



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Pennsylvania

Sealing Mines and Installing Treatment Systems Restores Streams

Waterbodies Improved

Abandoned mine drainage (AMD) has polluted Gumboot Run and the East Branch Clarion River in northwestern Pennsylvania's McKean County since the 1800s. Numerous AMD seeps flow in the Gumboot Run watershed, which, in turn, flows into the East Branch Clarion River. Those seeps negatively affected the water quality in four waterbodies, including three segments in the Gumboot Run watershed and one segment on the East Branch Clarion River mainstem, which prompted the Pennsylvania Department of Environmental Protection (PADEP) to add the segments to the state's Clean Water Act (CWA) section 303(d) list of impaired waters for low pH. PADEP added the three segments in Gumboot Run in 2004 and the East Branch Clarion River segment in 2006. Early efforts to clean up the watershed included sealing mines and stabilizing spoil piles in the 1970s. Between 2001 and 2007, several AMD treatment systems were constructed in the Gumboot Run Watershed that produced acceptable levels of pH and metals in both streams. PADEP intends to remove all four segments from the 2010 CWA section 303(d) list of impaired waters as the result of the water quality improvements.

Problem

Coal mining began in the Gumboot Run watershed in the late 1800s, near the small village of Clermont in McKean County. Gumboot Run is a tributary of the East Branch Clarion River, which is dammed to form the East Branch Lake in a heavily forested part of northwestern Pennsylvania. Deep mines produced a large amount of coal that was shipped by railroad to western Pennsylvania and Buffalo, New York. Although coal production decreased in the Gumboot Mines by the early 1900s, coal continued to be taken from the area into the late 1900s. An assessment of the East Branch Clarion River in 1969 determined that numerous AMD sources remained in the watershed. Attempts were made in the 1970s to seal mines and reclaim the area, but water quality impairment persisted.

In the late 1990s, data show that Gumboot Run had a pH as low as 3.8 (standards require a minimum of 6.0 to support aquatic life) and had elevated levels of manganese and aluminum. PADEP biologists sampled the East Branch Clarion River in 2004 and documented an impaired aquatic macroinvertebrate population approximately 0.4 mile downstream of the confluence with Gumboot Run. On the basis of these data, PADEP added four waterbodies (7.48 stream miles total) to the state's CWA section 303(d) list for low pH levels. The four waterbodies were three segments in the Gumboot Run watershed (added in 2004) and one segment on the mainstem of the East Branch Clarion River (added in 2006).

Project Highlights

Between 2001 and 2005, project partners installed several passive treatment systems in the Gumboot Run watershed. First, in 2001, PADEP's Knox District Mining Office installed a vertical flow system to add alkalinity directly into the stream. Then, in 2007, partners installed an additional passive treatment system to more thoroughly treat AMD sources in the watershed at a cost of approximately one million dollars. This project, designed by PADEP's Bureau of Abandoned Mine Reclamation (BAMR) and completed by E.M. Brown Construction, has a series of ponds with limestone beds that neutralize the acidic water and allow metals to drop out of solution (Figures 1 and 2).



Photo courtesy: Jon Smoyer, PADEP/BAMR

Figure 1. One of a series of limestone treatment ponds installed.

Photo courtesy: Jon Smoyer, PADEP/BAMR



Figure 2. Another limestone treatment pond.

Results

Water quality has been improving as a result of the restoration efforts. Data from Gumboot Run in 2007 and 2008 indicated that pH was achieving state standards, and aluminum and manganese were dropping to acceptable levels. PADEP's BAMR has collected samples on Gumboot Run approximately three-quarters of a mile downstream of the treatment systems. The average pH at that location was 4.1 between 1996 and 1999. It rose to 7.3 between 2007 and 2008. During the same period, aluminum declined by 46 percent (Figure 3) and manganese declined by 78 percent (Figure 4) in samples taken at the site.

