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 Tri-Districts, 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 2015 Water Quality Update provides a seasonal summary of the UCLP Watershed by highlighting snowpack and streamflow, as well as water quality during the months of April, May and June. Water quality conditions during snowmelt runoff are highly variable. To better capture this seasonal variability, monitoring is conducted two times per month, beginning in April and continuing through June. 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).

More information is available at *fcgov.com/source-water-monitoring*.

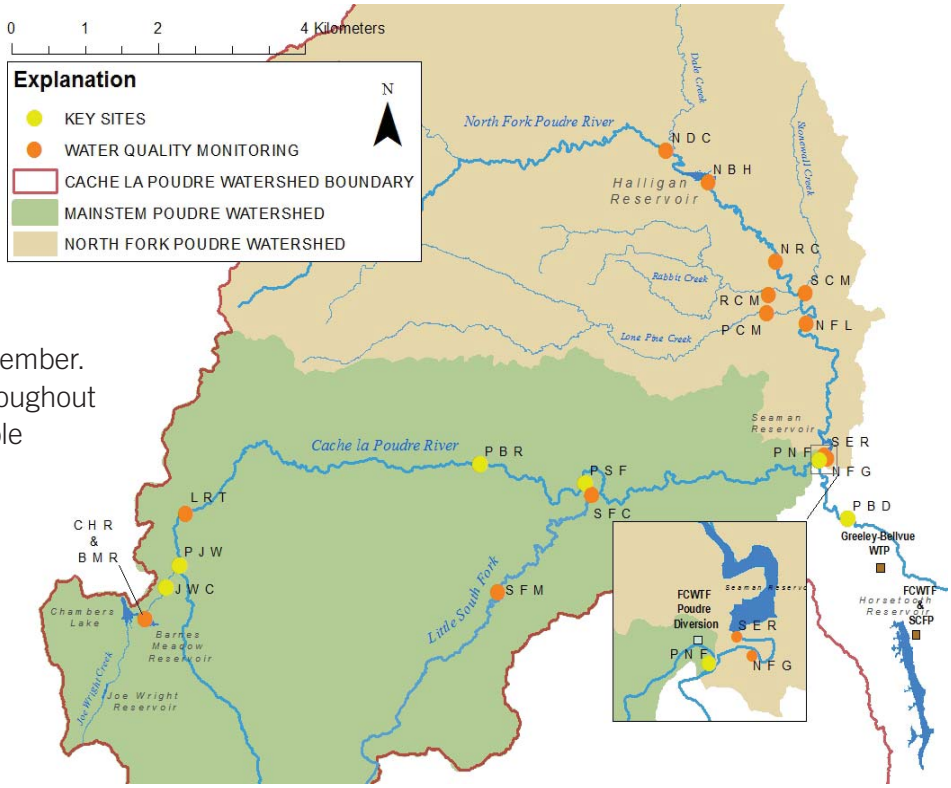
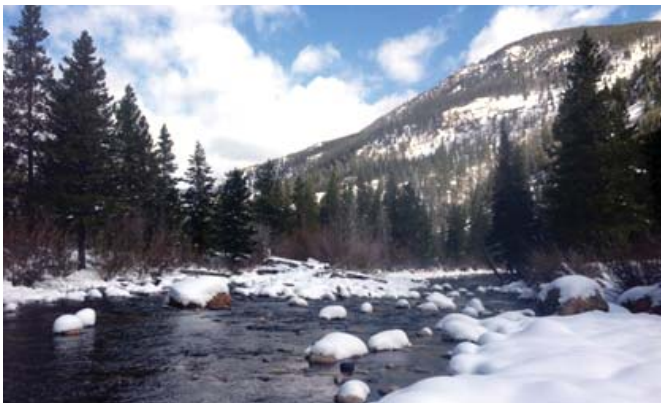


Figure 1
Upper Cache la Poudre Collaborative Monitoring Program sampling locations

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

SNOWPACK AND STREAMFLOW CONDITIONS



The amount of water contained in the snowpack, referred to as snow water equivalent, was near the long-term average for most of the winter season.

Abnormally dry conditions in the month of March and first half of April, normally considered Colorado's snowiest months, caused concern for an early snowmelt runoff and a potentially hot and dry summer. However, large May snowstorms, particularly at lower elevations, recharged the snowpack to end the snow accumulation season near average. Peak snow water equivalent, the maximum amount of water in the snowpack at the end of the snow accumulation season, was measured on April 27 at 15.7 inches – nearly 95 percent of the historical average. The snowpack began melting after this date, but a couple late season storms slowed the process. All monitoring sites were snow-free by June 24 (Figure 2a).

Warm weather in March began an early start to runoff at mid-elevations. The unseasonably warm weather was followed by cooler conditions and significant snowstorms in mid-April. Runoff was briefly slowed during these storms before returning to full effect by late April.

In contrast to the dry conditions in March, May was the wettest on record for Colorado. Despite the average snowpack in the high country, the May rain events, in combination with snowmelt runoff, resulted in above average streamflow conditions on the Poudre River. Peak streamflow was observed on June 12 at 3,910 cfs – nearly two times greater than average peak streamflow. By the June 15 monitoring event, streamflow had receded to near normal conditions (Figure 2b).

