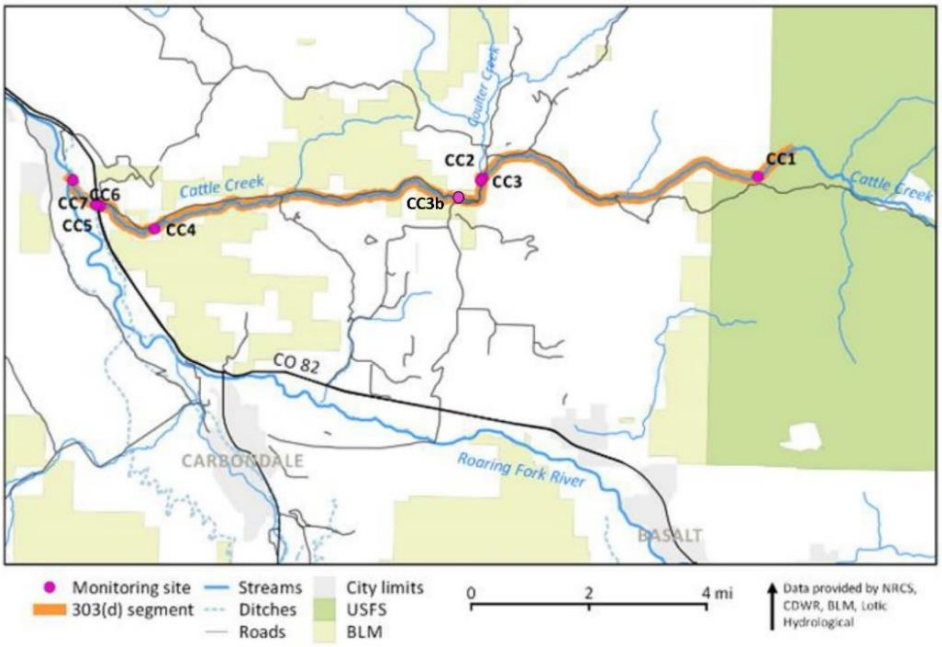
Cattle Creek Stream Health Evaluation Summary - 2019

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 has continued monitoring from 2016 through 2019 with funding from Garfield and Eagle Counties. All monitoring is strategically designed to complement and enhance the original data and provide additional information attuned to state standards. Results from five years of study have 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:

- Snowpack and flows were well above average on Cattle Creek in 2019 and their influences on water chemistry highlighted the importance of collecting long-term water quality data.


RFC staff measuring flow at CC3b

- Basic water quality constituents, Dissolved Oxygen, pH and temperature, did not exceed state standards in 2019. Stream temperatures were slightly below seasonal averages, likely due to above average flows.
- Similar to previous years, Specific Conductance, Total Dissolved Solids, and Salinity exhibited noteworthy downstream increases. However in 2019 these parameters were consistently below seasonal averages at all sites and particularly at downstream sites, likely influenced by dilution from higher flows.
- From 2017 through 2019, phosphorus levels were generally elevated at the mid-stream site (CC3b) compared to up and downstream sites. In 2019, only the


RFC Staff measuring water quality at CC1

April sample at the downstream site (CC5) reached (but didn't exceed state standards). A peak in phosphorus levels noted during spring runoff suggests livestock and natural/soil impacts.

- Nitrate concentrations in 2019 generally increased in a downstream direction, similar to previous years. Levels were sporadic, with some results above seasonal averages and others below. There was one significant spike in Nitrogen levels during the pre-runoff sample at all three sites, a time which also recorded seasonal flows well above average.
- Since 2016, Ammonia and Total Inorganic Nitrogen (TIN) have been included in the sampling regime. Ammonia consistently measures very low at all sites. TIN levels increase moving downstream, though no related exceedances of state standards have been documented.
- Different from previous years, Levels of E.coli were highest at the middle site (CC3b). They significantly exceeded state standards 2 times at that site and once at the downstream site (CC5) in 2019. In general, E.coli were above averages at all sites during pre-runoff flows, and below average during the late season flows. The pattern and timing of E.coli results continue to suggest that grazing activities and streamside land management are likely primary, but not sole, contributors.
- Monitoring results in 2019 reiterated Cattle Creek's potential nutrient and bacteria issues, but also revealed beneficial effects of above average flows (dilution) on some constituents.
- The WQCD placed the lowest reach of Cattle Creek the on the Monitoring and Evaluation list for Arsenic in 2020. This list means a water quality issue is suspected, but there is not enough data for placement on the 303(d) list. This is a state-only designation and not subject to EPA approval and typically means the State will seek additional data to ascertain whether a 303(d) listing is necessary.

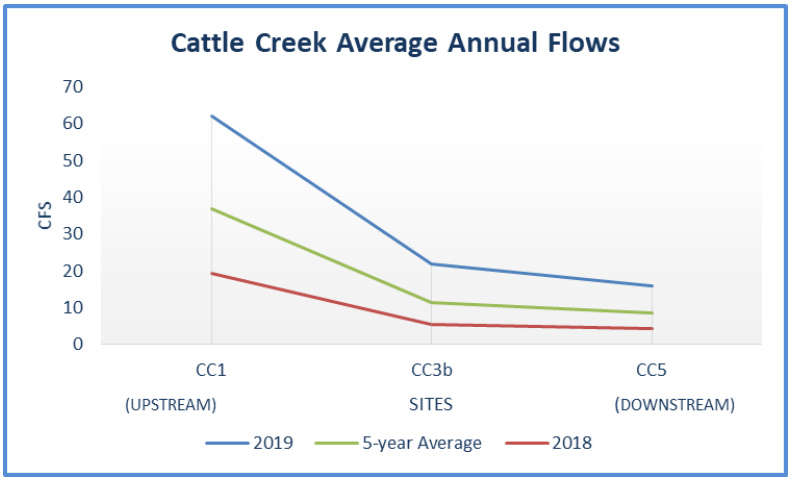
Please note, these results do not justify legal designations of impairments.

