



# NONPOINT SOURCE SUCCESS STORY

## West Virginia

### Treating Acid Mine Drainage Allows Aquatic Life to Rebound in Kanes Creek

#### Waterbody Improved

Acid mine drainage (AMD) from mines in West Virginia's sulfur-rich Upper Freeport Coal Seam polluted Kanes Creek.

The West Virginia Department of Environmental Protection (WVDEP) added the 4.3-mile-long stream to its Clean Water Act (CWA) section 303(d) list of impaired waters in 1998. Project partners have installed passive and active AMD treatment systems that have reduced metals and acidity loadings into Kanes Creek, allowing benthic macroinvertebrate and fish communities to increase in the lower reaches of the creek. A 7.2-acre impoundment upstream is meeting water quality standards and will be ready for volunteer or stocked fish communities after a few more projects solidify water quality gains.

#### Problem

Kanes Creek is a tributary to Deckers Creek, which is a tributary to the Monongahela River. Kanes Creek is a 4.3-mile stream that flows into Deckers Creek in Reedsville, West Virginia. Deckers Creek flows into the Monongahela River in Morgantown, West Virginia (Figure 1).

The Upper Freeport Coal Seam is rich in sulfur, and it generates sulfuric acid when exposed to air and water. Before 1977, no regulations were in place restricting the discharge of AMD from mines. Many of those mines were abandoned before the Surface Mining Control and Reclamation Act (SMCRA) went into effect, and continue to discharge polluted water to this day. Kanes Creek received AMD from 10 abandoned mine sites, leading to high metal concentrations and acidity. WVDEP's Watershed Assessment Branch (WAB) and Friends of Deckers Creek (FODC) collected data from 1994 to 1996 that led to the 1998 CWA section 303(d) listings for iron, manganese, pH and biological impairments of Kanes Creek.

#### Project Highlights

In 1997 and 2003, the WVDEP reclaimed abandoned mine lands as part of the SMCRA funded-effort to reduce problems from abandoned coal mines. In 2002 the U.S. Environmental Protection Agency (EPA) completed a total maximum daily load (TMDL) for the Monongahela River watershed, which includes Kanes and Deckers creeks. From 2003 to 2006 a permitted mine adjusted its

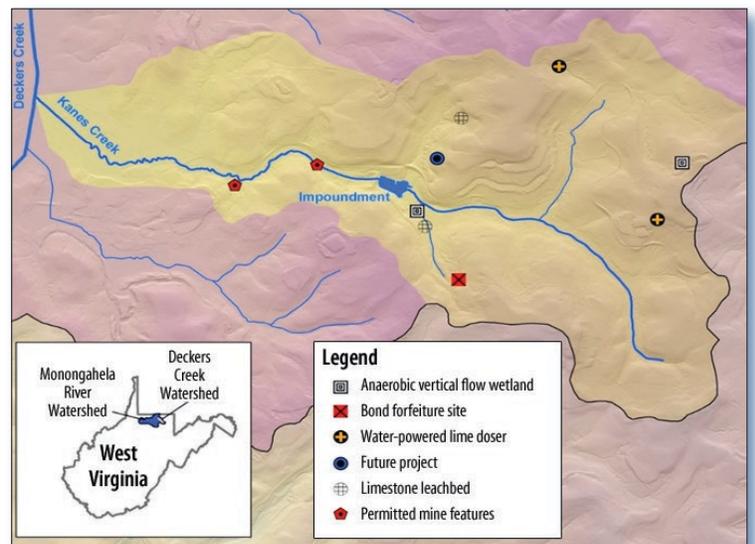


Figure 1. The Kanes Creek watershed is in northern West Virginia.

operation to better capture AMD surging from the mine. In 2005 a nonprofit organization, Friends of Deckers Creek (FODC), completed a watershed-based plan that served as a road map to eliminating all impairments from mine drainage in the Kanes Creek and Deckers Creek watersheds. In 2008, 2010, 2011 and 2013 FODC completed acid mine drainage treatment projects in the Kanes Creek watershed with sulfate-reducing bioreactors, water-powered lime dosing devices, limestone leachbeds and an anaerobic vertical flow wetland (see Figure 1 for project locations). One more project using a limestone leachbed and an anaerobic vertical flow wetland is in development.

## Results

The lowest reach of Kanes Creek has met water quality standards for AMD parameters, including pH and total iron, more than 90 percent of the time since April 2010 (Figure 2). An impoundment 2.5 miles from the mouth had a pH level near 4.0 when Kanes Creek was placed on the CWA section 303(d) list in 1998; since 2010, this site has met pH standards in excess of 6.0 approximately 20 percent of the time.

