NONPOINT SOURCE SUCCESS STORY

Wyoming

Constructed Wetlands Control Sedimentation in Wyoming's Muddy Creek

Waterbody Improved

Sedimentation due to failed irrigation structures and historical livestock grazing practices were responsible for degrading the condition of Muddy Creek. In 1996 the Wyoming Department of Environmental Quality (WDEQ) added a segment of lower Muddy Creek to the state's Clean Water Act (CWA) section 303(d) list of impaired waters for threats to aquatic life caused by habitat alteration (sedimentation). Partners reduced sedimentation by rehabilitating irrigation infrastructure and constructing a large wetland complex. WDEQ intends to remove sediment as a cause of impairment on this segment of lower Muddy Creek from its 2014 CWA section 303(d) list.

Problem

Muddy Creek is a high-elevation, cold-desert stream in south-central Wyoming's Little Snake River Basin (Figure 1). The creek begins along the continental divide within the northern foothills of the Sierra Madre and flows southwest to its confluence with the Little Snake River. The lower portion of Muddy Creek is protected by WDEQ for nongame fisheries, fish consumption, aquatic life (other than fish), recreation, wildlife, industry, agriculture, and scenic value uses. The major land uses in the Muddy Creek watershed are livestock grazing, oil and gas development, and recreation.

In the 1970s–1980s, Muddy Creek was identified as a substantial contributor of sediment to the Little Snake and Yampa rivers in the Colorado River drainage. The Muddy Creek watershed produces naturally high sediment loads because of its highly erodible soils. In addition, irrigation diversions constructed by early homesteaders were breached during the 1960s, causing severe headcutting, gully erosion, and sedimentation in the creek. Also, historical livestock grazing practices damaged riparian areas and stream banks, increasing erosion and sediment loading during precipitation and spring snowmelt events. Chemical, physical, and biological data collected in the mid-1990s indicated that excessive sedimentation was threatening the nongame fisheries and aquatic life uses along a 17.5-mile section of Muddy Creek. As a result, this segment (WYLS140500040104 _ 01) was added to Wyoming's 1996 CWA section 303(d) list of impaired waters.

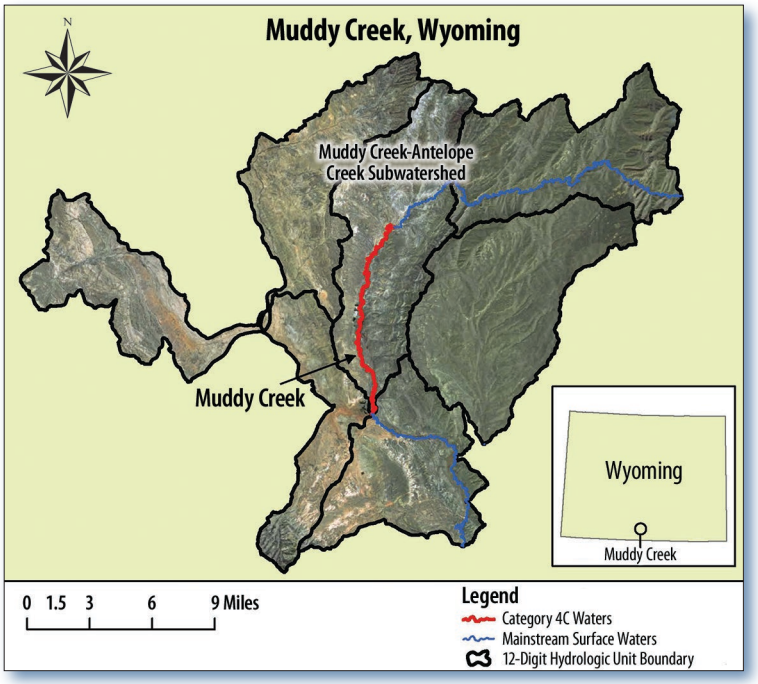

Figure 1. The lower Muddy Creek watershed.

