



# NONPOINT SOURCE SUCCESS STORY

## Colorado

### Restoration Efforts Reduced Metals in Lower Kerber Creek

#### Waterbody Improved

Kerber Creek, a tributary to San Luis Creek, was impacted by high concentrations of metals due to legacy mining activities. The Water Quality Control Commission (WQCC) initially listed Kerber Creek on the state's 1996 Clean Water Act (CWA) section 303(d) list of impaired waters due to copper (Cu), cadmium (Cd), and zinc (Zn) pollution. More than 25 years of characterization, assessment, monitoring, planning, and implementation of best management practices (BMPs) have improved the water quality in the lower segment of Kerber Creek. Fish and macroinvertebrate populations were absent for many years but have begun to reappear. Vegetative cover has also improved. The state's most recent water quality assessments showed that lower Kerber Creek is attaining Cu, Cd, and Zn standards. As a result, these three metals are approved for removal from the CWA section 303(d) list.

#### Problem

The Bonanza Mining District is at the headwaters of Kerber Creek, within the San Juan Mountains near Villa Grove, Colorado, and consists of abandoned, inactive hardrock mines and mill sites. Kerber Creek's water is used for crop irrigation and drinking water in the San Luis Valley; the lower portion (CORGCB09b\_B) is protected for the water supply, aquatic life, recreation, and agriculture uses (Figure 1). Water quality was impacted by Cu, Cd, and Zn primarily from legacy mining from the 1890s until 1970 in the Bonanza Mining District and included three tailings dams on Kerber Creek. All these activities exposed the creek to ores, creating water quality issues. The water quality issues adversely impacted aquatic life, including a 1997 fish kill caused by runoff, and created a major human health concern of exposure to heavy metals. Therefore, the mainstem of Kerber Creek (CORGCB09b) first appeared on the 1996 Colorado section 303(d) list for non-attainment of iron, dissolved Cu, and dissolved Zn.

A total maximum daily load (TMDL) was developed and approved by the U.S. Environmental Protection Agency (EPA) in 2008 using the site-specific standards formulas. The Kerber Creek Restoration Project, funded through a CWA section 319 grant, included the development of a watershed-based plan by Trout Unlimited to implement BMPs as recommended in the TMDL. The watershed plan identified steps to take to address water quality concerns and included a monitoring program to evaluate success towards achieving water quality goals.

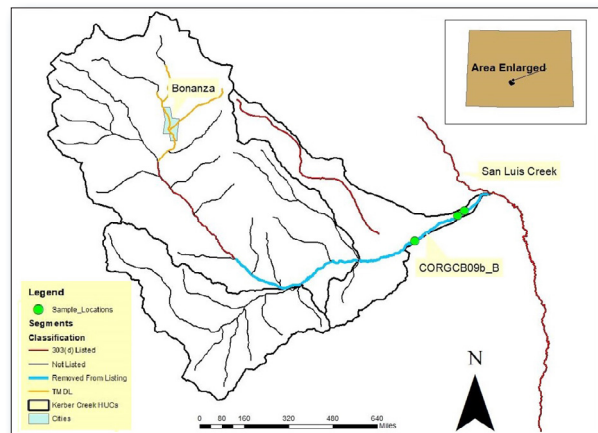


Figure 1. Kerber Creek is in central Colorado.

#### Story Highlights

To address the water quality issues in the watershed, local stakeholders formed the Bonanza Stakeholders Group (BSG). The U.S. Forest Service (USFS), EPA, and the Colorado Department of Public Health & Environment (CDPHE) led a clean-up plan. In 1994, CDPHE's Hazardous Materials and Waste Management Division and the American Smelting and Refining Company (ASARCO) jointly developed a Use Attainability Analysis. Site-specific standards were adopted for segment CORGCB09b, and ASARCO began site remediation with funding through CDPHE (i.e., Bonanza Mining District Restoration Project). Since 1994, ASARCO completed many waste and tailing removal and riparian restoration projects in

