



# NONPOINT SOURCE SUCCESS STORY

## Pennsylvania

### Reclaiming Abandoned Mine Lands Improves Bear Run

#### Waterbody Improved

Discharges from abandoned surface and deep mines caused high metal concentrations and acidity in Pennsylvania's Bear Run watershed. This prompted the Pennsylvania Department of Environmental Protection (PADEP) to add numerous segments of the South Branch and main stem of Bear Run to the state's Clean Water Act (CWA) section 303(d) list of impaired waters (between 1996 and 2004) for failing to attain their cold-water fishes designated uses. To restore these segments in the Bear Run watershed, project partners reclaimed and treated abandoned mine lands (AML) to address pollutant loadings. Those efforts have resulted in water quality improvement downstream of the reclamation sites, in both the South Branch and main stem of Bear Run.

#### Problem

The Bear Run watershed is in Clearfield, Indiana and Jefferson counties, Pennsylvania, in the headwaters of the West Branch Susquehanna River (Figure 1). Land use is composed of approximately 79 percent forest cover, 15 percent agriculture and grassland, and 6 percent abandoned coal mines and quarries. Soils are deep and well drained. Coal mining first began in the area in the late 1800s and continues through the present day; large areas within the watershed are disturbed by deep and strip mining operations.

The mining operations have negatively affected water quality in the Bear Run watershed. As rainwater and snowmelt flow through surface mines and spoil piles (excavated soils that were removed during mining), they become laden with metals and acidity, which are transported to receiving streams as runoff. Most of this runoff percolates down through the depressions left by the abandoned surface mines and is then transported to subterranean deep mine pools (ground water that has accumulated in an underground mine after mining operations have ended) via subsurface flow. The runoff leaches additional acidity and metals as it passes through underlying rock layers and deep mine pools, thereby significantly compounding the toxicity and volume of the abandoned mine drainage (AMD) discharges associated with the legacy deep mine pools.

Water quality data showed that AMD was causing metal and pH impairments in multiple segments along the South Branch and main stem of Bear Run, preventing these segments from supporting

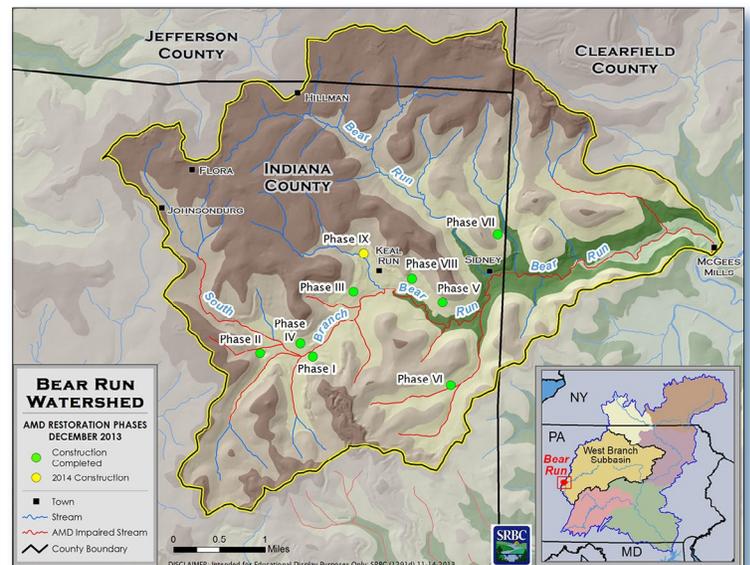


Figure 1. The Bear Run watershed is in western Pennsylvania.

their cold-water fishes designated use. As a result, PADEP added them to the state's CWA 303(d) list of impaired waters between 1996 and 2004. Water quality standards require that the waterbodies must remain at a pH between 6 and 9 and include iron concentrations of less than 1.5 milligrams per liter (mg/L), manganese concentrations of less than 1 mg/L and aluminum concentrations of less than 0.75 mg/L.

