



NONPOINT SOURCE SUCCESS STORY

Pennsylvania

Sixmile Run Beginning to Run Clean Due to Treatment Practices

Waterbody Improved

Metals and acidity in discharges from abandoned coal mines impaired Pennsylvania's Sixmile Run, prompting the Pennsylvania Department of Environmental Protection (PADEP) to add 7.4 miles of the stream's mainstem and an unnamed tributary to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 1996. Project partners installed 15 passive treatment systems at a cost of over \$2.5 million to address the impacts of the mine drainage discharges entering the stream. Water quality and aquatic habitat have been improving; with the construction of one more system scheduled for 2018, PADEP hopes the stream will soon be fully restored.

Problem

The Sixmile Run watershed drains approximately 14.6 square miles in south-central Pennsylvania's Bedford County (Figure 1). This watershed is predominantly forested but has experienced significant impairments from abandoned mine drainage (AMD) dating back to the 1800s. These AMD discharges deliver high metals and acidity loads to Sixmile Run.

A stream survey conducted by PADEP in 1980 indicated that Sixmile Run was a degraded aquatic ecosystem with depressed aquatic life due to AMD impacts. As a result, PADEP included 6.17 stream miles of the main stem and 1.23 stream miles of a tributary of Sixmile Run on the state's 1996 CWA section 303(d) list of impaired waters for not meeting the aquatic life designated use due to elevated levels of metals and acidity delivered through AMD. Broad Top Township assessed the AMD discharges in Sixmile Run in 2000 to diagnose the chemical and physical characteristics of the problem and prioritize treatment.

Using the assessment data, project partners developed an AMD remediation plan in 2001. This plan was updated in 2005 as a watershed implementation plan to include treatment implemented since 2001, as well as to reprioritize needs. PADEP developed a total maximum daily load (TMDL) in 2003 to serve as a pollution diet for the Sixmile Run watershed. The TMDL set limits for metals (aluminum, iron and manganese) and acidity loads systematically along stations on Sixmile Run. These limits, which differ per station based on the site-specific existing pollutant loads, served as goals for remediation.

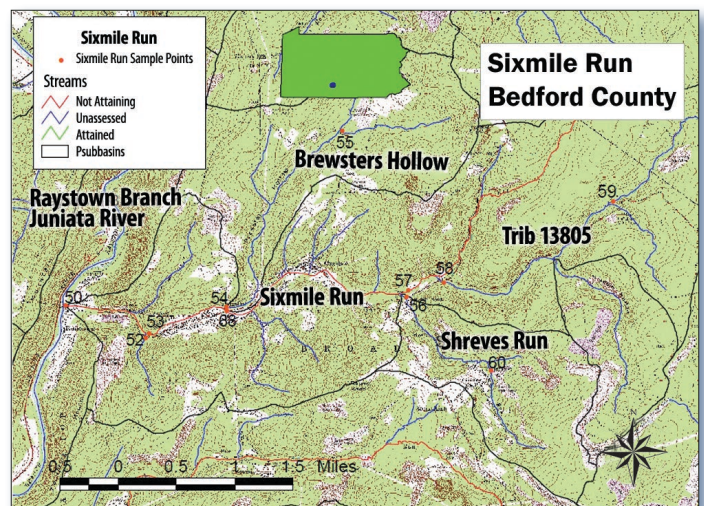


Figure 1. Sixmile Run is in south-central Pennsylvania.

Story Highlights

Project partners analyzed the AMD discharges in the Sixmile Run watershed and developed a remediation plan and TMDL. To help achieve TMDL targets, partners designed and constructed passive treatment systems to reduce metals and neutralize acidity in the AMD discharges while improving the water quality and aquatic habitat of Sixmile Run. When the water comes into contact with limestone the pH levels are raised, which in turn helps neutralize the acidity and allows dissolved metals to precipitate out of solution in a controlled environment (outside of the stream ecosystem). Practices installed included a sediment basin, a lined waterway/outlet, a vertical flow treatment system, eight limestone leach bed/ponds, and three constructed wetlands (Figures 2 and 3).



Figure 2. An aerator helps to neutralize acidity and raise pH in the Sixmile Run drainage.



Figure 3. A limestone settling pond treats an AMD discharge.

Results

Project partners attribute the improvement of this stream segment to the passive treatment systems installed to address the AMD discharges in this watershed. As project partners continued to construct passive treatment systems in the watershed, water quality has been steadily improving. Monitoring has been occurring at various sites along the stream since 2012. The results have been very promising, indicating that quality may be good enough in the near future to reassess the stream. The township has slowly built systems starting in the headwaters and working their way downstream. To show improvement, a few TMDL points were chosen as sample points (Table 1). The

Table 1. Data collected at TMDL points 53 and 50 on Sixmile Run show the TMDL limits and sample results for the pollutants of concern before and after treatment.

Sixmile Run Monitoring	Iron (mg/L)	Aluminum (mg/L)	Manganese (mg/L)	Acidity (mg/L)
TMDL monitoring point 53				
Before treatment	2.74	2.08	0.62	16.0
TMDL limits	0.70	0.20	0.36	0.00
After treatment	0.37	0.35	0.17	0.00
TMDL monitoring point 50				
Before treatment	1.89	3.29	0.91	26.0
TMDL limits	0.70	0.20	0.36	0.00
After treatment	2.15	2.28	0.69	0.00

first point is located 0.5 miles from mouth but downstream of constructed systems (TMDL monitoring point 53), while the second point (TMDL monitoring point 50) is at the mouth of the stream.

Although not all metals have been removed, the stream is now alkaline, showing that acidity has been neutralized. This is a significant step towards re-establishing aquatic life. A few fish have been noticed swimming in the area. An area of discharges affected by AMD remains active between the two mentioned TMDL monitoring points. Hopefully the construction of the next planned passive treatment system will reduce metals significantly enough to support aquatic life.

Partners and Funding

Broad Top Township, Bedford County Conservation District, the engineering firm of Skelly and Loy, Western Pennsylvania Coalition of Abandoned Mine Reclamation, U.S. Office of Surface Mining and PADEP partnered to address the water quality problems in the Sixmile Run watershed. Broad Top was awarded \$30,000 in an AMD Watershed Assessment Grant from PADEP to collect data on the AMD discharges in the watershed. Through 2014, the township has been awarded \$378,810 from Growing Greener; \$191,000 through Surface Mining Conservation and Reclamation Act (SMCRA) grants (bond forfeiture); and nearly \$1.9 million from CWA section 319 to treat the discharges.



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For additional information contact:

Donna Wagner
Pennsylvania Department of Environmental Protection
717-772-5173 • donnawagne@pa.gov