



NONPOINT SOURCE SUCCESS STORY

Montana

Abandoned Mine Reclamation Restores Yellowstone's Soda Butte Creek

Waterbodies Improved

For over 80 years, abandoned mines and mills near the town of Cooke City have leached metals into upper Soda Butte Creek and its tributary, Miller Creek. As a result, the Montana Department of Environmental Quality (DEQ) added both creeks to the Clean Water Act (CWA) section 303(d) list of impaired waters in 1996. Both the U.S. Forest Service (USFS) and the DEQ's Abandoned Mine Lands Program completed the 5-year McLaren Tailings Reclamation Project, which reduced pollution and allowed both creeks to attain water quality standards for aluminum, cadmium, zinc, iron, lead, and manganese. Soda Butte Creek is also meeting standards for copper. These pollutants are proposed for removal from the 2018 list of impaired waters.

Problem

Miller Creek flows into upper Soda Butte Creek, which flows for about 5 miles through southern Montana before entering Yellowstone National Park (YNP) in Wyoming and emptying into the Lamar River (Figure 1). In the early to mid-1860s, prospectors found gold in stream deposits in Miller Creek. Metal deposits of lead-silver ore from Miller Mountain, gold-copper ore from Henderson and Fisher mountains, and copper ore mined near the headwaters of Stillwater River were processed (in 1934–1953) by the McLaren Gold Mines Company at the McLaren Mill site on Soda Butte Creek. The operation produced a total of about 60,000 ounces of gold, 170,000 ounces of silver and 4 million pounds of copper.

Flooding in the upper Soda Butte Creek basin in 1950 breached the tailings impoundment dam. Years later, bright orange-red sediments containing elevated levels of metals were mapped more than 15 miles downstream near the confluence of Soda Butte Creek and the Lamar River. Although mining in this area has largely been abandoned, elevated levels of copper, lead, iron and manganese were impacting aquatic life. Surveys in the 1970s showed no trout below the tailings-impacted water. An instream bioassay resulted in 80 percent mortality of fingerling trout after 48-hour exposure to Soda Butte Creek water. Poor water quality led the DEQ to add Soda Butte and Miller creeks to the CWA section 303(d) list of impaired waters in 1996. In 2002 DEQ developed total maximum daily loads (TMDLs) and a Water Quality Restoration Plan for the Cooke City TMDL Planning Area, with help from Custer Gallatin National Forest.

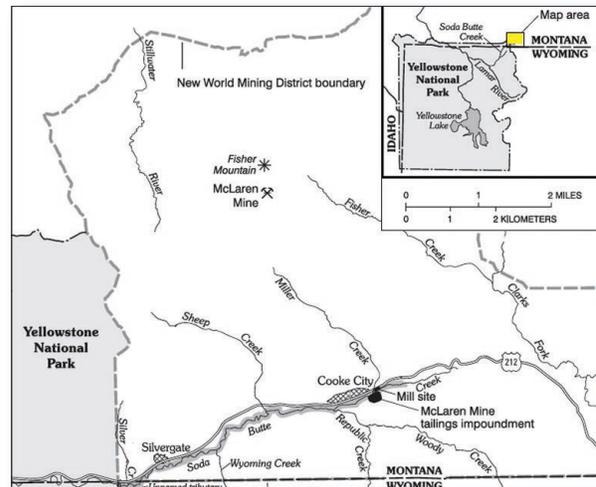


Figure 1. The upper Soda Butte Creek watershed is near the Montana/Wyoming border.

