NONPOINT SOURCE SUCCESS STORY

New Mexico

Improving Stream Temperature in Upper San Antonio Creek

Waterbody Improved

San Antonio Creek has been listed on the New Mexico state list of impaired waters since 2002 due to high stream temperatures and turbidity. Since 2008, multiple stream restoration projects in upper San Antonio Creek in the Jemez Mountains of north-central New Mexico have resulted in improvements to water quality. Projects addressing erosion from roads and headcuts and protecting riparian areas have produced a mean decrease in daily maximum temperature of 1.95 degrees Celsius. These efforts show the potential to move upper San Antonio creek from a status of "showing improvement" to "meeting standards," in spite of a general warming trend and more frequent droughts.

Problem

High stream temperatures and turbidity have kept San Antonio Creek on the list of impaired waters since 2002. These and other (e.g., low dissolved oxygen and high aluminum levels) water quality problems prevented San Antonio Creek from meeting the criteria to support the designated use for high quality cold-water aquatic life. Total maximum daily load plans were established for San Antonio Creek in 2002.

These impairments resulted from eroding roads and intensive grazing activities. There are many old logging roads throughout the watershed, as well as multiple primitive road crossings used to access a natural gas pipeline that crosses the Valles Caldera National Preserve (VCNP) to the Los Alamos National Laboratory. As this road travels adjacent to and through the creek, it previously negatively affected water quality in San Antonio Creek and the structure and function of the wetlands and riparian areas. Additionally, multiple road intersections located at the confluence of the Rito de los Indios widened the stream, adding sediment and decreasing stream bank stability (Figure 1). Some culverts were improperly sized and sometimes improperly located, and steep pitches in the road gradient without proper drainage were in a highly erosive condition.

Another impact of the roads and grazing has been damage to slope wetlands that are common in the watershed and provide source water for San Antonio Creek. Berms, ditches and gullies from these impacts concentrated shallow dispersed runoff which caused gully erosion and draining of wetland habitats.

Figure 1. Eroding banks along San Antonio Creek.

Story Highlights

Multiple restoration projects in the upper San Antonio Creek watershed were implemented to reduce temperature, turbidity and suspended sediment (Figure 2). The first were conducted by Los Amigos de Valles Caldera, and aimed to reduce sediment and turbidity by improving low-water road crossings, replacing bad culverts, and treating eroding hillslopes and cut banks. They also removed and replaced degraded in-stream structures. The WildEarth Guardians constructed large fenced exclosures and planted native riparian vegetation to increase cover and decrease stream temperature on San Antonio Creek both above and below the VCNP boundary and in the Rito de los Indios subwatershed. Additional work was conducted by Keystone Restoration Ecology in the Rito de los Indios subwatershed to reduce erosion and restore wetlands following the Las Conchas Fire. Another project on the

Figure 2. Improving a road crossing reduced erosion at the confluence of Rio de los Indios and San Antonio Creek.

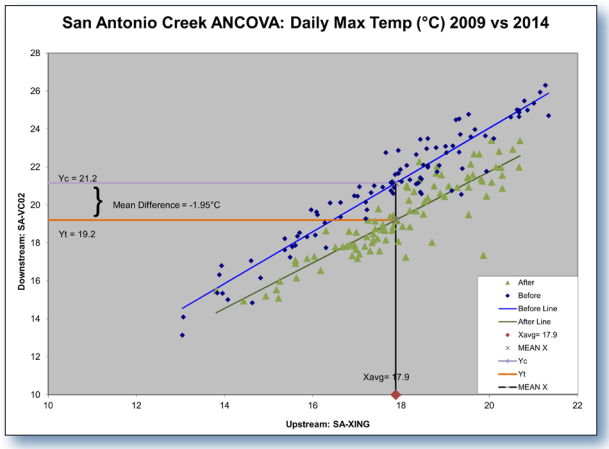

Figure 3. Data (2009–2014) show that temperature levels declined in San Antonio Creek after restoration work.

mainstem of San Antonio Creek prevented a meander cut-off which would have generated a damaging head-cut that would have increased incision of the creek.

Another project called "The Six Tribs Project" used innovative plug-and-pond techniques to restore slope wetland habitat to help trap sediment and cool water temperatures. This project also treated road drainage issues by installing rolling dips and addressed headcut erosion with multiple rock structures. Several projects included fencing and planting native riparian vegetation to increase canopy cover and shade to decrease stream temperature. Many of the projects described above were greatly assisted by the Albuquerque Wildlife Federation, which for years has held volunteer restoration workshops in the VCNP. Some of the projects were supported with federal Clean Water Act section 319 funds, and some were funded under the New Mexico River Stewardship Program.

The projects have restored flow to the natural channel and returned incised channels to grade so that the high stream flows can disperse across the floodplain. Spillways on a number of stock ponds were modified to spread flow broadly across wetland surfaces. These projects used innovative restoration techniques pioneered in New Mexico, which was a goal in the Jemez Watershed Restoration Action Strategy (2005) and in the environmental assessment for wetlands in San Antonio Creek watershed by VCNP. The benefits of these restoration efforts include water temperature and turbidity reductions; stream flow attenuations; sediment retention; groundwater recharge; base flow augmentation; and improved fish and wildlife habitat.

Results

The Surface Water Quality Bureau of the New Mexico Environment Department has been monitoring water quality on upper San Antonio Creek since 2000. An analysis of the upper restoration reach has shown promising results—there was a decrease in the daily maximum stream temperature from the upstream to downstream sites from before and after the restoration projects (Figure 3).

Although there was a mean decrease of 1.95 degrees Celsius, both stations still occasionally exceeded the upper limit of 20 degrees C set by the standards. Restoration work is ongoing, and effectiveness monitoring will provide the basis for further analysis to determine if San Antonio Creek can fully attain the standards. However, the decrease in stream temperature during a period of general warming and more frequent prolonged drought is in itself confirmation that the restoration projects are having a positive effect.

Partners and Funding

Primary partners on the upper San Antonio Creek watershed restoration projects include Bob Parmenter (VCNP), Nina Wells (Los Amigos de Valles Caldera), Steve Vrooman (Keystone Ecology), Van Clothier (Stream Dynamics) and Michael Scialdone (Albuquerque Wildlife Federation). Five of the six projects used section 319 funding for a total of $855,169, with $172,000 in state match from a New Mexico River Stewardship Project and $690,403 in other match.

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