Project Highlights

The Muddy Creek watershed became the focus of extensive sediment remediation efforts beginning in the early 1990s. Breached spreader dikes (dam structures built across streams to spread flows onto the adjacent land) were repaired to create the George Dew and Red Wash wetlands, which together encompass most of the impaired

segment of Muddy Creek. This combined wetland complex consists of water storage impoundments, engineered channels, vertical drop structures, headgates for diversions, overflow spillways, and a braided channel stream network. Water is either stored or released gradually back to Muddy Creek's main channel. Coordinated Resource Management (CRM) efforts led by the Little Snake River Conservation District (LSRCD) beginning in 1992 added to restoration efforts by addressing sedimentation caused by historical livestock grazing. CRM is a framework to organize partners (e.g., natural resource owners, managers, users) to develop and implement management plans for all major resources and ownerships within a specific area. Through CRM, partners implemented a number of best management practices, including installing off-channel water sources for livestock, adding riparian fencing, herding cattle away from riparian zones, conducting prescribed burns, planting riparian vegetation, and installing channel stabilization structures.

Results

Repairing the wetland complex has greatly decreased peak stream flows in the threatened segment of Muddy Creek. Following wetland and irrigation infrastructure reconstruction, flow duration intervals and peak flows were much higher above the wetland complex than below. Data collected by LSCRD between March and June during 2000–2003 indicate that monthly average discharge was 5 to 10 cubic feet per second higher above the wetlands than below. Likewise, average peak discharge was also higher above the wetlands than below. Thus, the wetlands have greatly reduced the occurrence, magnitude, and duration of the scouring streamflows that were causing accelerated erosion within the impaired segment of Muddy Creek. As a result, stream banks have stabilized and new vegetation has grown. In addition to storing water, the wetlands act as a sediment filter that traps sediment eroded from upstream sources. Turbidity was used as a surrogate measure to estimate sediment trends. Average monthly turbidity was compared between monitoring sites, showing that turbidity decreased 2–4 times from above the wetlands to below (Figure 2). Moreover, basic water quality parameters (pH, dissolved oxygen, turbidity, total

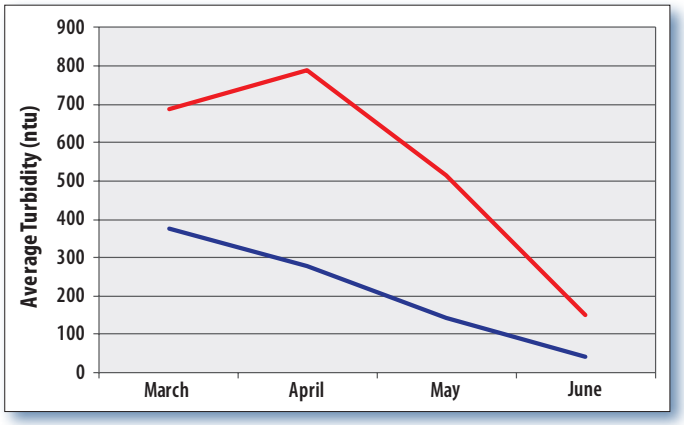

Figure 2. Average monthly turbidity above (red) and below (blue) wetlands between 2000 and 2003.

dissolved solids, and temperature) were found to be within WDEQ's water quality standards, and values remained relatively constant from 2000 to 2003.

WDEQ is proposing to remove sediment as a cause of impairment on this segment of Muddy Creek from its 2014 CWA section 303(d) list of impaired waters.

Partners and Funding

CWA section 319 funds supported watershed restoration efforts in the Muddy Creek watershed, including efforts to stabilize, rehabilitate, and expand the wetland complexes. LSRCD managed a total of $752,952 in CWA section 319 funds to implement four project phases between 1993 and 2005 throughout the larger Muddy Creek watershed. In addition, a total of $952,338 in non-federal matching funds and $454,000 in other federal funding supported the implementation of best management practices, project effectiveness monitoring, and coordination of the CRM and stakeholder involvement. The LSRCD's major partners included the Bureau of Land Management, Natural Resources Conservation Service, Wyoming Game and Fish Department, Wyoming Department of Agriculture, WDEQ, Wyoming Water Development Commission, Wyoming Natural Resource Trust Fund, Ducks Unlimited, Wyoming Land Conservation Initiative, U.S. Fish and Wildlife Service, and numerous private landowners.

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