May snowstorms recharged the snowpack following abnormally dry conditions in March and early April. The snow accumulation season ended near its historical average.

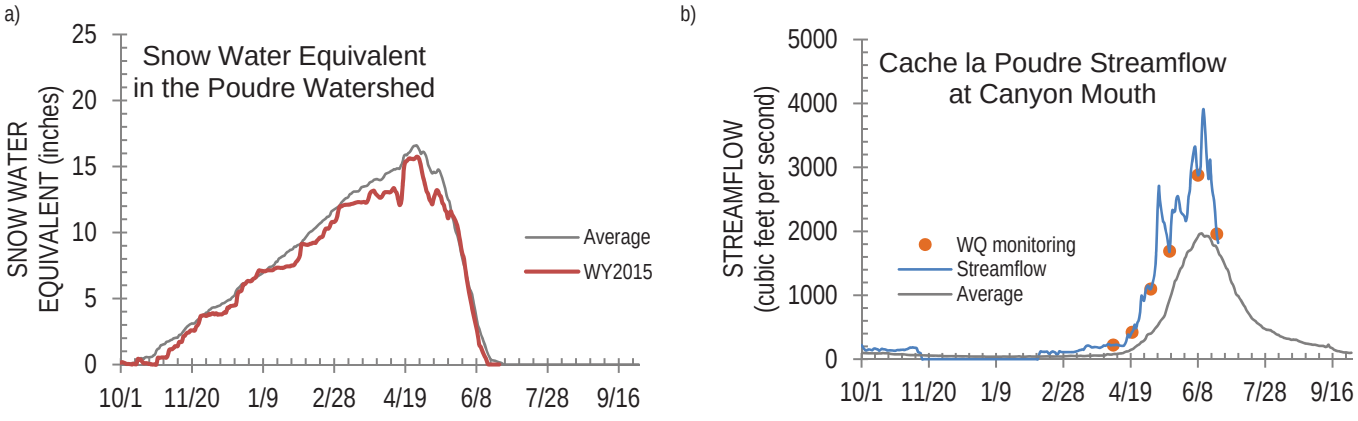


Figure 2 – Snowpack (a) and streamflow (b) conditions in the Poudre River watershed

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 1). 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 an early warning of potential water pollution.

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.
pH	pH is an important water quality parameter to monitor, as 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. Hardness is an index of the total calcium (Ca) and magnesium (Mg) in water.
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 storm water 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.

Table 1 - Water quality indicators measured as part of the Upper Cache la Poudre Collaborative Water Quality Monitoring Program

Spring water quality monitoring captures water quality conditions throughout snowmelt runoff and peak streamflow. Water quality conditions vary with changes in elevation and contributing watershed area. All water quality indicators were within the range of values observed over the long-term monitoring period. Most sites and parameters reported near the long-term median, indicating normal water quality conditions on the Poudre River during the 2015 snowmelt runoff season (Figure 3 on next page).

Measuring water quality indicators on the Little South Fork above the confluence with the Mainstem Poudre River

WATER QUALITY INDICATORS CONTINUED

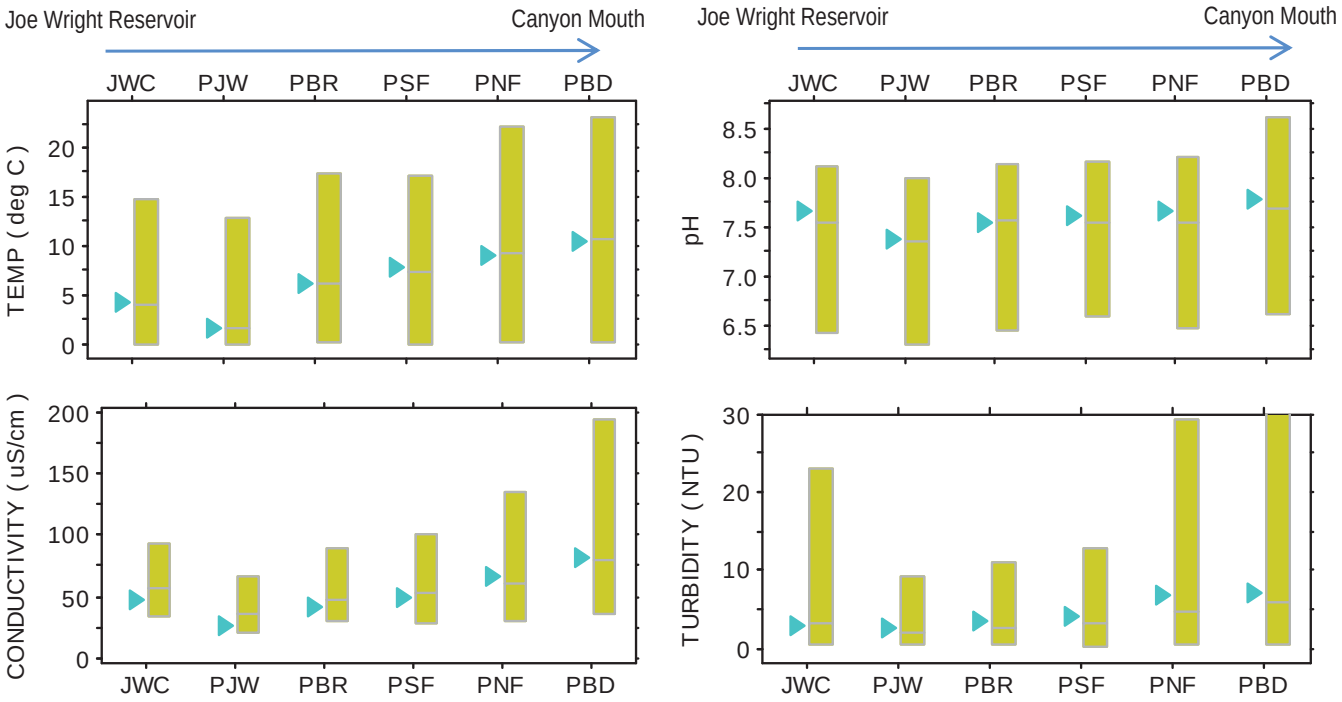
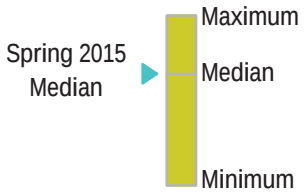


