# Collaborative Upper Cache la Poudre Monitoring Program



## 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 UCLP. Water quality data provide valuable information about the health of our source watershed and raw water supply.

The *Spring 2021 Water Quality Update* provides a seasonal summary of watershed conditions in the Upper CLP watershed by highlighting weather, snowpack, and streamflow conditions over the spring season (March–May), as well as water quality information collected over the months of April and May.

Water quality during spring snowmelt runoff is highly variable. To better capture this seasonal variability, monitoring is conducted two times per month. 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).*** Present water quality conditions are compared to baseline water quality conditions collected over the period of 2008 to 2012.

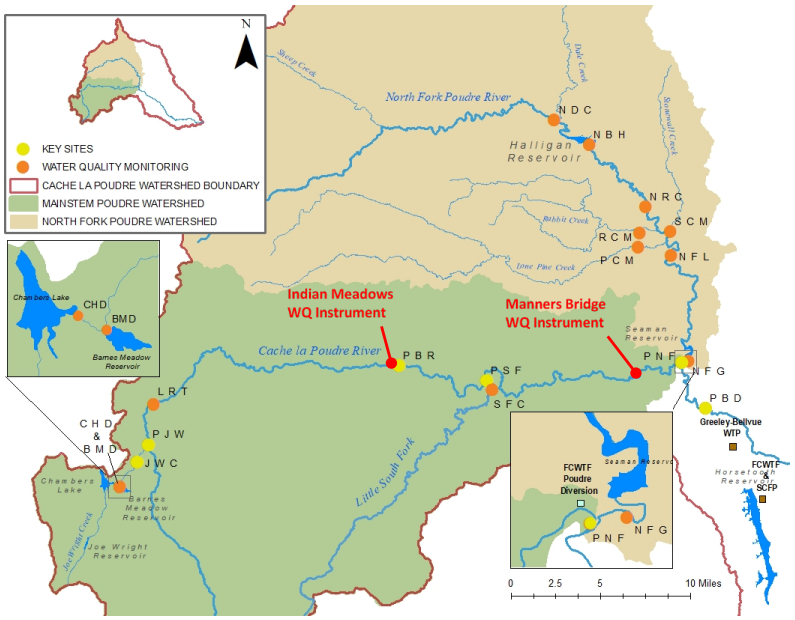


***Figure 1*** *- Upper Cache la Poudre Collaborative Monitoring Program sampling locations*

**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 spring season was only 0.4°F warmer than the long-term average and ranked as the 15th warmest spring on record (32 years). The monthly mean air temperature for March was average and only slightly above average in the months of April and May ***(Table 1).***

***Table 1 –*** *Monthly mean air temperatures measured at Joe Wright SNOTEL over the spring months of 2021 compared to the long-term average (1990 – 2019). Note: H = hottest and C = coldest*

| Period of Record | Temperature | | | |
|---|---|---|---|---|
| | 2021 (°F) | Average (°F) | Departure (°F) | 2021 Rank |
| March | 25.0 | 25.0 | 0.0 | 15th (H) |
| April | 31.0 | 30.5 | 0.5 | 15th (H) |
| May | 39.0 | 38.3 | 0.7 | 11th (H) |
| Spring | 31.7 | 31.3 | 0.4 | 15th (H) |

# PRECIPITATION

Precipitation measured at the Joe Wright SNOTEL over the 2021 spring season was 86% of the long-term average and ranked as the 12th driest spring on record (43 years). Precipitation over the month of March measured slightly above average, while precipitation measured below average in the months of April and May. The largest deficit in monthly total precipitation was observed in the month of May, which measured only 70% of average ***(Table 2).*** Despite below average precipitation measured near the headwaters of the Upper CLP watershed over the spring season ***(Table 2)***, precipitation in Fort Collins was 162% of average for the spring season with over two times the amount of precipitation measured in May (203% of average). Due to the wet and near average temperatures observed over the spring season, much of northern Colorado and the Upper CLP watershed, which were experiencing severe drought conditions in March, are no longer in a drought ***(Figure 2).***

***Table 2 –*** *Monthly accumulated precipitation totals measured at the Joe Wright SNOTEL over the 2021 spring season compared to the long-term average (1981 – 2010). Note: W = wettest and D = driest*

| Period of Record | Total Precipitation | | | |
|---|---|---|---|---|
| | 2021 (inches) | Average (inches) | % average | 2021 Rank |
| March | 4.9 | 4.7 | 103% | 19th (W) |
| April | 4.4 | 5.2 | 85% | 15th (D) |
| May | 3.1 | 4.5 | 70% | 11th (D) |
| Spring | 12.4 | 14.4 | 86% | 12th (D) |