In 2007 PADEP developed a total maximum daily load (TMDL) for Bear Run. The TMDL set limits for the metals (aluminum, iron and manganese) and acidity loads systematically along water quality sampling stations along Bear Run. These limits,

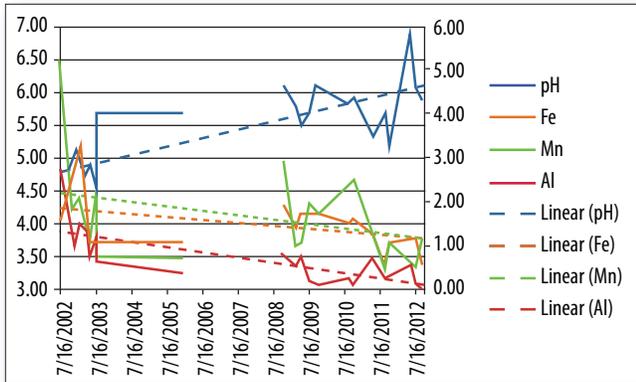


Figure 2. Data show improving trends (dotted lines) in pH (left axis) and metal concentrations (right axis).

which differ per station based on the site-specific existing pollutant loads, serve as goals for remediation, specifically to meet water quality criteria 99 percent of the time.

## Project Highlights

Since 2007 eight AMD construction phases have been completed or are nearing completion (see Figure 1). The waste coal piles in the South Branch Bear Run subwatershed, a source of high metals and acidity leachate, were removed and treated by 2013 through a combination of re-mining, grading, and amending and revegetating bare soils. The AMD discharges have been treated using passive and active treatment systems, including aerobic staggered pond/wetland systems, manual flush oxalic limestone drains, Swedish bucket lime silo dosers and limestone channels.

A ninth construction phase might be initiated through an agreement/partnership with the Pennsylvania Game Commission and P&N Coal Company, through an expansion of their surface mine in State Game Lands 164 in the Bear Run watershed. If progress continues, the ninth phase will be a coal refuse reclamation project on Keal Run, a tributary to Bear Run.

## Results

The restoration efforts described above have significantly improved water quality, as shown in measurements of pH and metals at the mouth of Bear Run (station 1.8) following restoration activities (Figure 2).

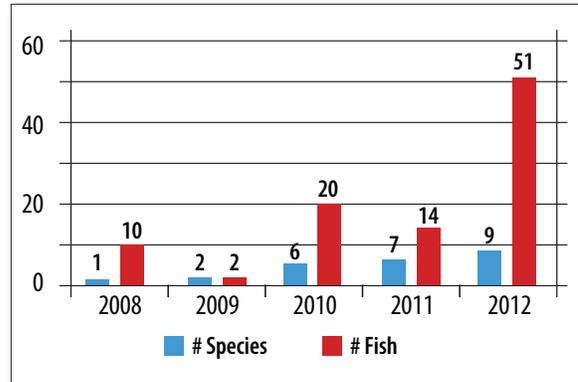


Figure 3. The number of fish and variety of fish species have improved over time in Bear Run.

Fish surveys also show an increase in the numbers of fish species and individuals (Figure 3). Before treatment, the Susquehanna River Basin Commission (SRBC) surveyed fish at Bear Run station 1.8 and found only one species, the pollution-tolerant creek chub. In the September 2012 survey, SRBC collected a total of 51 individuals representing nine species, including wild brown trout. PADEP anticipates this improvement will continue slowly as fish move into this section via the West Branch Susquehanna River. This recolonization should quicken as additional restoration activities are completed.

## Partners and Funding

Partners that supported the restoration effort in Bear Run included PADEP, the U.S. Department of the Interior's Office of Surface Mining (OSM), the Pennsylvania Game Commission, SRBC, the Indiana County Conservation District, and the Evergreen Conservancy. PADEP provided \$273,000 in grant funds through the Growing Greener Grant and \$1.424 million through the Growing Greener Watershed Renaissance Initiative Grant. OSM provided \$130,000 in grant funds through the Watershed Cooperative Agreement.

The Pennsylvania Game Commission supported the restoration by providing land, while SRBC provided project oversight, monitoring and stream assessments. Lastly, the Indiana County Conservation District and Evergreen Conservancy supported project implementation as grantees of the aforementioned funds.



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