



NONPOINT SOURCE SUCCESS STORY

New Mexico

Riparian Restoration Improves Water Quality in Bluewater Creek

Waterbody Improved

Bluewater Creek was heavily impacted by off-road vehicle use and grazing, which prompted New Mexico to add the creek to the state's Clean Water Act (CWA) section 303(d) list of impaired waters for turbidity/sedimentation (in 1996), nutrients (in 2006), and temperature (in 2006). Starting in 2009, the nonprofit Wild Earth Guardians conducted a CWA section 319(h) project to build fencing exclosures to restrict access for herbivores and off-road vehicles to the riparian area, and to re-plant native vegetation. Additionally, the Cibola National Forest improved grazing management in the upper watershed by rounding up wild horses that were impacting the area. Subsequent water quality surveys indicated that nutrient and turbidity levels had improved, allowing these impairments to be removed from the state's list of impaired waters in 2008 and 2010, respectively. The success of this work indicates that these proven methods could be applied in similar locations to improve stream habitat and water quality.

Problem

Staff from the Surface Water Quality Bureau (SWQB) at the New Mexico Environment Department (NMED) documented water quality problems in Bluewater Creek in Cibola County in west-central New Mexico (Figure 1). The creek has a designated use of Coldwater Aquatic Life that was not supported due to nutrients, turbidity and temperature impairments. As a result, NMED added the creek to the state's list of impaired waters for turbidity/sedimentation (in 1996), nutrients (in 2006), and temperature (in 2006). Probable sources included off-road vehicle use, loss of riparian habitat, forest road construction and use, wild horse grazing, rangeland grazing, silviculture harvesting, and stream-bank modifications/destabilization.

Project Highlights

Restoration efforts and best management practice implementation have improved water quality on Bluewater Creek. A primary factor in improving water quality was the CWA section 319(h) project entitled "Bluewater Creek Temperature Reduction and Riparian Restoration Project," which was conducted by the Wild Earth Guardians from January 2009 to December 2010. This project dramatically increased the riparian canopy cover and reduced temperature loading by planting 2,500 cottonwood trees, 35,000 willow trees, and 500 native riparian shrubs. To protect these plantings from domestic livestock grazing, elk browsing, and off-road vehicles, the Wild Earth Guardians also constructed

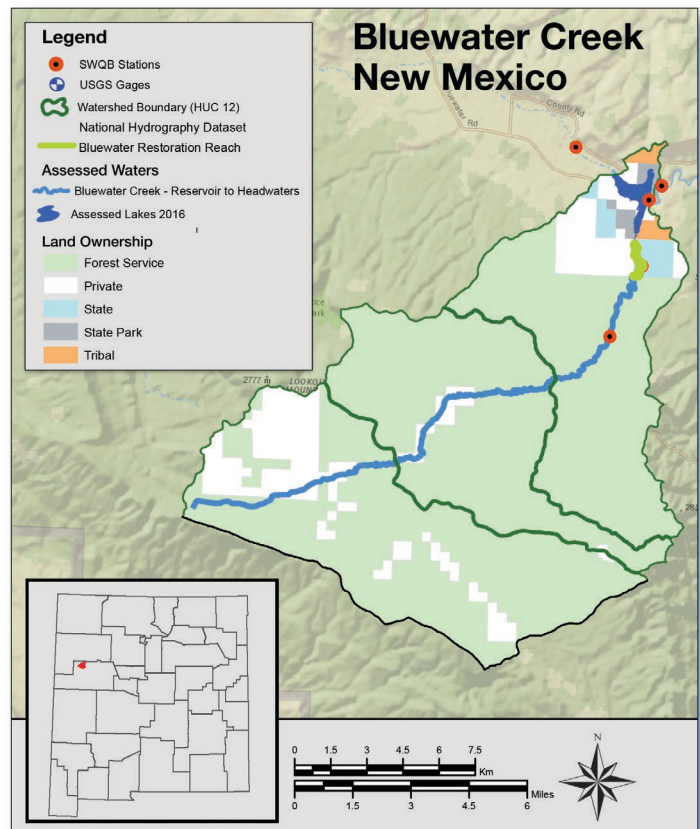


Figure 1. Bluewater Creek, which flows into the Bluewater Reservoir, drains a watershed that includes large areas of federally owned land along with smaller areas of land owned by state, tribal and private entities.