PADEP's Division of Water Quality Standards reassessed the stream in 2009 to ensure that minimum state standards are being met. Results of their findings are that benthic populations have returned to both Gumboot Run and the previously impaired segment of the East Branch of the Clarion River. The waterbodies now meet Pennsylvania's water quality standards. PADEP plans to remove the four segments from the 2010 CWA section 303(d) list.

Partners and Funding

Funding for the large, passive treatment system completed in 2007 was provided by the Surface Mining Control Reclamation Act, Title IV, Appalachian Clean Streams Initiative (\$233,304) and Pennsylvania's Growing Greener Program (\$804,972).

Additional partners include the U.S. Army Corps of Engineers, and Pennsylvania's Game Commission, Fish and Boat Commission, and Department of Conservation and Natural Resources. In addition, in the early 1990s, the now disbanded Elk County Fishermen worked to clean up the watershed. The PADEP Knox District Mining Office and BAMR have been very involved in monitoring the benthic populations and metal levels, as well as funding and designing treatment systems.

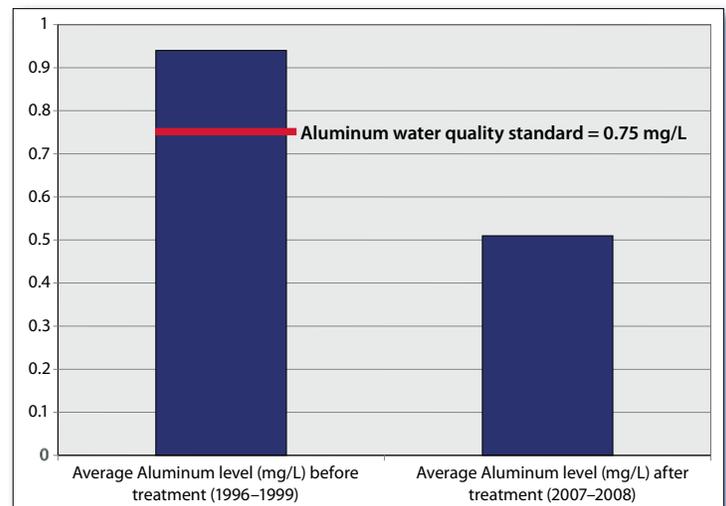


Figure 3. Aluminum reductions in Gumboot Run in milligrams per liter (mg/L).

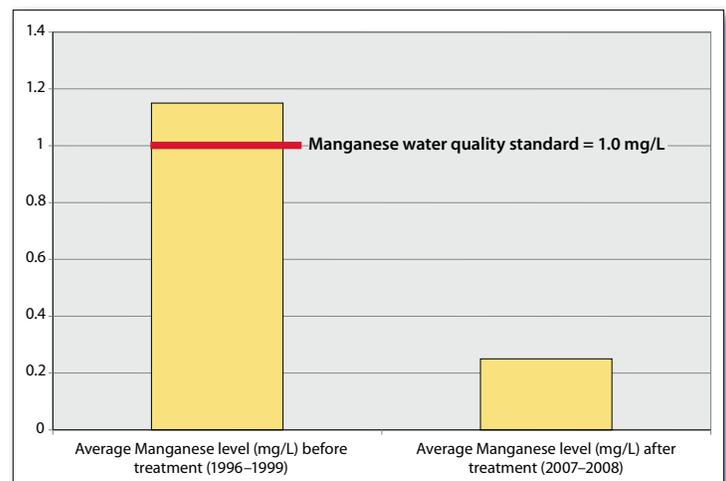


Figure 4. Manganese reductions in Gumboot Run in mg/L.



U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-09-001MM
December 2009

For additional information contact:

Joe Kelly, Pennsylvania Department of Environmental Protection
717-783-2404 • josephkel@state.pa.us

Ely Heferle, Pennsylvania Department of Environmental Protection
Bureau of District Mining Operations
814-797-1191 • eheferle@state.pa.us