



## Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

# Virginia

## Implementing Management Practices Reduces Nitrate in Virginia's Muddy Creek

### Waterbody Improved

Nutrients from agriculture and failing septic systems contributed to violations of the nitrate-nitrogen drinking water use water quality standard in Virginia's Muddy Creek. As a result, the Virginia Department of Environmental Quality (DEQ) added a 2.17-mile segment of the creek to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 1998. Project partners worked with landowners to implement numerous residential and agricultural best management practices (BMPs), which over time brought nitrogen levels in the creek into compliance with the water quality standards. As a result, VA DEQ removed this segment of Muddy Creek from the state's list of impaired waters for nitrate-nitrogen in 2010.

### Problem

Muddy Creek is in Rockingham County, approximately 15 miles northwest of Harrisonburg, Virginia (Figure 1). Muddy Creek drains into Lower Dry River, a headwater tributary of the South Fork of the Shenandoah River in the Chesapeake Bay watershed. Land uses in the 20,025-acre watershed are predominantly agriculture and forestry.

Lower Muddy Creek is designated for public drinking water use because it is less than 5 miles upstream of the water treatment plant intakes for two local municipalities. DEQ added the lower 2.17 miles of Muddy Creek to the state's 1998 CWA section 303(d) list of impaired waters for violating the state's water quality standard for nitrate-nitrogen. The creek was listed again in 2004 based on monitoring that showed that three of 53 samples violated the public drinking water use water quality standard, 10 milligrams per liter (mg/L) nitrate-nitrogen. The creek was also listed as impaired for nitrate-nitrogen during the 2006 and 2008 assessment cycles. In 1996 all of Muddy Creek (a 10.36-mile-long segment extending from the headwaters to its confluence with Dry River) had been listed as impaired for violating bacteria water quality standards for recreation and for failing to support its aquatic life designated use.

In 2000 DEQ completed a total maximum daily load (TMDL) study for nitrate in Muddy Creek. The TMDL identified the load reductions that would be necessary for the creek to comply with water quality standards. The study identified the key sources of nitrogen as failing septic systems, straight pipes, and runoff from pasture and cropland areas.

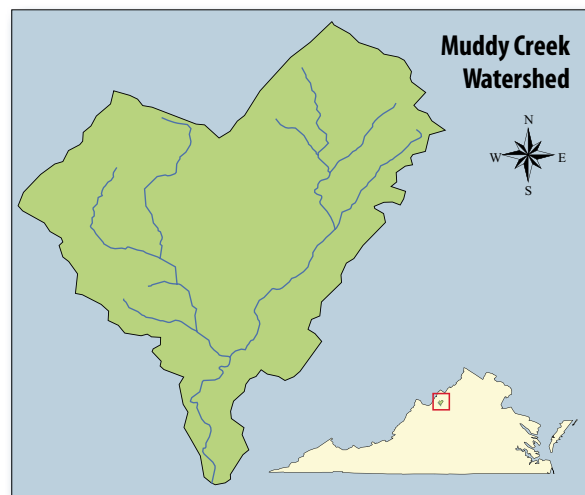


Figure 1. Muddy Creek is in northwestern Virginia.

### Project Highlights

In 2001 the Virginia Department of Conservation and Recreation (DCR) completed a TMDL implementation plan with the help of local landowners and watershed partners. After more than an estimated 1,100 hours of community input and assistance, DCR released a plan that outlined the BMPs that would be needed to achieve the TMDL, along with associated costs and a project timeline. Following completion of this plan, DCR provided the Shenandoah Valley Soil and Water Conservation District (SVSWCD) with CWA section 319 grant funds to help watershed landowners implement the recommended BMPs.

In the early 2000s, SVSWCD staff worked with property owners to implement BMPs, including installing



Figure 2. Livestock exclusion fencing was voluntarily implemented in the Muddy Creek watershed.

5,514 feet of livestock exclusion fencing, planting 14 acres of riparian buffers, establishing permanent vegetative cover on 108 acres of cropland, establishing no-till forage production on 26 acres and cover crops on 4,030 acres, and building 14 animal waste control facilities and eight loafing lot management systems. SVSWVD staff also worked with homeowners to pump out 41 septic systems and repair or replace 18 systems (four of which were replaced with alternative waste treatment systems).