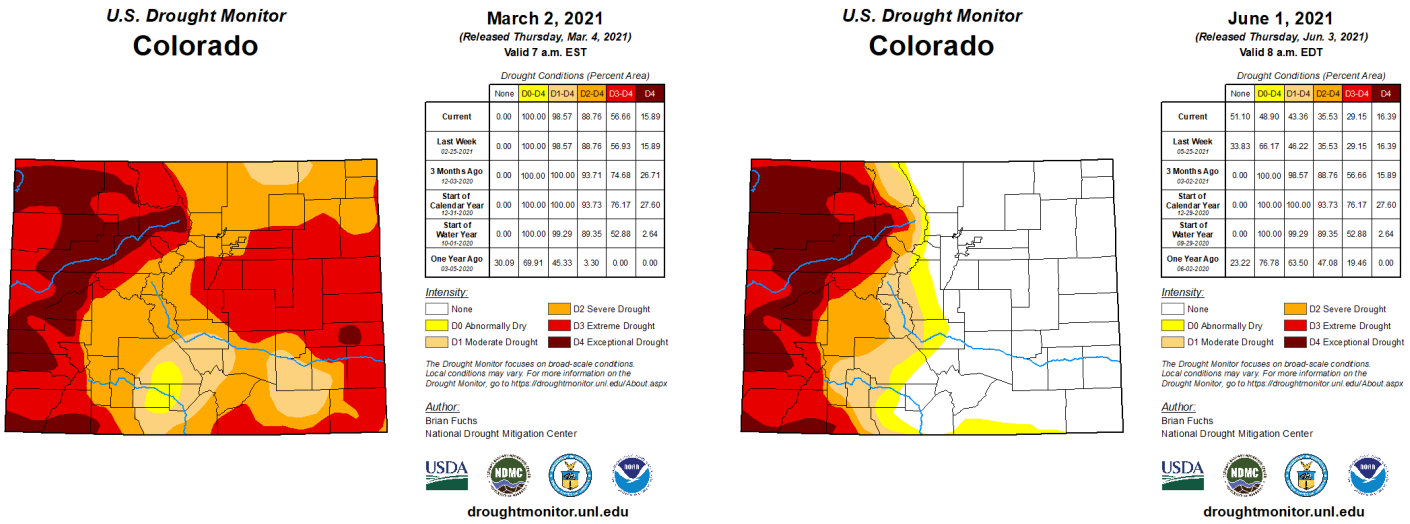


***Figure 2 –*** *Drought conditions for the state of Colorado as monitored by the United States Drought Monitor on March 2nd and June 1st, 2021. Most of Colorado, east of the continental divide, is no longer in drought (map source: https://droughtmonitor.unl.edu/)*

# SNOWPACK

Snow water equivalent (SWE), the amount of water held in the snowpack, at the Joe Wright SNOTEL near Cameron Pass was below normal (1981 – 2010 median) for most of the snow accumulation season (October through April). Monthly maximum SWE was well below average from October through January and ranged from 75% to 78% of normal. Conditions began to improve in February (89%) followed by a potent winter storm in early-March that increased the water content to near average (97%). The snowpack continued to build through much of April before beginning to melt in early-May. The maximum amount of water contained in the snowpack was observed on April 30th at the Joe Wright SNOTEL and measured 23.0 inches – 98% of normal. Peak SWE across the Upper CLP watershed was near average and measured 105%. The North Fork and South Fork CLP watersheds measured above average at 122% and 113%, respectively ***(Figure 3).***

