



NONPOINT SOURCE SUCCESS STORY

Colorado

Source Identification and Targeted Actions Reduce Bacteria in the Bear Creek Watershed

Waterbody Improved

Kerr Gulch and Swede Gulch in the Bear Creek watershed were listed by the Colorado Water Quality Control Division (division) on the 2010 Clean Water Act section 303(d) list of impaired waterbodies due to non-attainment of the *Escherichia coli* bacteria water quality standard. Following this listing, the Bear Creek Watershed Association (BCWA) identified potential sources of *E. coli* and partnered with local landowners to relocate livestock operations, which had been determined to be a primary source. Recent data show Kerr Gulch and Swede Gulch now attain the *E. coli* water quality standard, resulting in removal of the waterbody segment from the section 303(d) list in 2016.

Problem

Downstream of its confluence with Swede Gulch, Kerr Gulch flows into Bear Creek approximately one mile east of Kittredge, Colorado (20 miles west of Denver). Kerr Gulch and Swede Gulch include approximately seven linear stream miles within a watershed encompassing approximately 2,500 acres (Figure 1).

Between 2003 and 2008, the division assessed data collected at the mouth of Kerr Gulch. The six water samples collected had a geometric mean of 271 colony-forming units per 100 mL of water (CFU/100 mL), which exceeded the *E. coli* recreational use water quality standard of 126 CFU/100 mL. This resulted in the CWA section 303(d) listing of the Kerr/Swede gulch system (segment COSPBE05_0501).

The Bear Creek watershed is home to many who enjoy life in the foothills immediately west of Denver; it is also frequently visited by outdoor enthusiasts from the nearby urban corridor. To minimize the potential impacts to residents and recreationalists from the elevated levels of *E. coli* in Kerr and Swede gulches, BCWA initiated a project to investigate nonpoint sources of bacteria in the watershed and to prioritize actions to address these sources.

Project Highlights

As part of the project, BCWA collected water quality samples to better understand *E. coli* in the Kerr/Swede system (Figure 2). The project also investigated potential *E. coli* nonpoint sources based on water quality

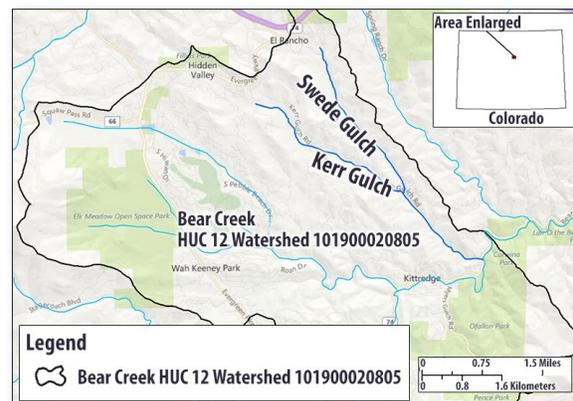


Figure 1. The Kerr Gulch/Swede Gulch watershed drains into Bear Creek in central Colorado.

data from these sampling locations and land uses. The two potential nonpoint sources identified were on-site wastewater treatment systems (OWTS) and horse stabling operations.

In collaboration with BCWA, Jefferson County Public Health Department investigated the OWTS in the area and found no obvious system failures, making OWTS sources a lower priority for additional action.

To investigate the potential horse stabling sources, BCWA identified multiple horse operations proximal to Kerr and Swede gulches. In 2011 BCWA began conversations with the owners of these operations to discuss the potential for runoff of *E. coli* and other nonpoint source pollution. As one of the outcomes of the outreach efforts by BCWA, two stabling operations

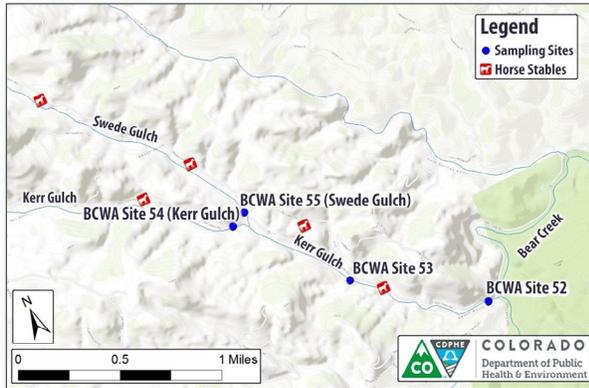


Figure 2. Sampling sites and potential bacteria sources in Kerr and Swede gulches.

