



NONPOINT SOURCE SUCCESS STORY

Pennsylvania

Treatment of Mine Drainage Improves Blacks Creek (Venango County)

Waterbody Improved

Metals in discharges from abandoned coal mines impaired Blacks Creek, prompting the Pennsylvania Department of Environmental Protection (PADEP) to add 5.6 miles of the mainstem stream and 13.0 miles of unnamed tributaries to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 1996 and 2004, respectively. In response, project partners installed three passive treatment systems at a cost of nearly \$1 million to address the impacts of the mine drainage discharges entering the stream. Water quality and aquatic habitat have been improving since project work began, and more systems are planned in the future in hopes of continuing this trend.

Problem

Western Pennsylvania's Blacks Creek watershed drains approximately 9 square miles in Butler and Venango counties and is a major headwaters tributary and subwatershed of Slippery Rock Creek in the Ohio River watershed (Figure 1). This watershed is predominantly forested but has experienced significant impairments from abandoned mine drainage (AMD) discharges from abandoned mines or oil wells dating back to the 1800s. Nonpoint source runoff from these AMD discharges delivers high metals loads to Blacks Creek. Due to the influence of layers of limestone underlying the area, most of Blacks Creek and its tributaries have an acceptable pH and are net-alkaline.

A stream survey conducted by PADEP indicated that Blacks Creek was a degraded aquatic ecosystem with depressed aquatic life due to AMD impacts. As a result, PADEP included 5.6 stream miles of the main stem 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 delivered through AMD. An additional 13 stream miles of Blacks Creek tributaries were added to the impaired waters list in 2004.

In 2005 PADEP developed a total maximum daily load (TMDL) to serve as a pollution diet for the Blacks Creek watershed. The TMDL set limits for metals (aluminum, iron and manganese) systematically along stations on Blacks Creek. These limits, which differ per station based on the site-specific existing pollutant loads, served as goals for remediation.

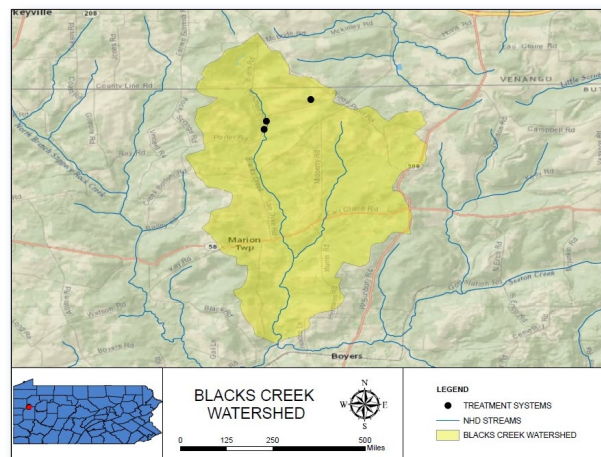


Figure 1. Blacks Creek is in western Pennsylvania.

After development of the TMDL in 2005, Stream Restoration Incorporated (SRI) received a CWA section 319 grant to assess the watershed. Using the assessment data, project partners developed a watershed implementation plan that was approved in 2007. This plan was revised in 2017 to include treatment implemented since 2005 and to reprioritize needs.

Story Highlights

Over 20 AMD discharges have been identified and sampled within the Black Creek watershed; 15 priority areas are identified in the watershed implementation plan. Passive treatment systems have been constructed addressing three of these priorities, including an upwelling of AMD from an abandoned oil well (site BC16) and a heavily degraded tributary (Tributary #15) that is downstream of a bond forfeiture and coal refuse site known as the McIntire mine site (Figures 2 and 3).



Figure 2. A settling pond and wetland were installed to address the BC16 AMD discharge site along an unnamed tributary to Blacks Creek.



Figure 3. An oxidation precipitation channel (OPC) raises pH and removes iron from the water on a tributary that is downstream of the McIntire mine site.

Results

Water sampling at selected in-stream points are beginning to show improvements in water quality, especially in iron removal. Project partners attribute the improvements in water quality 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 2007. The results have been very promising indicating that water quality may be good enough soon to reassess the stream.

Table 1. Pre- and post-project monitoring data on Blacks Creek.

| Pollutant | Sampling Years | | | |
|-------------------|----------------|----------|-------------------|----------|
| | 2000 | | 2012–2016 Average | |
| | Site BC1 | Site BC2 | Site BC1 | Site BC2 |
| pH | 6.8–7.4 | 6.3–6.8 | 8 | 7.4 |
| Iron | 1.78 | 15.56 | 0.5 | 1.9 |
| Aluminum (mg/L) | 0.55 | 1.04 | 0.1 | 0.2 |
| Manganese (mg/L) | 3.18 | 6.87 | 0.6 | 1.3 |
| Acidity (mg/L) | 0 | 0 | 0 | -75 |
| Alkalinity (mg/L) | 95.7 | 97.2 | 107 | 91 |

SRI has built three systems that target the discharges ranked the highest based on total metal loadings. Monitoring data were collected at two TMDL points to show improvement due to restoration efforts (Table 1). The first TMDL sample point (BC2) point is downstream of two of the three constructed systems. Further downstream, TMDL point BC1 is located below all three passive treatment systems. There are a few more AMD discharges in the watershed that need to be addressed. However, the work that has been completed thus far has improved water quality and is a significant step towards reestablishing aquatic life in the Blacks Creek watershed.

Partners and Funding

The Slippery Rock Watershed Coalition, private land-owners, SRI, BioMost, Beran Environmental, Quality Aggregates, Butler County Conservation District, Western Pennsylvania Coalition of Abandoned Mine Reclamation, U.S. Office of Surface Mining, Foundation for Pennsylvania Watersheds and PADEP partnered to address the water quality problems in the Blacks Creek watershed. SRI was awarded \$19,415 in CWA section 319 funding to complete the watershed restoration plan. Through 2017, the group has been awarded \$110,000 from Growing Greener and close to \$871,986 from CWA section 319 to treat the discharges. Most recently, they were awarded \$49,667 to revise their watershed implementation plan with updated data.



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