

Water Quality Update | Fall 2018

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

The Fall 2018 Water Quality Update provides a seasonal summary of watershed conditions in the upper CLP watershed by highlighting precipitation, streamflow and drought conditions at the end of 2018 water year (October 1 through September 30) and start of the 2019 water year, as well as water quality during the fall season, as defined by the months of September, October, and 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). Water quality measured over the 2018 fall season is compared to baseline water quality data 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









PRECIPITATION

The 2018 water year ended with very little precipitation in the upper CLP watershed. Only two tenths of an inch of precipitation was measured in September resulting in below average total precipitation to end the 2018 water year. Despite the below average precipitation observed in September (7% of average), precipitation measured over the 2018 fall season was above average. Several storm systems from early to mid-October delivered over 4-inches of mixed precipitation (rain and snow) to the upper CLP watershed. Drier conditions were observed through the remainder of October, but the total monthly precipitation for October was well above average and measured 5.0 inches – 135% of average (*Figure 2*).

Winter storms delivered several inches of snow to the upper CLP watershed through November. Over two feet of snow accumulated at the Joe Wright Snow Telemetry (SNOTEL) station by the end of November. The total monthly precipitation for November measured 6.5 inches – 148% of average. The start of the 2019 water year was the fifth wettest on record with a total of 11.5 inches of precipitation recorded at the Joe Wright SNOTEL from October through November. The amount of snow contained with the early season snowpack (snow water equivalent) was 108% of normal on December 1.



Figure 2 – Total monthly precipitation measured at the Joe Wright Snow Telemetry station near Cameron Pass over the fall season. Precipitation data were obtained from the Natural Resource Conservation Service.









STREAMFLOW

The total volume of water that flowed past the canyon mouth of the Poudre River over the 2018 water year measured 211,716 acre-feet – 80% of average. Fall streamflow was well below average in all months. The total amount of water measured over the fall season at the canyon mouth was 55% of average (*Figure 3*).



Figure 3 – Daily average streamflow (left) and monthly streamflow (right) measured over the fall season on the Poudre River near the canyon mouth. Data were obtained from the Colorado Division of Water Resources.

TEMPERATURE

Air temperature measured at the Fort Collins weather station measured over the 2018 fall season was 2.3°F warmer than the long-term average (1893-2012). The month of September was particularly hot and ranked as the 3rd hottest September on record. The monthly mean temperature in September was 5.3°F warmer than the long-term average. Temperatures in October and November were near average; however, the average minimum air temperature was slightly warmer than the long-term average (*Table 1*).

Table 1 – Average maximum, minimum and mean air temperatures measured at the Fort Collins weather station over the fall months of 2018 compared to the long-term averages (1893-2012). Data were obtained from the National Climatic Data Center.

Period of Record		Averages			Extremes (125 year record)		
		Max (°F)	Min (°F)	Mean (°F)	Highest Mean (°F)	Year	2018 Rank
September	1893 - 2012	75.4	45.1	60.3	67.1	2015	3rd
	2018	81.3	49.8	65.6	07.1		
October	1893 - 2012	64.2	34.2	49.2	50.0	2016	74th
	2018	62.3	35.9	49.1	50.2		
November	1893 - 2012	51.1	23.1	37.1		1949	4 Gth
	2018	51.0	26.0	38.5	45.8		4001
Fall	1893 - 2012	63.6	34.1	48.9		2016	10+6
	2018	65.7	37.3	51.2	55.4	2010	Touri

DROUGHT

Dry conditions over the summer and early fall (September) resulted in an expansion of abnormally dry conditions throughout much of the upper CLP watershed and moderate drought conditions to the headwaters of upper CLP watershed. Above average precipitation in October and November lessened drought conditions in the headwaters to abnormally dry at the end of November (*Figure 4*). Over the next several months, drought conditions will be dependent on winter storm systems delivering snow to upper CLP watershed.



Figure 4 - Drought conditions throughout Colorado measured by the U.S. Drought Monitor on November 27, 2018 (Note: Larimer County is outlined in red circle).









WATER QUALITY INDICATORS

The Upper Cache la Poudre Collaborative Water Quality Monitoring Program tests for several key water quality indicators, including pH, conductivity, temperature, and turbidity *(Table 2)*. These key measurements provide a snapshot of water quality conditions, which are useful to identify trends or changes in water quality. Significant changes in water quality may provide early warning for potential water pollution.

Table 2 – 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 compound, geosmin.				
рН	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.				
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 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 2018, water quality indicators measured at key sites along the Poudre River were within or below the range of values observed over the baseline period of record *(Figure 5)*. Water temperature and turbidity were lower than normal at all key sites. pH and specific conductivity were lower than normal at higher elevation monitoring sites, JWC and PJW, and slightly above normal from Rustic downstream to water supply intakes at PNF and PBD. The following lists the range of values measured throughout the Mainstern watershed during fall water quality monitoring in 2018:









WATER QUALITY INDICATORS CONTINUED

The following lists the range of values measured throughout the Mainstern watershed during fall water quality monitoring in 2018:

- Water temperature = 0.0°C 18.9°C
- pH = 6.86 8.60
- Specific conductivity = $40.2 \ \mu\text{S/cm} 100.8 \ \mu\text{S/cm}$
- Turbidity = 0.04 NTU 1.07 NTU



Figure 5 – Water quality indicator data collected at key monitoring sites over the 2018 fall monitoring season (September, October, November) compared to baseline fall water quality conditions (2008-2012).

Graphic Explanation











TASTE AND ODOR COMPOUNDS

Geosmin and 2-Methylisoborneol (2-MIB) are naturally occurring organic compounds that are produced by some species of blue-green algae. These compounds can introduce an earthy odor to drinking water that can be detected by the most sensitive individuals at concentrations as low as 4 nanograms per liter (ng/L) or 4 parts per trillion (ppt). These compounds do not pose a public health risk but are of concern because they can negatively affect customer confidence in the quality of drinking water. Early detection of elevated concentrations of these compounds is important so that they can be removed during the water treatment process. Geosmin and 2-MIB are monitored at PBR and PNF during routine upper CLP water quality monitoring events. Geosmin was detected above the report limit (2 ng/L) at PNF and PBR in October and at PBR in November **(Table 3)**. 2-MIB was detected above the reporting limit (5 ng/L) at PBR in September and at PBR and PNF in October. Routine monitoring of geosmin and 2-MIB in finished water samples at the Fort Collins Water Treatment Facility confirmed that these compounds were successfully removed during the treatment process.

Table 3 – Poudre River geosmin and 2-MIB concentrations (ng/L or ppt) during the fall of 2018 at Poudre above the North Fork (PNF) and Poudre below Rustic (PBR) monitoring locations. Note: Reporting limits are 2 ng/L for geosmin and 5 ng/L for MIB. Concentrations below the reporting limits are estimates. Concentrations above the reporting limit are highlighted in red.

	PE	BR	PNF		
Monitor Date	Geosmin (ng/L)	2 MIB (ng/L)	Geosmin (ng/L)	2 MIB (ng/L)	
9/10/2018	1.99	9.97	1.38	2.58	
10/15/2018	5.97	10.73	4.62	8.81	
11/12/2018	2.22	0.00	0.00	2.53	