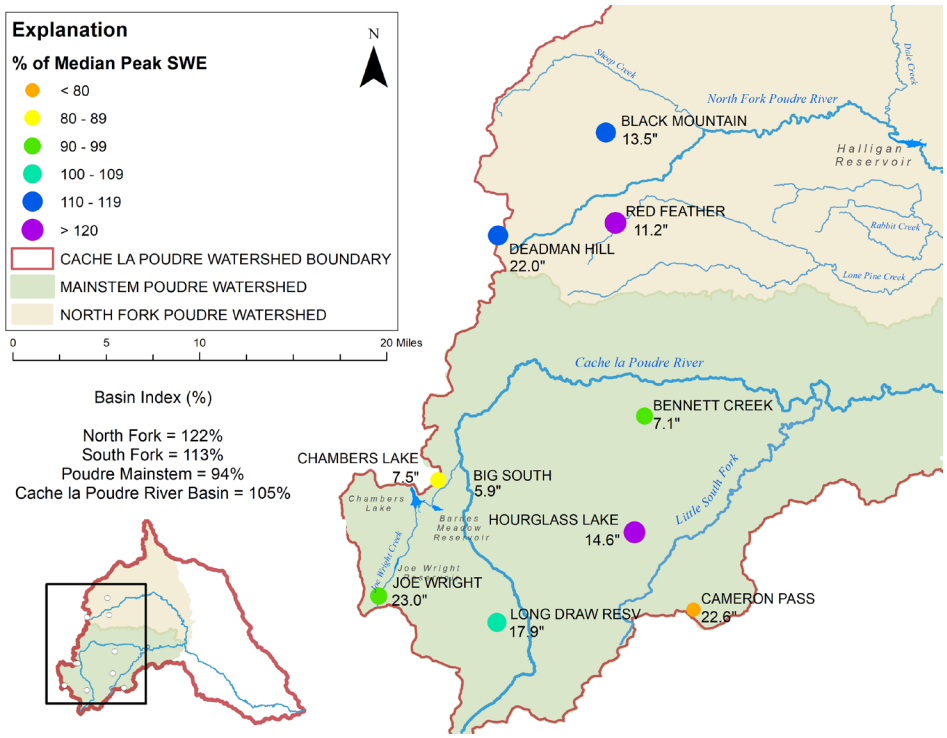


***Figure 3*** *– Peak snow water equivalent measured at snowpack monitoring (SNOTEL and snow course) sites throughout the Upper Cache la Poudre River watershed in 2021.*

# STREAMFLOW CONDITIONS

Streamflow at the Cache la Poudre River near the Canyon Mouth (CLAFTCCO) stream gage measured 109,956 acre-feet over the spring season which was 162% of the long-term average. Streamflow was above average in all spring months, especially in the month of May when streamflow was nearly two times greater than average **(Figure 4).**

Snowmelt runoff began as expected when streamflow began to increase in late-April. Streamflow increased rapidly in late-April and early-May from snow melting in the mid- to lower elevation foothills of the Upper CLP watershed impacted by the significant winter storm in March. The initial rise in streamflow was followed by cooler weather slowing down snowmelt and streamflow in early to mid-May. Streamflow began to rapidly rise again when temperatures returned to near normal, and several precipitation events impacted the mid- to lower elevations of the Upper CLP watershed. The rapid rise and peak observed on May 23 was caused by a significant rain event, in combination with snowmelt, that occurred over the Cameron Peak Wildfire burn scar.

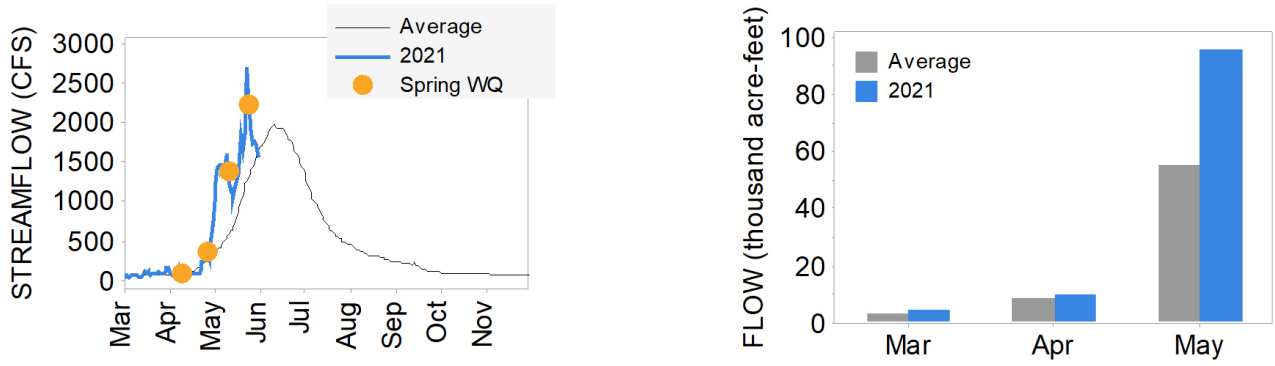


***Figure 4*** *– Streamflow conditions on the Poudre River over the 2021 spring season (left) and monthly total water volume measured over the spring season (right).*

# 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-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. |

# WATER QUALITY INDICATORS CONTINUED

Spring water quality monitoring captures water quality conditions from the start of snowmelt runoff to near peak streamflow on the CLP River. Water quality conditions vary with changes in elevation, contributing watershed area and potential watershed impacts.