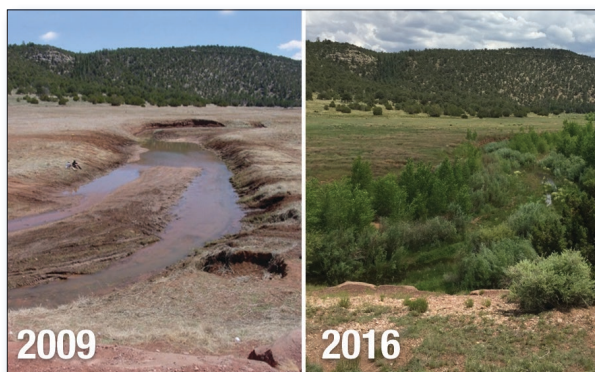


Figure 2. Restoration projects have allowed the riparian area along Bluewater Creek (above Bluewater Reservoir) to recover, as evident from photo-point monitoring photographs showing the creek before (left, 2009) and after (right, 2016) implementation.

elk-proof fenced exclosures along 1.3 miles of the creek. Additionally, the Cibola National Forest rounded up feral horses on their portion of the watershed, which has also improved the condition of the riparian areas. As a result, the area was transformed from a denuded channel to a lush riparian forest in just a few years (Figure 2).

Results

The CWA section 319(h) projects in Bluewater Creek have resulted in removal of the nutrient impairment in 2014 and the turbidity impairment in 2010 from the state's list of impaired waters, as well as a significant decrease in temperature loadings. In 2010 only one of seven samples exceeded the turbidity threshold of 25 Nephelometric Turbidity Units, and this assessment unit was declared as unimpaired for turbidity. The nutrient impairment was also removed in 2014 after a level one nutrient assessment indicated that the nutrient levels had fallen below impairment levels.

Project efforts are also addressing the temperature impairment. Effectiveness monitoring data collected by the SWQB Watershed Protection Section upstream and downstream of the restoration reach before and after the project showed a canopy cover increase from 4 percent in 2009 to 57 percent in 2016 (Figure 3). Additionally, an Analysis of Covariance (ANCOVA)

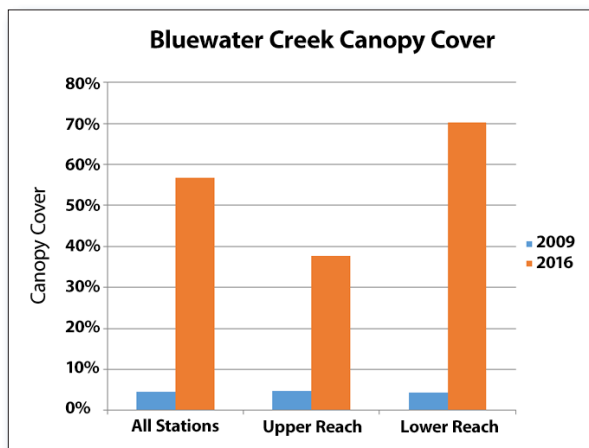


Figure 3. Measurements of canopy cover show a dramatic increase following restoration.

performed on temperature data showed that the project resulted in a mean temperature decrease of 1.6 degrees Celsius. Although stream temperature still occasionally exceeds the standard, this trend in decreasing temperature is positive and should lead to a future delisting of the temperature impairment as well. In 2011 the SWQB Hydrology Protocol indicated that this assessment unit might have intermittent reaches where flow dissipates during the dry season. After the riparian vegetation was restored, beaver moved in and constructed ponds which increased water storage and seem to have lengthened the duration of flow.

Partners and Funding

The restoration project on Bluewater Creek was funded by a CWA section 319(h) grant for \$186,516. The funds were awarded through a competitive Request for Proposals from the NMED SWQB, who also provided project oversight, development and effectiveness monitoring. The environmental nonprofit group Wild Earth Guardians submitted the successful proposal and carried out the on-the-ground work. The New Mexico State Land Office is the managing agency for the project area. These cooperators provided \$223,481 in nonfederal matching funds. Additionally, the Cibola National Forest manages the land upstream which encompasses the majority of the watershed.



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