



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Virginia

Re-Mining and Reclaiming Abandoned Mine Lands Improves Water Quality in Black Creek

Waterbody Improved

Acidic drainage from disturbed lands and abandoned coal mines led to the impairment of Black Creek in southwestern Virginia. In 1998 the Virginia Department of Environmental Quality (DEQ) added Black Creek to the state's Clean Water Act (CWA) section 303(d) list of impaired waters for not supporting aquatic life use. A total maximum daily load (TMDL) was developed in 2002, and watershed stakeholders implemented mined-land best management practices to address exceedances in total manganese (TMn) and total dissolved solids (TDS). Monitoring results show improvements in the biological health of Black Creek, indicating that restoration efforts have made significant progress toward meeting water quality standards.

Problem

The Black Creek watershed (Figure 1) is in Wise County, Virginia, just west of the town of Norton. Black Creek flows into the Powell River, which is part of the Upper Tennessee River Drainage Basin, and eventually drains into the Mississippi River and the Gulf of Mexico. Over the past century, coal processing wastes generated at preparation plants (facilities that wash soil and rock from the coal to prepare it for transport) and coal-loading sites were often disposed of in nearby hollows or creeks, contributing sediment and dissolved minerals into waterbodies like Black Creek.

Before the Surface Mining Control and Reclamation Act of 1977 was in effect, miners commonly practiced "shoot-and-shove" mining in steeply sloped areas—blasting the soil and strata overlying the coal and pushing it downhill. That practice created the characteristic highwall-bench-outslope terrain that is still visible in Virginia's coalfield counties. Such outslope spoils are generally unstable and contain pollutants that can impair coalfield-area streams like Black Creek.

Data collected in the mid-1990s indicate that Black Creek did not support aquatic life, prompting DEQ to add a 5.98-mile segment of the creek to Virginia's CWA section 303(d) list in 1998. A 2002 TMDL study determined that the specific chemical stressors causing benthic impairment were TMn and TDS, two stressors that originate from acid mine drainage from abandoned underground mines and deep-mine cavities. As a result, the load allocation for TMn in the Black Creek TMDL was set at 1,599 kilograms/year. A TMDL was not developed for TDS. The water quality goal identified for Black Creek includes



Figure 1. Virginia's Black Creek watershed has been mined for more than 100 years.

reclaiming abandoned sites and achieving pollution load reduction in the impaired segment.

Project Highlights

Reclaiming abandoned mine lands is costly. Virginia's mining regulatory agency, the Department of Mines, Minerals, and Energy's Division of Mined Land Reclamation (DMME-DMLR), considers re-mining an appropriate approach to reclaiming abandoned mine lands. In re-mining, coal companies obtain the appropriate permits and then re-disturb lands that were previously mined, remove remaining coal, eliminate existing environmental problems, and reclaim the land to current standards.

In 1996 Virginia DMME-DMLR issued a mining permit to the Red River Coal Company to begin re-mining operations in Black Creek watershed. In 2002 DMME-DMLR approved the Red River Coal



Figure 2. Red River Coal Company revegetated and regraded mined areas to reduce erosion and restore original contours on mined areas.

Company's re-mining and reclamation plan, which directly addresses TMn and TDS, the two stressors listed in the Black Creek TMDL. Red River Coal Company has completed 75 percent of its re-mining and reclamation plan, restoring approximately 300 acres of abandoned mine lands. As outlined in the plan, Red River Coal Company is implement-

ing the following mined-land best management practices:

1. Revegetating mined areas to control water infiltration and erosion
2. Regrading to restore original contours on mined areas (Figure 2)
3. Constructing wetlands
4. Installing sediment ponds to collect drainage from disturbed areas and provide stormwater retention and sedimentation
5. Restoring riparian areas along stream segments
6. Constructing diversion ditches to restore drainage patterns and direct water away from outcrops and areas where erosion and mineral-leaching potentials are high
7. Installing infiltration channels (shallow, excavated trenches backfilled with coarse gravel and covered with soil and grass) to slow stormwater runoff
8. Daylighting with resource recovery, in which deep-mined coal seams are exposed by surface mining so that the remaining coal can be recovered, thus eliminating existing pollutant discharge

In addition, DMME-DMLR secured grant funding to install additional restoration projects in Black Creek, including a wetland area enhancement project (2001) and five habitat improvement structures (2006).

Results

Chemical water monitoring, performed routinely by the Red River Coal Company, shows marked improvement in water quality of Black Creek. DMME-DMLR also collects biological assessment

data, which show increases in the taxa richness (total number of different kinds of organisms), EPT richness (total number of taxa within the "pollution sensitive" orders Ephemeroptera, Plecoptera, and Trichoptera), the percent Ephemeroptera, and percent "Scrapers" (Plecoptera and Trichoptera). Among those metrics, higher values indicate an increase in water quality. Additionally, both the Virginia Stream Condition Index (VSCI) and habitat score of Black Creek increased between 2001 and 2009, indicating an increase in water quality (Table 1).

Table 1. Virginia Stream Condition Index (VSCI) metrics for aquatic health in Black Creek

	Taxa richness	EPT richness	% Ephemeroptera	% Scrapers	% Chironomidae	VSCI (impairment threshold = 60)	Habitat score (maximum = 200)
1995	4	3	2.3	0	81.6	39	80
2001	8	3	0	0	0	36	160
2009	18	5	0.92	4.13	12.84	49	181

While most aquatic life metrics indicate water quality improvements, some issues remain. For example, Table 1 shows fluctuations in the percent Chironomidae index—it dropped from 81.6 in 1995 to zero in 2001, but crept back up to 12.84 in 2009. This index represents the presence of pollutant-tolerant organisms; therefore, index values tend to increase as water quality get worse. After the Black Creek re-mining and reclamation plan is fully implemented, DMME-DMLR and DEQ will reassess the impairment status of the stream to determine if Black Creek can be removed from Virginia's CWA section 303(d) list.

Partners and Funding

Red River Coal Company is the Virginia-based coal company that is re-mining the Black Creek watershed. Virginia DMME-DMLR contributed to the development of the Black Creek TMDL and oversees biological monitoring within the watershed. DEQ has also been involved in assessing the impairment status of Black Creek. Supplemental DMME-DMLR projects in the watershed were supported by grants from the National Fish and Wildlife Foundation (for the habitat improvement structures) and by EPA CWA section 319 and the U.S. Office of Surface Mining Reclamation and Enforcement Clean Streams Initiative (for the wetland enhancement project).



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