Water temperature was cooler than baseline at nearly all key monitoring sites. The cooler than baseline water temperature observed in the Poudre below Rustic (PBR) downstream to the City of Greeley's diversion (PBD) was likely caused by above average streamflow originating from mid- to low- elevation snowmelt from the winter storm in March. pH values were within the range of values observed over the baseline period of record; however, pH at key monitoring sites downstream of the Cameron Peak Wildfire burn scar (PBR to PBD) measured higher than normal (baseline median). Specific conductivity measured above the baseline maximum at nearly all sites above the confluence with the North Fork CLP river and City of Greeley's diversion (PBD). Turbidity was measured higher than normal in the Poudre below Rustic (PBR) downstream to the City of Greeley's diversion (PBD) ***(Figure 5).***

The notable departure from baseline of these water quality indicators implies post-fire impacts from the Cameron Peak Wildfire, such as of ash, and elevated sediment and solids (dissolved and suspended), are impacting Poudre River water quality during the snowmelt runoff season.

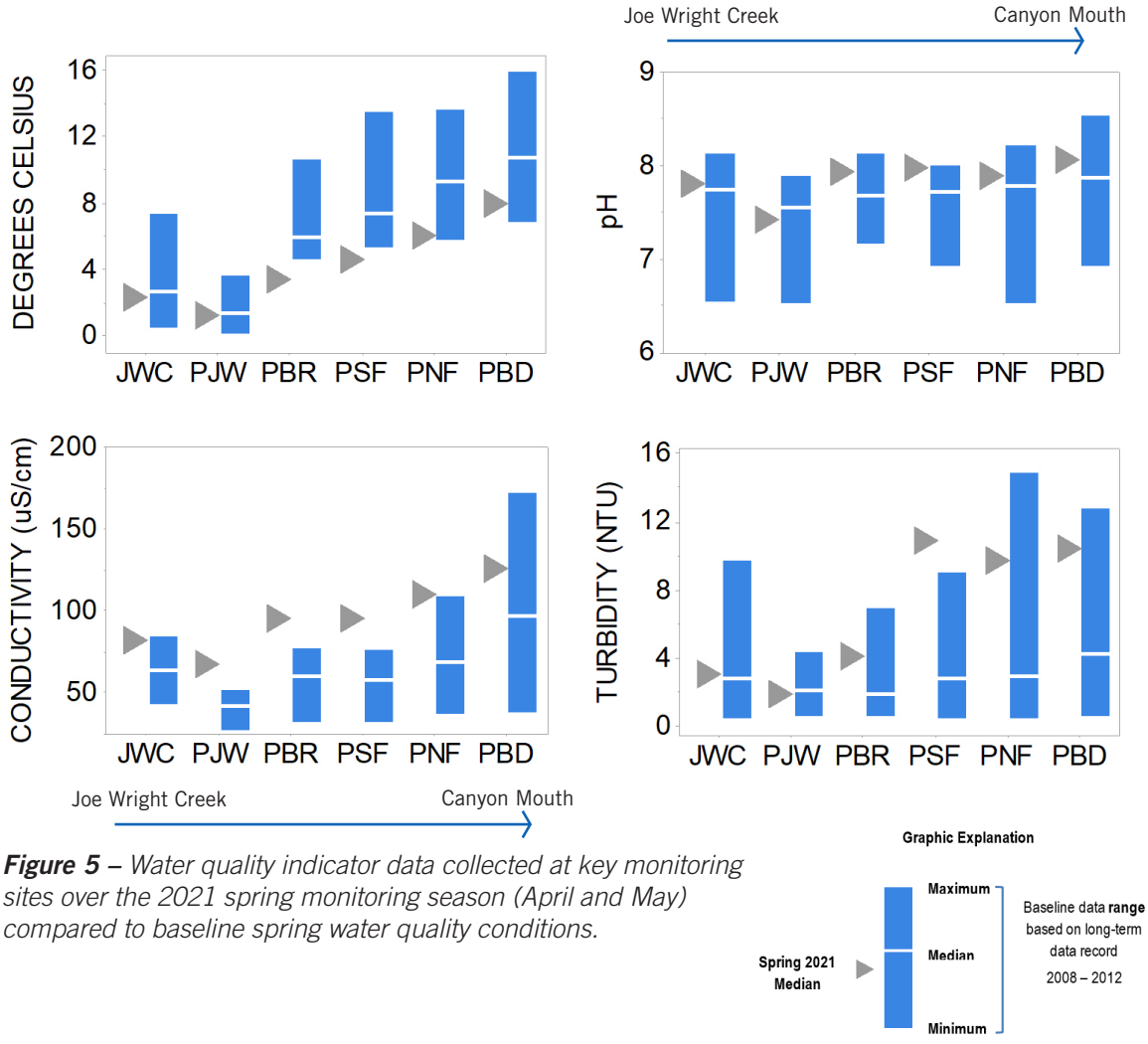


***Figure 5*** *– Water quality indicator data collected at key monitoring sites over the 2021 spring monitoring season (April and May) compared to baseline spring water quality conditions.*

