



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Colorado

Better Management of Unpaved Roads and Cattle Grazing Reduces Sediment Loads

Waterbody Improved

Sediment from unpaved roads and poorly controlled cattle grazing impaired the assessment unit comprising Colorado's Box Canyon Creek and its unnamed tributaries. As a result, Colorado added the assessment unit to its 1998 Clean Water Act (CWA) section 303(d) list. The U.S. Forest Service (USFS) completed a number of watershed restoration projects and changed land management practices to address sediment sources. Sediment levels dropped, and Box Canyon Creek and its unnamed tributaries now attain their designated aquatic life uses. Colorado determined that this assessment unit is no longer impaired as of 2010.

Problem

The watershed of Box Canyon Creek, a tributary of the West Mancos River, is entirely within the San Juan National Forest in southwestern Colorado's Montezuma County. The watershed includes approximately 5.8 total stream miles; the mainstem, which is perennial, is approximately 3 miles long. Sediment from disturbed areas such as unpaved roads (Figure 1), off-road vehicle use areas, and livestock grazing areas entered the creek. The presence of excessive fine sediment prevented the creek from supporting its cold water class I aquatic life use designation. Consequently, Colorado added the assessment unit that includes Box Canyon Creek and its unnamed tributaries to the 1998 CWA section 303(d) list of impaired waters.

Colorado completed a total maximum daily load (TMDL) for Box Canyon Creek in June 2000 with a goal of restoring the macroinvertebrate community throughout the mainstem. Three metrics were used to describe the macroinvertebrate community: total taxa richness, EPT index, and EPT:C ratio. The total taxa richness indicates the diversity of the macroinvertebrate community and is determined by counting the total number of different taxonomic groups (e.g., families, genera or species) within a sample. The EPT index measures the richness of genera and species from the three aquatic insect orders most sensitive to pollution—Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). A third biological metric used to evaluate stream health is the EPT:C ratio, which compares the number of individuals from the sensitive



Figure 1. Before restoration efforts, unmaintained forest roads like this one contributed sediment to the creek.

Ephemeroptera, Plecoptera and Trichoptera (EPT) orders in the sample to the number of individuals from the pollution-tolerant family Chironomidae (e.g., non-biting midges). Streams that have an EPT:C ratio above 0.5 are considered unimpaired.

The TMDL set two additional water quality targets: (1) a maximum of 25 percent sediment fines of 8.0 millimeters (mm) or smaller diameter deposited on the surface of the streambed and (2) a road density no greater than 1.8 total road miles per square mile within the 5-square-mile Box Canyon Creek watershed. The TMDL study found a baseline road density of 6.9 miles per square mile.

Project Highlights

After the TMDL was approved, the USFS implemented watershed restoration projects and changed land management practices to address sediment sources. Unmaintained native surface roads used for off-road vehicle use were a primary source of sediment. Because motorized vehicle use previously had been unrestricted, the road density in the watershed included many unauthorized, user-created and unmaintained recreational use roads. The Bureau of Land Management (BLM) and USFS implemented travel management plans for the surrounding area, specifying which roads would be added, maintained or closed. Each travel management plan outlined travel designations, specifying what types of vehicles would be permitted on each

designated route and in what season. Travel management decisions set restrictions limiting the use of motorized vehicles (including off-road and four-wheel-drive vehicles) to designated routes on roads maintained or added under the travel management plans. Implementation of the travel management plans also included permanently closing and reclaiming many roads (Figure 2).



Figure 2. Many unpaved roads, such as this one, were closed to vehicular traffic and reseeded.

Additional sediment control measures included better management of permitted livestock grazing. The specific measures used included reducing the number of cattle and the duration of grazing, as well as constructing drift fences (typically of barbed wire) to guide cattle away from sensitive areas. Changing grazing practices increased vegetative cover in the watershed and reduced cattle access to riparian areas, thereby reducing the potential for accelerated erosion from grazing.

Results

In July 2006 the U.S. Environmental Protection Agency (USEPA) Region 8, the Colorado Department of Public Health and Environment (CDPHE), and the USFS partnered to collect post-restoration data on substrate particle size, macroinvertebrate community, stream habitat and water chemistry at four sites in the Box Canyon Creek watershed. The data showed that the TMDL

target for fine sediment—a maximum of 25 percent fines of 8.0 mm or smaller diameter—had not been achieved in any of the four reaches of Box Canyon Creek; however, efforts to meet the TMDL goal for macroinvertebrate diversity (Table 1) and the target for road density had been successful.

The data showed a macroinvertebrate community with a greater richness of species, specifically the more sensitive EPT species, throughout the entire stream length than before the project began. The EPT:C ratio for all reaches was above the target of 0.5, and therefore all four reaches could be considered unimpaired.

Table 1. Macroinvertebrate Survey* in Box Canyon Creek (July 11–12, 2006)

	Reach 1	Reach 2	Reach 3	Reach 4
Total Taxa Richness	44	34	34	30
EPT Richness	20	17	11	11
Chironomids (%)	15.14	6.45	9.6	18.43
EPT (%)	75.03	80.82	27.90	53.40
EPT:C ratio	0.83	0.93	0.74	0.74

* Streams with an EPT:C ratio above 0.5 are considered unimpaired.

Post-project road density was calculated in September 2006 using field verification of the existing geographic information system (GIS) roads layer. The total length of open roads (system, secondary system and non-system roads) was 5.689 miles, and the total watershed area was 4.64 square miles. These figures gave a current road density of 1.23 miles of road per square mile, well below the initial density of 6.9 miles per square mile in 2000.

Because of these results, the Colorado Water Quality Control Commission reports that Box Canyon Creek fully meets its aquatic life designated use and is no longer impaired as of 2010.

Partners

Restoration partners included the USFS, in conjunction with livestock grazing permittees and the off-road recreation community in the Box Canyon watershed. BLM and USFS developed travel management plans for watershed areas. USFS, USEPA Region 8, and the CDPHE's Water Quality Control Division conducted post-restoration monitoring and documented watershed improvements using approximately \$15,000 in federal funding; CDPHE and USEPA Region 8 personnel provided additional in-kind assistance.



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

EPA 841-F-11-001M
February 2011

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