over the fall season, which was 89% of the long-term average. Streamflow was below average for the months of September and October, and above average for the month of November. Streamflow was notably lower than average for the month of September, which measured 72% of average. In contrast, streamflow for the month of November measured 119% of average (**Figure 3**).

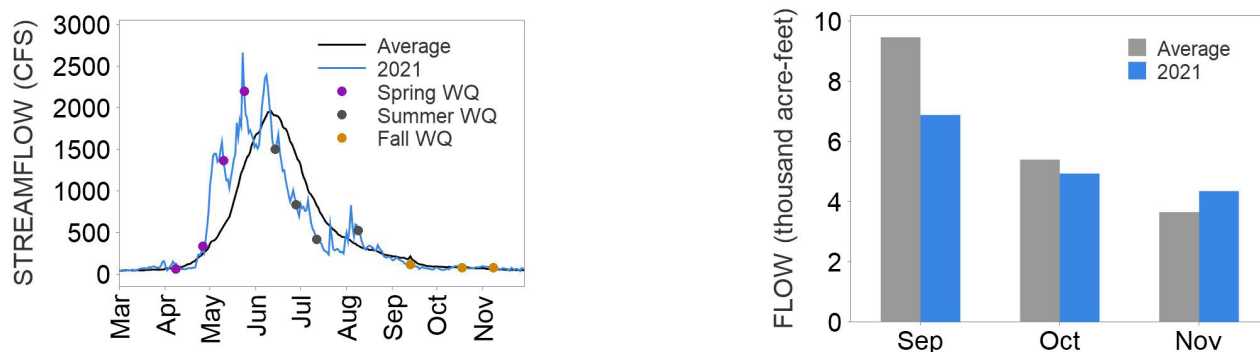


Figure 3 – Streamflow conditions on the Poudre River over the 2021 fall season (left) and monthly total water volume measured over the fall season (right) compared to the long-term average (1885-2021).

WATER QUALITY INDICATORS

The Upper Cache la Poudre 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 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-methylisoborneol.
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.

WATER QUALITY INDICATORS CONTINUED

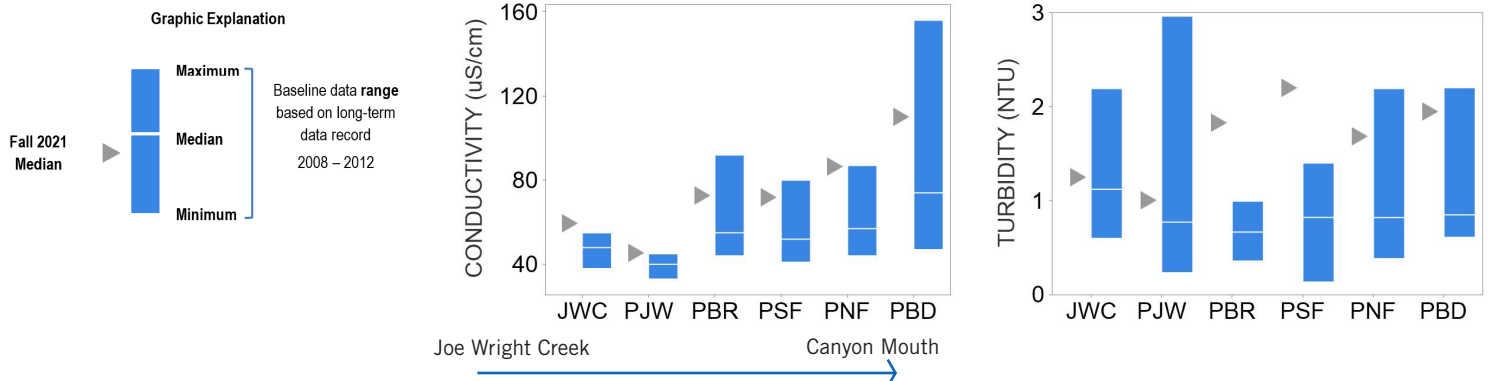
Fall monitoring captures water quality as streamflow on the Poudre River transitions to baseflow (or low flow) conditions. During this time of the year water quality is generally stable throughout the watershed. Water releases from high elevation water storage reservoirs and storm events may cause changes 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 2021, most water quality indicators at key sites along the CLP River were within the baseline range of values (**Figure 4**). Despite the warm air temperatures observed over the fall season, water temperature was near or cooler than normal at all key monitoring sites. pH was slightly above normal at all sites except in the Poudre above Joe Wright Creek (PJW), which was normal for the fall season.



Nik Radtke, Watershed Technician, prepares to collect water samples from Joe Wright Creek below Chambers Lake.

Figure 4 – Water quality indicator data collected at key monitoring sites over the 2021 fall monitoring season (September, October and November) compared to baseline summer water quality conditions.