# 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.

*Ash from the Cameron Peak Fire deposited on the banks of the Little South Fork Cache la Poudre River during an April water quality monitoring event.*

Both sites have already proven to be valuable in detecting post-fire impacts from the Cameron Peak Fire during snowmelt runoff. Some post-fire water quality impacts to the Poudre River have been observed during spring snowmelt runoff. Snowmelt and spring rainstorms eroded some ash and sediment from burned hillslopes and drainages into the Poudre River; however, the magnitude of these events was relatively small, and the high volume of water in the river from snowmelt diluted these impacts downstream, as can be seen in turbidity measurements observed on May 29 ***(Figure 6)***.

A significant post-fire water quality impact was observed on May 30th from a rain event that occurred over the burn scar. The water quality monitoring instrument in the Poudre River at Indian Meadows measured a maximum turbidity near 300 NTU during this event. The impact was diluted as it moved downstream, but still caused a spike in turbidity above 150 NTU at the Manners Bridge water quality monitoring instrument ***(Figure 6)***. The water quality instruments also measured a spike in both pH and conductivity during this event, indicating the presence of both suspended ash and sediment in the Poudre River. The event was relatively short in duration. These types of water quality impacts are typically avoided by shutting down water treatment operations until the event has passed.

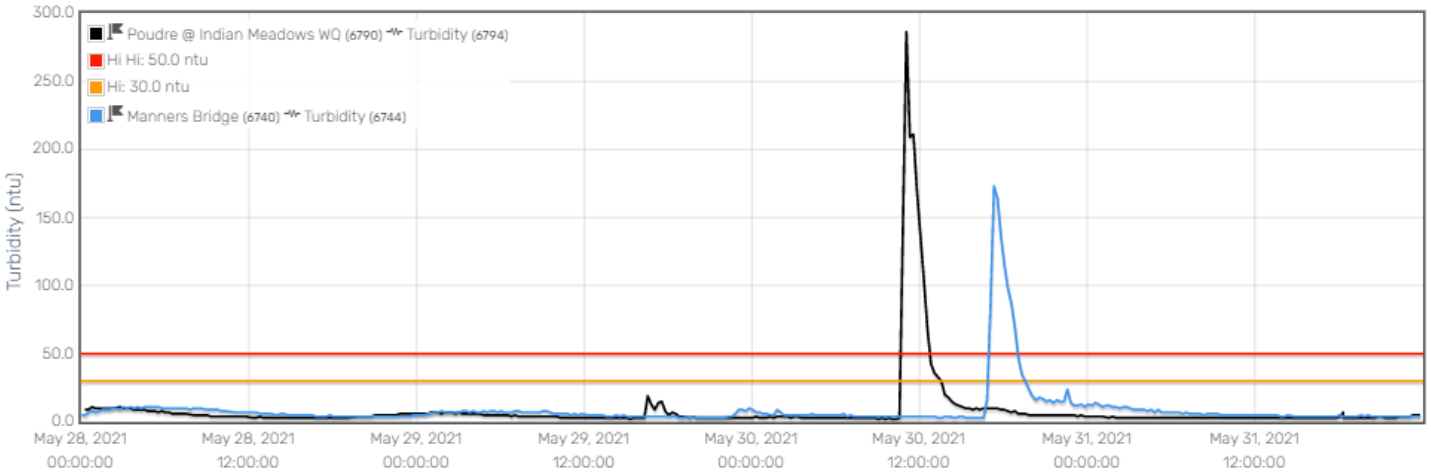


*Figure 6 – Turbidity measured in the Poudre River at the Indian Meadows and Manners Bridge real-time water quality instruments. A rain event over the Cameron Peak burn scar on May 30th caused turbidity in the river to increase rapidly over a short amount of time and remain elevated for several hours before returning to normal.*

# 2020 UPPER CACHE LA POUDRE WATERSHED WATER QUALITY REPORT

The Upper Cache la Poudre Watershed Collaborative Monitoring Program recently released its 2020 Annual Report. The 2020 Annual Report summarizes climate and hydrology in the Upper CLP watershed over the 2020 calendar year and water quality data collected as part of the Upper CLP Collaborative Water Quality Monitoring Program. Water quality reports can be found online at ***fcgov.com/source-water-monitoring***.