



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Missouri

Stream Restoration Efforts on Upper Cedar Creek Reduce Impacts of Acid Mine Drainage

Waterbody Improved

Acid mine drainage (AMD) from historical mining sites has degraded water quality in Cedar Creek in central Missouri for years. Even though the mines were closed and reclamation projects were completed on 704 acres of watershed land, approximately 4 miles of Upper Cedar Creek continued to suffer from AMD and remained on the state's 303(d) list of impaired waters due to high sulfates and low pH. After streambank restoration projects and the construction of passive treatment wetlands, the creek was removed from the state's 303(d) list and now meets water quality standards for both pH and sulfates.

Problem

Prior to 1977 and the passage of the Surface Mining Control and Reclamation Act, coal strip mining operations disturbed nearly 2,000 acres of the Cedar Creek watershed. AMD, generated as runoff drained over pyrite-rich soil exposed during the mining process, severely degraded water quality in the creek. Between 1948 and 1980 periodic discharges of AMD and acidic sediments into the creek resulted in numerous fish kills.

By 1990 the Missouri Land Reclamation Program (LRP) had completed reclamation projects on 704 acres of land in the Cedar Creek watershed. The reclamation projects revegetated and stabilized large areas of the Upper Cedar Creek watershed. However, a few remaining areas of barren acidic spoil and eroding streambanks continued to contribute acidic sediments and AMD to the Upper Cedar Creek watershed. Flooding in the 1990s further contributed to AMD problems by damaging significant portions of streambanks, causing additional acid-forming materials to be exposed and more sediment to enter the creek. Although water quality greatly improved in the 1990s, approximately 4 miles of the creek remained on the state's 303(d) list of impaired waters due to high sulfates and low pH.



Acidity, sulfates, and metals are removed from AMD as it flows through layers of limestone rock and compost in the passive treatment wetland cells.

Project Highlights

The Missouri LRP used section 319 funding in coordination with funding from the U.S. Office of Surface Mining (OSM) Abandoned Mine Land Clean Streams Initiative to complete the cooperative reclamation project to address the remaining water quality problems at Cedar Creek. In 2001 to 2002, six passive treatment wetlands and alkaline-producing cells were constructed to treat AMD by adding alkalinity and removing dissolved metals and sulfates, and four acid ponds were amended and



Native trees and grasses are thriving along sections of restored streambank.

neutralized. Streambank restoration projects further added to the health and renewal of the creek. Project partners planted approximately 200,000 native trees and shrubs and helped repair 2,700 linear feet of eroding streambank at 16 restoration sites. Sixty-six acres were amended and seeded with native grasses for erosion control and wildlife habitat enhancement. Additional native grass plantings are planned for the coming years.

Results

Data collected over the course of the 4-year restoration project indicate Cedar Creek is now meeting water quality standards for both pH and sulfates. Dissolved oxygen concentrations have also improved over time, and fewer occurrences of dissolved oxygen below 5 mg/L

occurred in 2001 and 2002. Alkalinity showed the greatest increase at sites downstream of the restoration site, suggesting that the constructed wetlands are neutralizing the acid seeps. Native trees and grasses are thriving, and wildlife are returning to the restoration site and downstream areas. As a result of the successful cooperative reclamation project, the creek has been removed from the state's 303(d) list of impaired waters.

Partners and Funding

Project partners included Missouri Department of Natural Resources Water Protection Program (WPP), Boone County Soil and Water Conservation District, OSM, U.S. Department of Agriculture Natural Resources Conservation Service, U.S. Geological Survey, Missouri Department of Conservation, U.S. Environmental Protection Agency, the Columbia Audubon Society, and private landowners. Construction costs of the restoration project totaled \$354,094. The LRP received \$150,000 in section 319 grant funds from the WPP and \$204,094 from the OSM Abandoned Mine Land Clean Streams Initiative to fund the construction of six wetland cells and restoration of streambank areas.

Maupin Road Bridge Sample Site

	pH (s.u.)	Alkalinity (meq CaCO ₃ /L)	Acidity (meq CaCO ₃ /L)
Before Project	5.7	24.3	17.8
After Project	6.8	75.8	-57.4



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

EPA 841-F-05-004T
September 2005

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