WATER QUALITY INDICATORS CONTINUED

Specific conductivity values were higher than normal at all key sites, but still within the baseline range of values for most sites. Specific conductivity values measured higher than the baseline maximum in Joe Wright Creek (JWC) and the Poudre above Joe Wright Creek (PJW) as well as the at the City of Fort Collins' raw water intake (PNF). Turbidity levels were near normal in Joe Wright Creek (JWC) and in the Poudre River above Joe Wright Creek (PJW). Fall turbidity values were elevated in the Poudre River near Rustic (PBR) downstream to the City of Greeley's raw water intake (PBD). Turbidity was notably higher in the Poudre near Rustic (PBR) and the Poudre below the South Fork (PSF). Turbidity values at these sites were still low (<3 NTU) but did measure outside of the baseline range of values typically observed during the fall season.

The notable departure from baseline of these water quality indicators were not extreme, but these changes, specifically associated with pH, specific conductivity and turbidity, imply post-fire impacts from the Cameron Peak Wildfire, such as ash, and elevated sediment and solids (dissolved and suspended), continued to slightly impact Poudre River water quality during the fall season.



View looking upstream from the Poudre below Rustic (PBR) monitoring site. Turbidity values were slightly elevated at this site over the fall season due to lingering effects from post-fire debris flows, flooding and erosion events that occurred over the summer season.

POST-CAMERON PEAK WILDFIRE WATER QUALITY IMACTS

Water quality monitoring instruments were installed at two locations upstream of the Poudre supply intake facility in early April. The Poudre at Indian Meadows site is located one mile downstream of the Town of Rustic and the Manners Bridge site is located approximately one mile upstream of the City's raw water intake (**Figure 1**). This monitoring system provides water treatment operations near real-time water quality data to quickly respond to changes in Poudre River water quality that result from runoff from the Cameron Peak burn area or other upstream events.

The summer monsoon began to wane in September with only two prominent precipitation events observed over the fall season (**Figure 5**). As was observed over the summer season, these events caused a drastic spike in turbidity, but both were very short-lived.

Despite the limited number of post-fire debris flows and flood events observed over the fall season, water quality indicators (**Figure 4**) displayed a slight shift in fall water quality in the Upper CLP Watershed. The post-fire erosion and sedimentation events that were observed over the summer season appeared to have lingering effects on water quality as significant quantities of ash, sediment, and debris were observed within and along the river channel. This excess material may have resulted in the elevated pH, turbidity and specific conductivity values measured at several key monitoring sites.

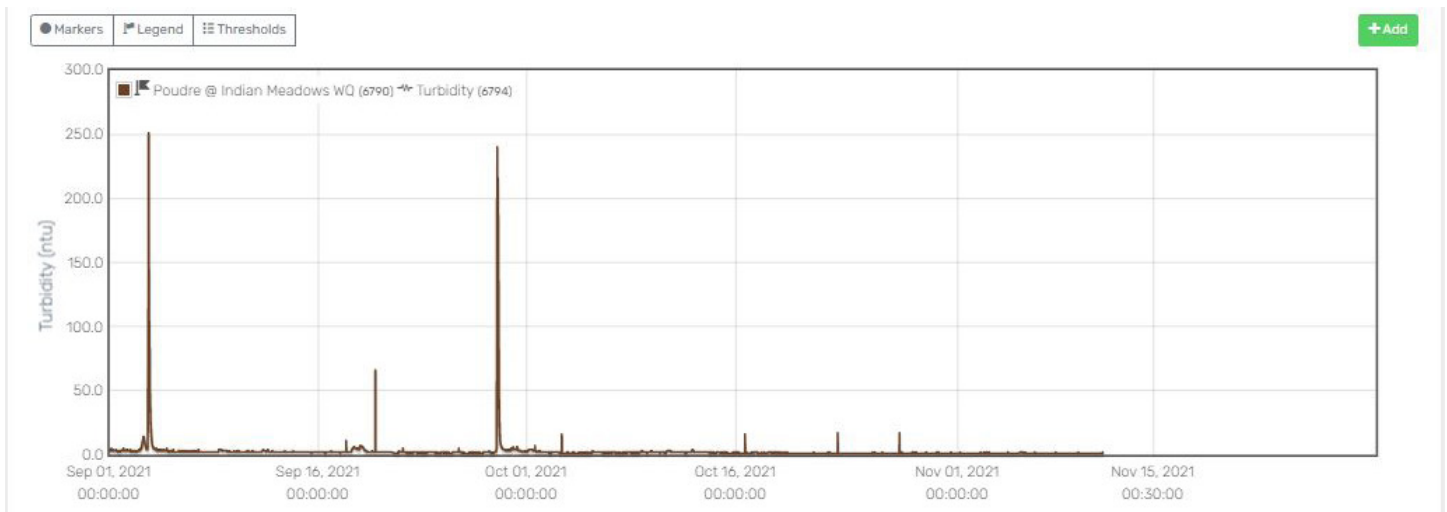


Figure 5 – Turbidity measured in the Poudre River at the Indian Meadows real-time water quality instruments over the fall season. Note: These data are preliminary and subject to change and some outlier data may be present.