



NONPOINT SOURCE SUCCESS STORY

Pennsylvania

Treatment of Mine Drainage Restores Longs Run

Waterbody Improved

Metals and acidity in discharges from abandoned coal mines impaired Pennsylvania's Longs Run, prompting the Pennsylvania Department of Environmental Protection (PADEP) to add 5.3 miles of the mainstem stream to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 1996. Project partners installed 15 passive treatment systems to address the impacts of the mine drainage discharges entering the stream. Water quality and aquatic habitat was restored, allowing PADEP to remove the entire 5.3-mile segment of Longs Run from the list of impaired waters in 2014.

Problem

The Longs Run watershed drains approximately 4.8 square miles in Broad Top Township, Bedford County, in southcentral Pennsylvania (Figure 1). This watershed is 91 percent forested but has experienced significant impairments from abandoned mine drainage (AMD) dating back to the 1800s. Nonpoint source runoff from these AMD discharges delivers high metals and acidity loads to Longs Run.

A stream survey conducted by PADEP in 1980 indicated that Longs Run was a degraded aquatic ecosystem with depressed aquatic life due to AMD impacts. As a result, PADEP included 5.3 stream miles of the main stem of Longs Run on the state's CWA section 303(d) list of impaired waters in 1996 for not meeting the aquatic life designated use due to elevated levels of metals and acidity delivered through AMD. Broad Top Township conducted an assessment of the AMD discharges in Longs 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 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 Longs Run watershed. The TMDL set limits for metals (aluminum, iron and manganese) and acidity loads systematically along stations on Longs Run. These limits, which differ per station based on the site-specific existing pollutant loads, served as goals for remediation.

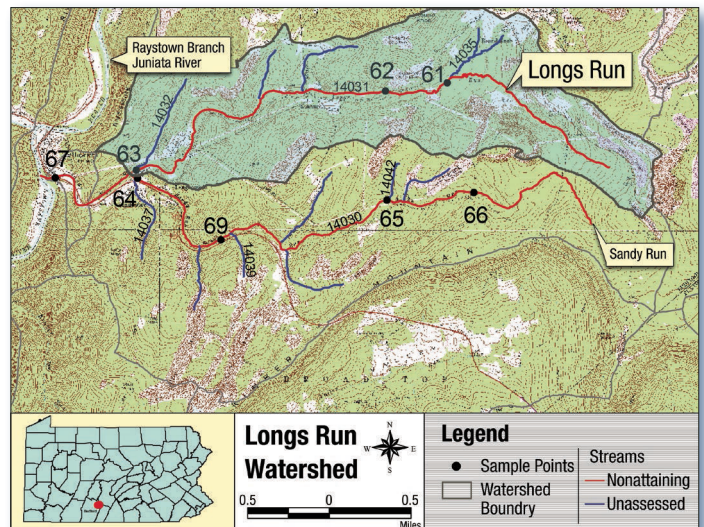


Figure 1. Longs Run is in south-central Pennsylvania.

Project Highlights

Project partners analyzed the AMD discharges in the Longs 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 Longs Run (Figures 2 and 3). 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).



Figure 2. Before project implementation, AMD flows emerging from a seep in the hillside caused erosion and carried pollutants. (Photos by Skelly and Loy, Inc.)



Figure 3. At site LR0-D14, AMD flows through an open limestone channel passive treatment system and into a small aerobic wetland before discharging to Longs Run.

Results

In 2011, after remediation, PADEP performed aquatic habitat assessments on Longs Run to quantify the recolonization of benthic aquatic life (macroinvertebrates, or “bugs”) in the waterway. These data showed an Index of Biotic Integrity (IBI) value of 78.3, exceeding the minimum IBI score of 63 that indicates a sustained and healthy aquatic ecosystem. On the basis of these data, PADEP removed the entire 5.3-mile segment of the main stem of the Longs Run (PA7899) from the list of impaired waters.

Project partners attribute the delisting of this stream segment to the passive treatment systems installed to address the AMD discharges in this watershed. Pre-treatment concentrations of metals and acidity at the mouth of Longs Run were brought below the TMDL limits post-treatment, attaining the goals of the TMDL (Table 1).

Table 1. Data collected at the mouth of Longs Run show the TMDL limits and the sample results for the pollutants of concern before and after treatment.

Longs Run monitoring	Aluminum (mg/L)	Iron (mg/L)	Manganese (mg/L)	Acidity (mg/L)
Before treatment	0.34	2.75	0.58	8.27
TMDL limits	0.20	0.80	0.55	1.41
After treatment	0.05	0.05	0.03	0.00

Of significance, while metals were beneficially reduced by an order of magnitude, hot acidity was completely neutralized post-treatment. This indicates water quality had become net alkaline, a necessary step toward the reestablishing a stable and robust aquatic ecosystem. It should also be noted that the otherwise pristine nature of the Longs Run watershed, being 91 percent forested, positively contributed to its rapid recovery post-AMD treatment. Once Longs Run returned to its natural background chemistry and alkalinity, macroinvertebrates were able to drift downstream from healthy refugial tributaries to readily recolonize the restored main stem.

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 Longs Run watershed. Broad Top Township was awarded \$30,000 in an AMD Watershed Assessment Grant from PADEP to collect data on the AMD discharges in the watershed. The township was awarded \$140,079 in Pennsylvania Growing Greener funds in 2002 to treat half the AMD discharges and another \$227,619 in CWA section 319 funds in 2003 to treat the remaining discharges.



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For additional information contact:

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