Figure 3 – Water quality indicator data collected at key monitoring sites during spring (April, May, June) 2015

Data range based on long-term data record 2008-2014

Graphic Explanation



All water quality indicators were within the range of values observed over the long-term monitoring period.

MICROOGRANISMS

Coliforms are types of bacteria found naturally in plant and soil material. They can also be found in the digestive tract of animals, including humans.

Disease causing bacteria or pathogens can be introduced to the raw drinking water supply from fecal contamination. Although the water treatment process effectively eliminates pathogens, source watershed monitoring can provide indication of changes in the activity and location of pathogen sources over time.

Through the Upper Cache la Poudre Collaborative Monitoring Program, the raw Poudre River water supply is routinely tested for the presence of bacterial contamination. This is done by measuring the total amount of coliforms, an indicator organism for the presence of pathogenic bacteria.

In addition, *Escherichia coli (E. coli)* is measured and used as an indicator of human or animal fecal waste pollution, since the source of origin is more specific than total coliforms.

In spring 2015, *E. coli* and *T. coli* were within the range of values seen in previous years, but slightly higher than the long-term median (Figure 4a, 4b). Snowmelt and rain served as delivery mechanisms for *E. coli* and *T. coli* from the surrounding watershed to the Poudre River, likely elevating concentrations above normal levels, especially at monitoring locations impacted by the High Park and Hewlett Gulch wildfires (PSF, PNF and PBD).

The raw Poudre River water supply is routinely tested for the presence of bacterial contamination.

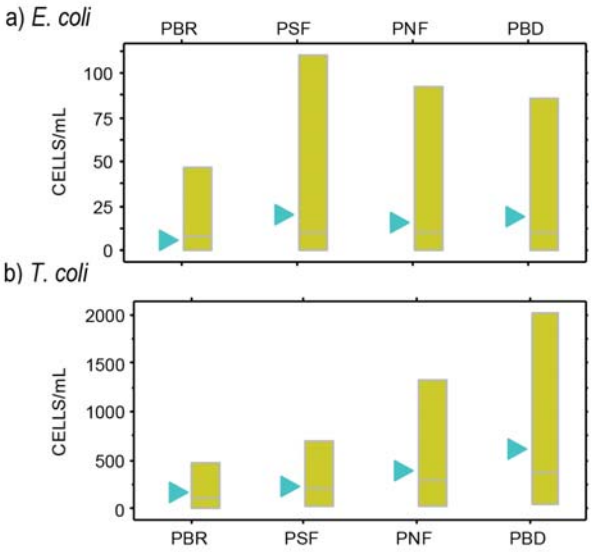


Figure 4 – E. coli (a) and (b) T. coli counts on the Poudre River during the 2015 spring season

Coliforms are types of bacteria found naturally in the environment

TASTE AND ODOR COMPOUNDS

Geosmin and 2-methlyisoborneol (MIB) are naturally occurring organic compounds that impart an earthy odor to water. They 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 their presence can negatively affect customer confidence in the quality of drinking water. During the spring of 2015, geosmin concentrations remained at or below the odor threshold at both sampling locations on the Poudre River. MIB was not detected (ND) at either monitoring location (Table 2).

Concentrations remained at

OR BELOW

the odor threshold.

Monitor Date	PBR		PNF	
	Geosmin (ppt)	MIB (ppt)	Geosmin (ppt)	MIB (ppt)
4/6/2015	1.94	ND	<1	ND
5/4/2015	1.05	ND	1.06	ND
6/8/2015	1.04	ND	<1	ND

Table 2 – Poudre River geosmin concentrations (ppt) in the spring of 2015 at Poudre above the North Fork (PNF) and Poudre below Rustic (PBR) monitoring locations

Anabaena, capable of producing geosmin
Photo: A.L. Baker, University of New Hampshire