were identified as likely sources of *E. coli*; these were targeted for source removal (Figure 3). In 2013 BCWA worked with these owners to alter their operations to reduce the potential for *E. coli* to enter Kerr and Swede gulches. In one instance, the stable operator was able to move the stabling area away from Kerr Gulch to provide a larger stream buffer between the stabling operations and the waterway. This operator was also willing to remove manure stockpiles from a location immediately adjacent to the stream. A separate stabling operation farther upstream in Swede Gulch voluntarily moved three trailers' worth of manure away from the stream.

Results

Following project implementation, BCWA continued to regularly monitor *E. coli* levels throughout the Kerr/Swede Gulch system at the same sampling locations. Whereas water quality data collected by BCWA show non-attainment of the *E. coli* water quality standard in the summer of 2010 and the summer of 2012, after all investigations and subsequent source removal activities, no water quality samples showed exceedances of the water quality standard of 126 CFU/100 mL (Figure 4).

The efforts undertaken by BCWA and landowners in the watershed resulted in a documented reduction of *E. coli* entering Kerr and Swede gulches. BCWA monitoring data were subsequently used by the division to support a 2016 removal of the Kerr Gulch and Swede Gulch *E. coli* impairment listing.

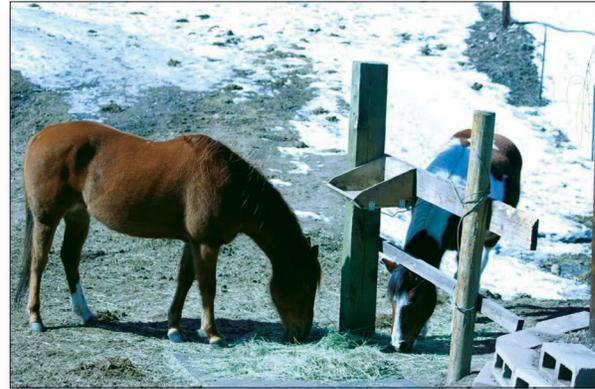


Photo: BCWA

Figure 3. BCWA worked with the horse stable operators to control manure sources near waterways.

Partners and Funding

Source investigation, data analyses and implementation work were conducted by BCWA. BCWA membership includes counties, local general-purpose governments, special districts, local citizen groups and other agencies. The members work together to protect and restore water and environmental quality within the Bear Creek watershed from the effects of land use. BCWA accomplishes its work in the watershed through member dues, member and partner contributions, and targeted funding opportunities. The water quality improvements in Kerr and Swede gulches were the result of landowner in-kind donations and voluntary land management changes, as well as BCWA outreach efforts.

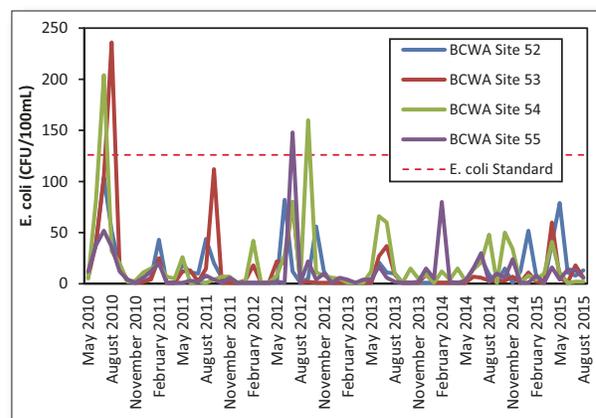


Figure 4. *E. coli* levels in the Kerr/Swede Gulch watershed declined between 2010 and 2015.



U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-17-001U
October 2017

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