MACROINVERTEBRATES:

- In 2017 RFC submitted 2016 Macroinvertebrate data to the Colorado Water Quality Control Division (WQCD) to address the current 303(d) impairment listing of the creek. Based primarily on this data and a revised state metric, in January 2020 the WQCD officially removed the creek from the 303(d) list for macroinvertebrates.
- In 2018 the Glenwood Ditch Company installed a new diversion structure on lower Cattle Creek below site CC6. In the fall of 2018, RFC staff collected macroinvertebrate samples at sites above (CC6) and below (CC7) the structure to assess potential impacts to aquatic insect communities. The CC7 site downstream of the new structure, produced a result which was improved over previous sampling results. The CC6 site produced a macro MMI score below previous sampling results however this site has been significantly reworked since then and contains improved substrate habitat as a result of the CDOT culvert work.

FLOWS:

- The 2019 water year represented a large change from the 2018 drought year (see graph). Above average snowpack, a delayed runoff regime, and higher sustained flows throughout the summer and fall resulted in above average flows at all sites during nearly every sample event.
- Water withdrawals in the middle and upper watershed continue to remove significant streamflow to irrigate lands in Missouri Heights, leaving the lower reach at consistently low levels. This typically exacerbates water quality issues due to the reduced dilution for existing stressors, however the above average flows throughout 2019 mitigated some of this effect.



LAND USE:

- Land use analysis (conducted in 2015) identifies land use changes that correlate with water quality and macroinvertebrate findings. The upper reaches of Cattle Creek are largely undeveloped and forested, supporting excellent water quality, however a portion of this area burned in the Lake Christine Fire. 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.

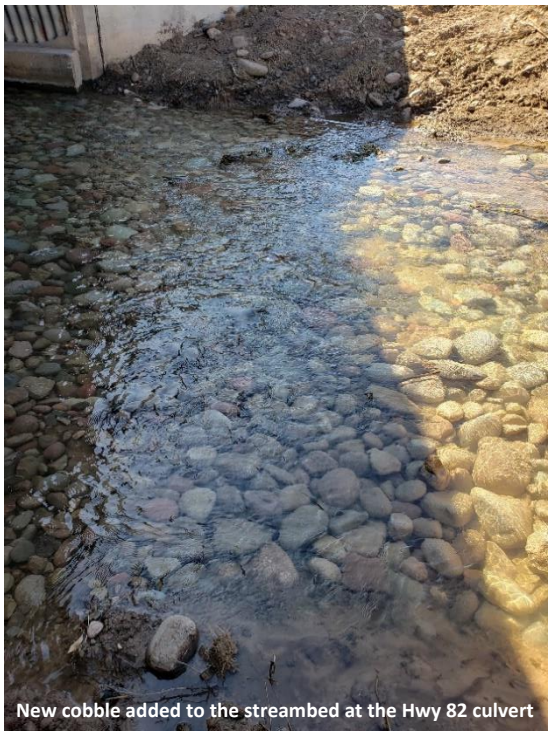
LAKE CHRISTINE FIRE:

- In July 2018, the Lake Christine fire burned over 12,000 acres around Basalt Mountain. Some of the highest intensity burn areas were located in the Cattle Creek headwaters which increases flood risk, erosion rate, and downstream threats.
- No evidence of debris or sediment flows from the burn area were noted during 2019 monitoring, however there is still potential for related impacts to the creek in the next 4 years.
- In 2019 RFC co-hosted a public panel discussion with all affected jurisdictions detailing post-fire impacts, preparedness, and restoration projects.
- RFC continues to work with the Lake Christine Technical Advisory Group to support communication between active agencies and facilitate long term fire restoration planning and projects.

Action Items:

CDOT Highway 82 Project:

- In 2019 the Colorado Department of Transportation (CDOT) implemented a scour mitigation project at the Highway 82 Cattle Creek culvert. At the request of Garfield County, RFC served as a technical advisor for the project, conducting site visits and providing recommendations and resources to CDOT staff.
- The primary goal of the project was to prevent scour and damage to the culvert however the work also benefited stream health by reducing channel incision and seeding for native riparian vegetation.
- The streambed through the work area had become embedded with sediment over many years. One key RFC recommendation was to improve instream habitat by replacing the fine sediment with cobble in the streambed. CDOT incorporated this into its project and the result is a much improved habitat for aquatic life at a site (CC6) which previously received impaired scores for macroinvertebrates.



New cobble added to the streambed at the Hwy 82 culvert

Next Steps:

Roaring Fork Conservancy will:

- Continue water quality monitoring in 2020 at levels conducive to long-term background monitoring.
- Investigate the new listing of lower Cattle Creek on the WQCD Monitoring and Evaluation List for Arsenic.
- Conduct macro sampling in relationship to the CDOT project to ascertain effects on macro communities.
- Explore future opportunities to address the health of the creek, particularly a voluntary coordinated flushing flow in spring or in the event of a post-fire sediment pulse. Continue work with stakeholders to provide consultation and resources, and other best management practices to improve stream health.

For more information, visit www.roaringfork.org
Contact: Chad Rudow, Water Quality Program Manager, chad@roaringfork.org
Heather Lewin, Director of Science and Policy, heather@roaringfork.org
(970) 927-1290

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