Recent fish surveys have found creek chub, yellow bullhead catfish and green sunfish in sections of the stream where no fish were found before 2006. Benthic macroinvertebrate sampling yielded six individuals per square meter in 2003. Similar sampling in 2012 yielded 275 organisms per square meter. Total taxa, which is the total number of families, improved 58.8 percent from 2007 to 2012.

The West Virginia Stream Condition Index (WVSCI) is a family-level index for biological integrity for benthics that incorporate six different metrics. WVSCI scores in Kanes Creek have fluctuated over the years but the trend shows an overall improvement. The 2012 scores are only slightly below the threshold for biological impairment.

Lastly, although AMD has a major impact on Kane Creek, other factors such as changes in habitat and hydrologic conditions also have greatly influenced the benthic communities. With additional evaluation of existing water quality data and potentially more sampling, West Virginia hopes for Kanes Creek to be delisted in the near future.

## Partners and Funding

WVDEP conducted its projects with support (\$1.8 million) from the U.S. Office of Surface Mining (OSM) and the Natural Resources Conservation Service. FODC conducted its projects with support from CWA section 319 funds (\$613,000), OSM's Watershed Cooperative Agreement Program (\$463,000) and an EPA Brownfield Assessment Grant (\$74,000).

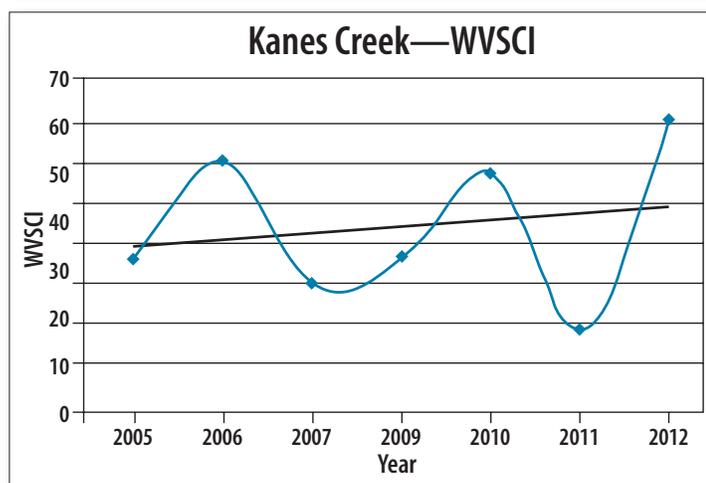
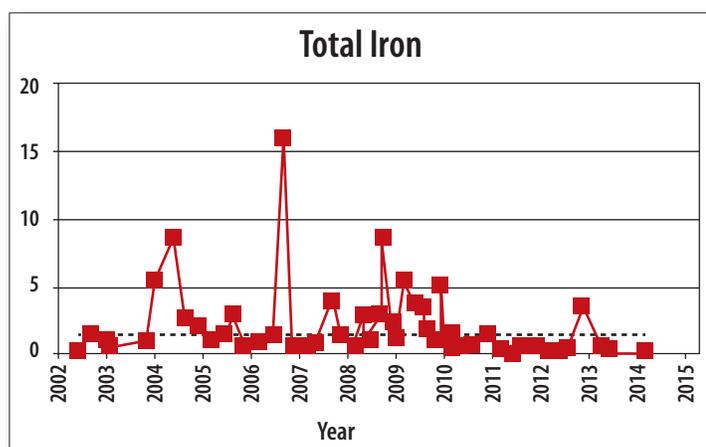
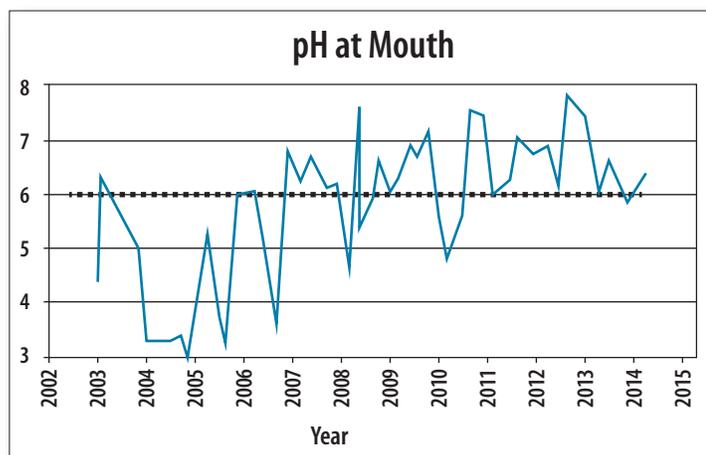


Figure 2. Trends in pH (top), iron (middle) and the WVSCI (bottom) index over time show improvements. Dotted lines in the pH (6) and iron (1.5 mg/L) plots indicate state criteria for those parameters.



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