Story Highlights

After the 1988 YNP fires, the McLaren Mill tailings site was designated as an Emergency Response Action Site by the U.S. Environmental Protection Agency (EPA), resulting in work to reduce the amount of water flowing into a tailings impoundment and to improve the dam's stability. Following the recommendations of the 2002 TMDL studies, the Custer Gallatin National Forest completed extensive reclamation in the New World Mining District, including waste removal and reclamation of the Great Republic Smelter site and a portion of the McLaren Mill site. Given the ongoing discharge of contaminants from the McLaren Mill site into Soda Butte Creek and the risk of a catastrophic tailings dam failure, DEQ decided to remove the tailings



Figure 2. Soda Butte Creek before (left) and after (right) restoration.

impoundment. The 10-acre impoundment, which held approximately 0.5 million tons of mine tailings and 1 million gallons of contaminated groundwater, was underlain by a sand and gravel aquifer. Dewatering the tailings required intercepting uncontaminated groundwater around the perimeter of the tailings and pumping contaminated water from the under the impoundment. The pumped contaminated tailings water was sent to a temporary water treatment plant. More than 110 million gallons of water were treated with calcium hydroxide during active reclamation to increase pH and precipitate dissolved metals. Excavated tailings were amended with quicklime to dry the tailings for placement in the mine waste repository and neutralize the acidity of the tailings. About 1,800 feet of stream channels along Soda Butte Creek and Miller Creek were reconstructed in their approximate pre-mining locations in 2013. The project site was covered with compost-amended soil and seeded in 2014.

Results

Water quality has improved (Figure 2). The USFS monitored surface water quality during the New World Response and Restoration Project (2000–2010). In 2015–2016, National Park Service (NPS) scientists teamed with DEQ to conduct a comprehensive characterization of post-reclamation water quality in Soda Butte Creek. Water and sediment monitoring were completed at nine sites on 11 occasions in the basin. USFS data from 2000 to 2010 confirmed that exceedances of iron and copper were common in Soda Butte Creek before reclamation. The 2015–2016 NPS/DEQ investigation demonstrated that reclamation of the McLaren site effectively eliminated the source of metals along Miller Creek and the mainstem of Soda

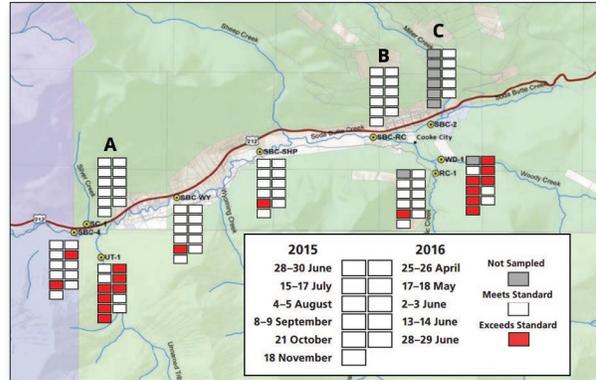


Figure 3. Miller Creek and Soda Butte Creek both meet water quality standards (see boxes A, B, and C).

Butte Creek (Figure 3). Both creeks are attaining water quality standards for aluminum, cadmium, zinc, iron, lead, and manganese. Soda Butte Creek (from Cooke City to the border of YNP) is also meeting standards for copper. These pollutants are proposed for removal from the 2018 list of impaired waters. Water quality data indicate that elevated concentrations of metals are still found in the basin, but occur along downstream tributaries that are unimpacted by mining or development.

Partners and Funding

The DEQ Water Quality Division led TMDL development, with help from the DEQ Abandoned Mine Lands Program and USFS. Partners in the cleanup effort include the Custer Gallatin National Forest, NPS's Water Resources Division and Greater Yellowstone Network, YNP, the Montana Department of Natural Resources and Conservation (DNRC), and DEQ. Collaboration with Wyoming and EPA helped address pollutants that flowed from Wyoming into Montana. The cleanup (including water treatment and site reclamation) cost almost \$22 million and was funded by the U.S. Department of the Interior Office of Surface Mining Reclamation and Enforcement, and a grant from DNRC. The project earned two national awards (2015 and 2016).

Tom Henderson, DEQ's Project Manager for the McLaren Reclamation Project, passed away suddenly in October 2018. Tom, who spearheaded the cleanup and coordinated the data collection for delisting, said his work on McLaren was the highlight of his career. Without Tom, none of this would've been possible.



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