



# NONPOINT SOURCE SUCCESS STORY

## Colorado

### Locally Led Restoration Efforts Decrease Abandoned Mine Impacts on Mineral Creek

#### Waterbody Improved

Runoff from historic mining sites has loaded heavy metals to Mineral Creek and many other waterbodies within the Upper Animas River watershed. Because Mineral Creek failed to meet water quality standards for metals and pH, the Colorado Department of Public Health and Environment (CDPHE) added the creek to the state's impaired waters list in 1998. Following more than 20 years of characterization, assessment, monitoring, planning and implementation of best management practices, the copper and zinc concentrations in the lower segment of Mineral Creek have declined. Fish have also begun to appear in upper Mineral Creek where they have been absent for as much as a century. The state's most recent water quality assessments showed that lower Mineral Creek is attaining copper standards. As a result, copper will be proposed for removal as a source of pollution in Mineral Creek.

#### Problem

Southwest Colorado's Mineral Creek empties into the Animas River in the heavily mineralized Silverton Caldera (Figure 1). This area, often referred to as the Upper Animas Basin, is characterized by remote, high elevations (9,200–13,800 feet above sea level), steep mountains and heavy annual snowfall. The caldera encompasses the Animas River from below the town of Silverton to the headwaters, and includes two major tributaries: Mineral Creek and Cement Creek. (Note: A release from the Gold King Mine occurred on Cement Creek, which empties into the Animas River. The release did not affect Mineral Creek.)

Originally, the region was part of the Ute Indian territory. Beginning in the 1860s, prospecting and subsequent mining resulted in several hundred mines in the watershed, most of which had ceased operation by the late 1920s. The largest and last operating mine, the Sunnyside, shut down in 1991.

One legacy of the past mining activity is the addition of heavy metal pollution into the streams, beyond what occurs naturally. Mining exposes ores to water and air, accelerating the natural processes that create acidic conditions and release metals such as copper and zinc from mine waste piles or from abandoned mine shafts. In the 1990s, participants in the Animas River Stakeholders Group (ARSG) characterized approximately 170 mine waste piles and 160 draining mines.

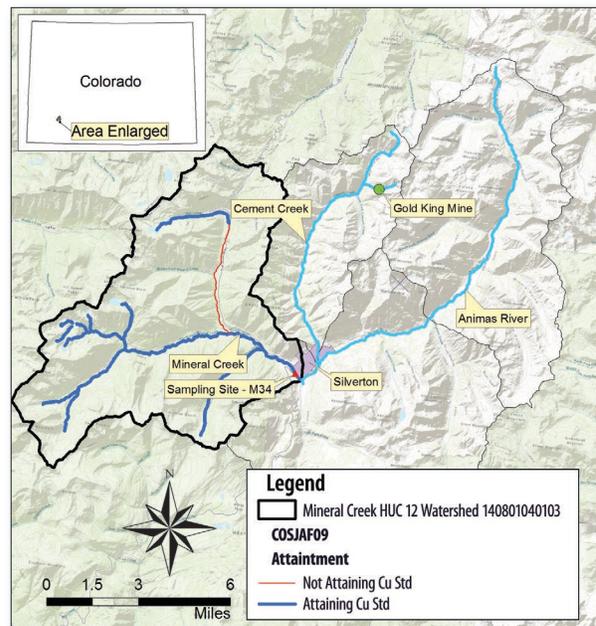


Figure 1. Mineral Creek is in southwest Colorado.

These sites were ranked in terms of metal loading. The group found that 33 of the waste piles accounted for 90 percent of the metal load from all waste piles.