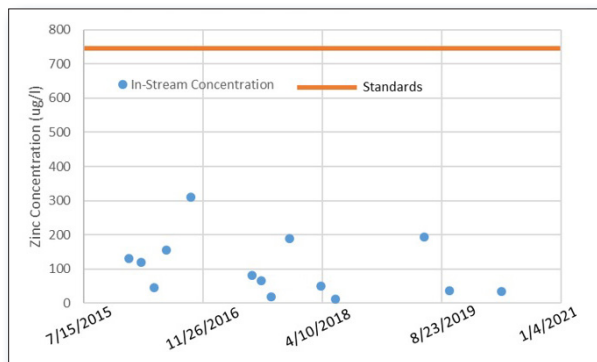


Figure 2. Zinc concentrations in Kerber Creek (2015–2018).

the Bonanza Mining District, resulting in the removal of over 120,000 cubic yards of tailings. A CWA section 319 grant funded a project in 1998 that removed 4,500 cubic yards of tailings at the mill site and completed bank stabilization and phytoremediation to decrease the erosion of tailings along Kerber Creek.

Since the approval of the TMDLs for Cd, Cu, and Zn in 2008, over 100 acres were treated using phytostabilization, which involves the in-situ application of soil amendments following revegetation to reduce mobilization of metals. Phytostabilization provided sustainable results based on a comparison of samplings 1-year pre-treatment and 3-year post-installation. The cover frequency index that provides the effectiveness of the treatment based on the amount of new growth compared to pre-treatment conditions has been monitored at several locations. Data at the most downstream measurement location showed that a 40% reduction in bare soil with increased plant species diversity was recorded three years after treatment. Additional BMPs included 2.51 acres of heavy metal tailings relocation, 77 additional acres of phytostabilization, and the installation of fish habitat and stream bank stabilization structures at 307 sites. These installations included cross-vanes, root wads, sedge mats, and willow plants, drastically improving the condition of the riparian vegetation and creek sinuosity, width, and depth spanning 7.41 miles of stream bank. Fishery habitat was greatly improved due to the installation of

390 in-stream rock structures. Several public education and outreach activities were completed. Public involvement included watershed landowners, local conservation groups, school and youth groups, and the Saguache community, which led to the project's success. The outcomes of Kerber Creek restoration projects received six water quality awards, including the USFS – Rocky Mountain Region's Water Emphasis of the Year Honor Award.

## Results

After implementation of nonpoint source controls by the state, ASARCO, and other partners, WQCC assessed the water chemistry data collected at the three gaging stations on the segment. Data were available from 01/01/2016 to 12/31/2020 for all parameters. Data showed that the 85th percentile of 14 dissolved Cd samples was 0.48 micrograms per liter ( $\mu\text{g/L}$ ) compared to the chronic site-specific standard of 1.91  $\mu\text{g/L}$ . Similarly, the 85th percentile of dissolved Cu was 10.46  $\mu\text{g/L}$  compared to the chronic standard of 12.21  $\mu\text{g/L}$ . Corresponding values for dissolved zinc were 190.2  $\mu\text{g/L}$  and 740.3  $\mu\text{g/L}$ , respectively. The in-stream water quality data for Cd and Zn were 75% lower than those parameters' site-specific water quality standards (Figure 2). All these assessment results showed full attainment of water quality standards for aquatic life. As a result, Cu, Cd, and Zn are proposed for removal from the CWA section 303(d) list.

## Partners and Funding

The project was a partnership between ASARCO, Trout Unlimited, Bureau of Land Management, Colorado Nonpoint Source Program, Colorado Division of Reclamation Mining and Safety, Natural Resources Conservation Service, AmeriCorps Office of Surface Mining VISTA, Colorado Water Conservation Board, Colorado State Forest Service, BSG, U.S. Fish and Wildlife Service, USFS, numerous local landowners, and other partners. The Kerber Creek Restoration Project received \$938,500 in CWA section 319 funding; partners contributed over \$1.1 million in additional funding sources, including \$731,291 in cash and in-kind nonfederal match.



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

EPA 841-F-24-001E  
March 2024

## For additional information contact:

Kenan Diker  
Colorado Department of Public Health and Environment  
303-692-3597 • kenan.diker@state.co.us