

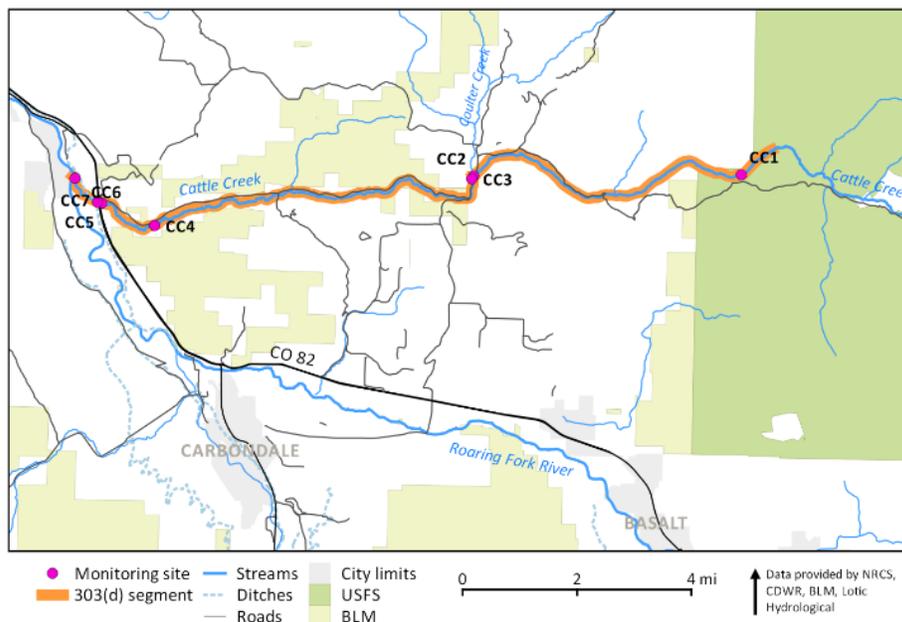


Cattle Creek Stream Health Evaluation Summary

Background:

In 2015, Roaring Fork Conservancy (RFC), with funding from Garfield County, embarked on an extensive study to better understand water quality impairments on Cattle Creek. Based on macroinvertebrate data, a 14.5-mile segment of Cattle Creek, from Bowers Gulch (near CC1) to the confluence with the Roaring Fork River (CC7) was placed on Colorado's 303(d) list for impaired waters.* Study goals included addressing the 303(d) listing and understanding the transition from high water quality near the headwaters to impaired water quality in the lower reach. In 2015, RFC collected and assessed chemical and biological data, conducted a land use analysis, and published results in the Cattle Creek 2015 Stream Health Evaluation.

Based on the 2015 findings, RFC initiated a modified second round of sampling in 2016 with funding from both Garfield and Eagle Counties. This work was strategically designed to complement the 2015 data and provide additional information attuned to state standards. Results from the two-year study has informed RFC's initiative to address Cattle Creek's 303(d) listing, and provided a broader understanding of overall creek health and potential impacts to aquatic life.



**The Clean Water Act is the primary federal law governing water quality in the United States. Section 303(d) asserts each state is required to monitor waterways and document those which do not meet water quality standards. States must then prioritize impaired waters and develop remediation plans to improve water quality.*

Overview:

WATER CHEMISTRY:

- Basic water quality constituents, Dissolved Oxygen and pH, did not exceed state standards in 2016, however Temperature exceeded the state daily maximum once in April just below the Coulter Creek confluence. Similar to 2015, Specific Conductance, Total Dissolved Solids, and Salinity exhibited noteworthy increases moving downstream with the exception of the furthest downstream site (CC7) which is likely influenced by a mixing of irrigation ditch water.
- Phosphorus levels were generally elevated at the lower sites (except CC7) and approached but did not exceed state standards in 2016, although they did twice in 2015. Seasonally, phosphorus levels peaked during runoff, then remained more consistent throughout the year. This timing primarily suggests livestock and natural/soil impacts.
- Nitrate concentrations increased in a downstream direction, again except site CC7. Similar to 2015, the timing suggests nitrate loading may occur at relatively consistent rates throughout low flow periods, then receive dilution during snowmelt, exhibiting a potential correlation with septic tank density.





- In 2016 additional nutrients were included in the sampling regime (Ammonia & Total Inorganic Nitrogen), however no related exceedances of state standards were detected.
- Levels of E. coli again exceeded state recreation standards at numerous sites in June and at least one site each in July and September. Levels generally increased moving downstream with exceptions at the most up and downstream sites, which remained consistently low throughout 2016. The spatial pattern and timing of E.coli results suggests that grazing activities and streamside land management are likely primary, but not the only, contributors.

Please note, these results do not justify legal designations of impairments.

MACROINVERTEBRATES:

- Macroinvertebrate sampling indicates a clear increase in levels of stress and disturbance in a downstream direction, reinforcing the trend seen in 2015.
- In 2016 sampling, upstream and middle sites attain state standards while only the most downstream sites indicate impaired conditions. A number of the middle sites, however, fell very close to the impairment threshold.

LAND USE:

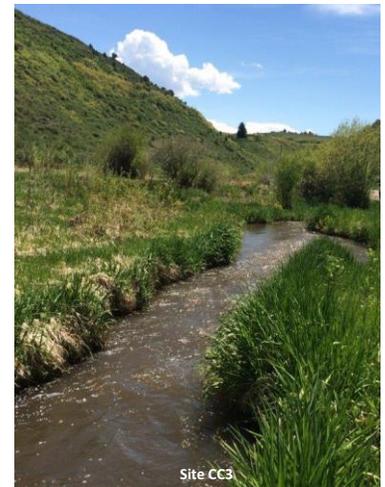
- Land use analysis (conducted in 2015) identifies gradients of land use change that correlate with water quality and macroinvertebrate findings. The upper reaches of Cattle Creek are largely undeveloped and forested, supporting excellent water quality. A gradient of increasing impacts matches land use in a downstream direction from agricultural activities to residential and commercial development. These varied uses along the stream corridor lead to water quality impacts, signals of aquatic life stress, and riparian alteration, all playing a role in the steady downstream degradation of stream health.

FLOWS:

- Water withdrawals in the middle and upper watershed continue to remove significant streamflow to irrigate lands in Missouri Heights. Throughout the lower reach, streamflow remains at consistently low levels, which may exacerbate water quality issues due to the reduced dilution for existing stressors including agriculture and streamside development.

Next Steps:

- Monitoring work in 2016 reinforced potential issues regarding nutrients and bacteria in Cattle Creek. Continued chemistry monitoring will add depth, reliability, and increased statistical power to the dataset.
- RFC plans to continue monitoring in 2017 at levels conducive to long-term background monitoring.
- 2017 Monitoring Plan
 - Conduct quarterly water quality monitoring at 3 strategic indicator sites along Cattle Creek.
 - Maintain the nutrient and bacteriological sampling regime established in 2016.
 - Discontinue macroinvertebrate sampling for 2017 and reinstate as needed in future years.
- In 2017, RFC intends to work with stakeholders to:
 - Further explore flow related factors and creative solutions to benefit instream health; and
 - Conduct public outreach/education regarding riparian, septic, and other best management practices.



For more information, visit www.roaringfork.org
 Contact: Heather Lewin, Watershed Action Director, heather@roaringfork.org
 Chad Rudow, Water Quality Coordinator, chad@roaringfork.org
 (970)927.1290

Roaring Fork Conservancy: Inspiring people to explore value and protect our watershed since 1996.