NONPOINT SOURCE SUCCESS STORY

Colorado

Reclaiming Mined Areas Improves Coal Creek and the Crystal River

Waterbody Improved

Forty years of large-scale coal mining in an area characterized by extremely unstable, steep slopes resulted in widespread erosion and debris flows that degraded water quality and stream habitat throughout Colorado's Coal Basin. As a result, Coal Creek (including its tributaries) to the confluence with the Crystal River—a total of 22.3 miles—was placed on the state's Clean Water Act (CWA) section 303(d) list in 1998 for failing to support its aquatic life designated use due to exceedances in total recoverable iron associated with excessive sediment loadings. Implementation of best management practices (BMPs) to address the mining-related problems resulted in improved water quality. Monitoring in 2002 showed that Coal Creek and its tributaries met water quality standards and supported the aquatic life designated use. As a result, the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division removed Coal Creek from the CWA section 303(d) list in 2004.

Problem

Coal Basin is just west of the historic town of Redstone in western Colorado (Figure 1). The nearly 27-square-mile watershed is drained by Coal Creek, a tributary to the Crystal River. The free-flowing Crystal River is the largest tributary of the Roaring Fork River. The U.S. Forest Service (USFS) identified the Crystal River as eligible for federal Wild and Scenic River designation in 2002.

Mining in Coal Basin started in the late 1800s and continued on and off until 1991. In 1956, several new mines were opened and many tunnels and wide haul roads were cut into the mountainsides, leaving large piles of waste rock and coal refuse.

Large-scale coal mining activities on steep, unstable and highly erosive slopes significantly altered the Coal Basin landscape. Little vegetation existed on the area's steep slopes prior to mining and reclaimed portions of mine sites were often poorly vegetated after mining. These areas might have regularly contributed to sediment loading in Coal Creek and its tributaries. Historical water quality data indicated that total recoverable iron levels exceeded the 1,000 parts per billion (ppb) chronic numeric criterion for support of the aquatic life use designation. As a result, in 1998 Coal Creek and tributaries were placed on Colorado's CWA section 303(d) list of impaired waters for total recoverable iron associated with excessive sediment loadings. Project partners implemented a reclamation plan

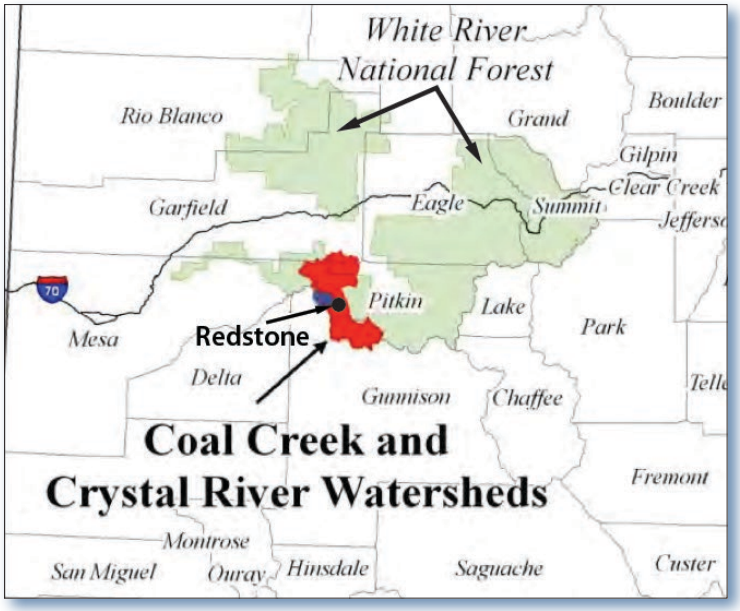

Figure 1. The Coal Creek (blue) and Crystal River (red) watersheds are in western Colorado.

and the water body was removed from the CWA section 303(d) list.