Since 1992, the volunteer-based Colorado River Watch program and others have collected monthly water quality monitoring data at a U.S. Geological Survey (USGS) gaging station near the town of Silverton. Because data showed that Mineral Creek failed to

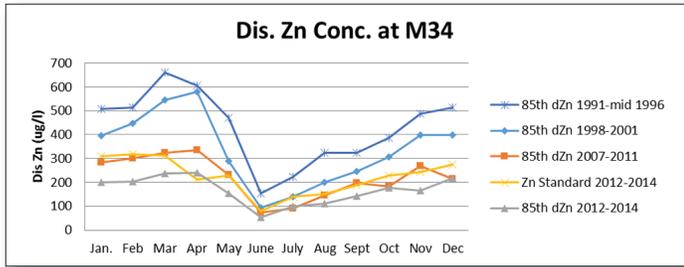


Figure 2. Dissolved zinc concentrations in Mineral Creek have declined over time.

meet water quality standards for metals and pH, CDPHE added it to the state's impaired waters list in 1998.

In 2001 ARSG proposed water quality standards in different segments of the Upper Animas Basin based on at least some remediation of all the top sites noted above. Those standards were adopted by the Colorado Water Quality Control Commission. Approximately 27 total maximum daily loads were developed by the Water Quality Control Division based upon ARSG's work. Today's water quality standards for the Animas Basin have changed little since 2001.

## Project Highlights

Starting in the 1990s, participants in ARSG initiated water quality improvement projects using different financial avenues. Most of the 33 mine waste sites have been reclaimed; of these, many used Clean Water Act (CWA) section 319 program funds. Overall, about 60 projects to control mining-related nonpoint sources have been completed in the Upper Animas Basin. In addition to numerous watershed planning and outreach activities, ARSG partners implemented nine water quality restoration projects in the Mineral Creek watershed between 1997 and 2015. Three separate projects in the Carbon Lakes area involved removing mine waste from the stream channel, developing water diversions, and restoring the creek channel and wetlands to recreate natural hydrology to help remove pollutants. Projects at the Congress, San Antonio, Brooklyn, Upper Browns, and Silver Ledge mines involved removing/consolidating mine waste, capping mine waste piles, re-channeling drainage ways and adding other hydraulic controls around waste pile areas, neutralizing residual mine waste, and planting vegetation on bare areas. The last project conducted

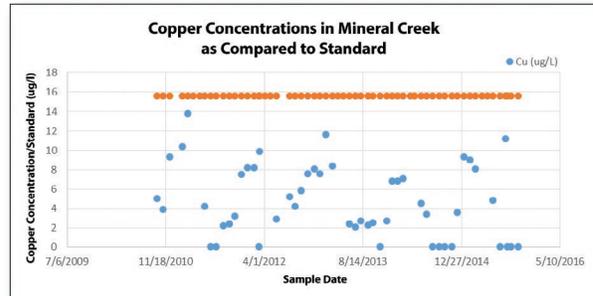


Figure 3. Copper Levels in Mineral Creek are meeting standards (orange line).

in the watershed was a project at the Bullion King Mine that included consolidating mine waste, capping the waste and installing drainage way controls.

## Results

Both ARSG and the state have assessed the water chemistry data collected at the USGS gaging station near Silverton. According to ARSG, the decline in dissolved zinc concentrations between the 1991–1996 and 2012–2016 monitoring periods varies from month to month but is generally 60–70 percent less (Figure 2). Reductions in dissolved copper concentrations are very similar in magnitude to zinc and now the waterbody meets copper standards according to the state's assessment (2016) of the recent 5-year period of record (Figure 3). As a result, copper is proposed for removal as a source of pollution in Mineral Creek.

## Partners and Funding

In cooperation with ARSG, approximately \$1.15 million in CWA section 319 funding was used for projects in Mineral Creek. Cash and in-kind match, estimated at up to \$5 million for the entire Upper Animas River, came from numerous state stakeholders, including the Colorado Division of Reclamation, Mining and Safety; Colorado Division of Parks and Wildlife; Colorado Geological Survey, and the River Watch Program. Local stakeholders include the San Juan Resource Conservation and Development Council, Southwest Water Conservation District, town of Silverton, San Juan County Commissioners, San Juan Citizens Alliance, and Sunnyside Gold Corporation. The U.S. Environmental Protection Agency, USGS, U.S. Forest Service, and U.S. Bureau of Land Management have also collaborated on the restoration efforts.



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