Project Highlights

Project partners, led by the Colorado Division of Reclamation, Mining and Safety (DRMS), focused on five major areas of reclamation in a series of projects from 1994 to 2002: roads, mine bench

Figure 2. An erosion control BMP used to slow water flow along an old mining road.

slopes, mine entries, the mine facilities area and reconstruction of the Dutch Creek (a tributary of Coal Creek) channel, and refuse piles and other miscellaneous sediment control projects. A number of BMPs were implemented to reclaim the impacted areas. Efforts included culvert removal with installation of rolled dips; slope reduction and broadening at mine entrances and waste piles; revegetation by hand and hydro-seeding and seeding by helicopter; slope reduction and broadening with re-vegetation at mine entrances; and demolition of mine facilities (Figure 2). These efforts reduced sediment loads to the Coal Creek system and to the Crystal River and improved both the ecological value of the watershed and its water quality.

The Coal Basin and Crystal River Area Restoration Project continues to be a multi-phase, multi-year effort; a second phase focusing on establishing vegetative cover was implemented in 2004. The local partnership also continues to be involved in implementing pilot restoration efforts, further identifying priority areas of concern, and conducting public outreach and engagement.

Results

The initial project achieved ecological improvement by mitigating and significantly restoring an area heavily impacted by coal mining. The first of the project's goals—to minimize iron-laden sediment generation from outslopes and roads—was achieved by in-situ slope stabilization through revegetation. Quantitative analysis of sediment yield data collected in 1999 (pre-construction) to 2007 indicates a nearly 50 percent overall reduction in sediment delivery (Figure 3).

The second goal of the project was to attain a measurable decrease in iron concentrations in Coal Creek. Data collected in Coal Creek and Crystal River in 2002 indicated attainment of all assigned standards, including the 1,000 ppb chronic numeric criterion protective of aquatic life use for total recoverable iron. On the basis of these post-restoration project data, the Coal Creek segment (Waterbody ID COUCRF09 _ 6400) was removed from the CWA section 303(d) list in 2004 and reported to be in good condition.

Partners and Funding

Restoration partners included USFS, DRMS and the CDPHE's Nonpoint Source Program. Nearly $4 million were spent by DRMS in reclamation bonds funds. (Reclamation bonds are posted by a mining company to provide funds to ensure that the regulatory authority can reclaim a site if the permittee fails to do so.) The reclamation efforts were supported by two CWA section 319 projects (a total of $260,600).

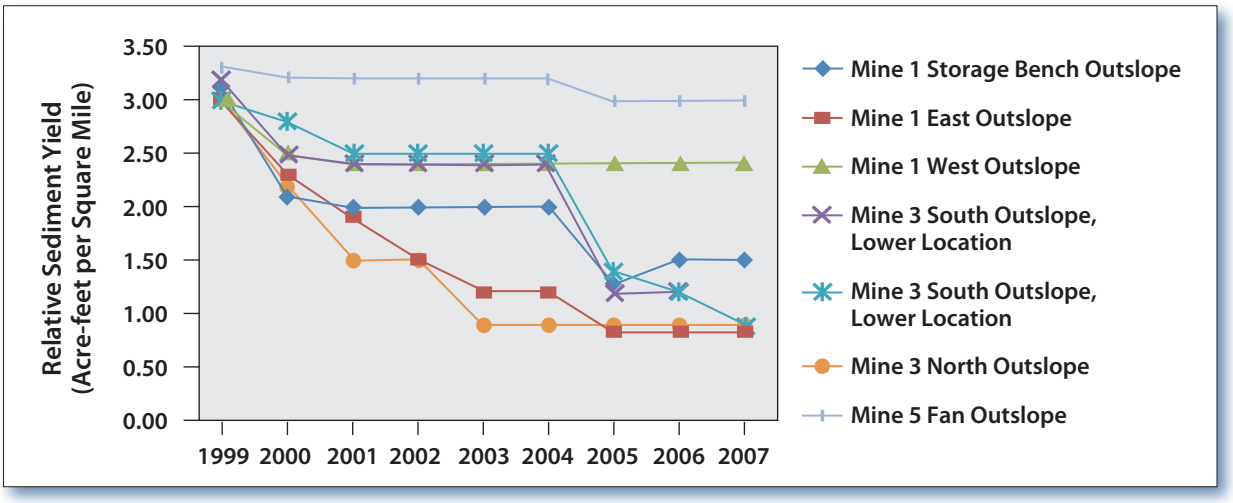

Figure 3. Reduction of sediment loads from various sites between 1999 and 2007.

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