The Shenandoah Resource Conservation and Development Council (RC&D) developed a flexible fencing program using private, non-government grant funds to assist farmers (including those within the Muddy Creek watershed) with streamside livestock exclusion fencing (Figure 2).

Numerous farmers worked with DCR staff to develop and implement nutrient management plans on more than 3,200 acres. Many of the farmers also worked with DCR to conduct pre-sidedress soil nitrate testing in cornfields, which determines whether the soil has adequate nitrogen for the growing season. DCR estimates that this testing allowed farmers to reduce nitrogen inputs on 200 acres of farmland in Muddy Creek. Efforts are currently under way to further increase precision in nitrogen application on corn through a cornstalk nitrogen testing program.

## Results

DEQ monitors Virginia's impaired streams through the agency's ambient monitoring program. Between 2003 and 2006, data showed no violations (out of 31 samples) of the nitrate-nitrogen standard. Beginning in 2007, DEQ transitioned from monitoring nitrate-nitrogen as a single parameter to monitoring nitrate + nitrite nitrogen (combined) because of budgetary constraints. During 2007–2008, the combined nitrate + nitrite nitrogen monitoring data showed no violations of 15 samples (Figure 3). Based on these data, DEQ removed the 2.17-mile-long segment of Muddy Creek from the state's 2010 list of impaired waters for its nitrate-nitrogen impairment. The creek remains listed as impaired for bacteria and aquatic life use non-support.

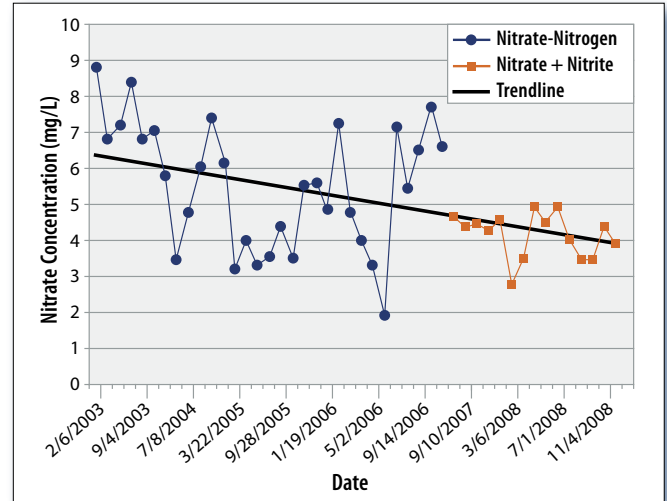


Figure 3. Average nitrate levels in Muddy Creek have steadily declined and have consistently met water quality standards (10 mg/L nitrate-nitrogen) since 2003.

## Partners and Funding

The success of this conservation initiative in the Muddy Creek watershed was largely attributed to partnerships between the local community and the conservation organizations that serve the watershed. Key partners include SVSWCD, DCR, DEQ, Shenandoah RC&D, Virginia Cooperative Extension, Rockingham County Farm Bureau, the Virginia Department of Health, and the Natural Resources Conservation Service (NRCS). These partners hosted farm tours, developed and distributed outreach materials promoting agricultural and residential BMPs, and provided technical assistance to anyone in the watershed wanting to implement conservation practices. In addition, the watershed's Old Order Mennonite community played a significant role in the success by voluntarily implementing BMPs.

Between 2001 and 2008, U.S. Environmental Protection Agency CWA section 319 funds supported two full-time SVSWCD staff positions to provide technical assistance for installing agricultural and residential BMPs. As a result, the SVSWCD administered \$286,965 in CWA section 319 funds for agricultural BMPs and \$55,855 for residential BMPs within the watershed. Virginia's Agricultural Cost Share Program provided \$472,405 between 2000 and 2011 for agricultural BMP implementation in the watershed. Cost share funds were also provided through the NRCS Conservation Reserve Enhancement Program and Environmental Quality Incentives Program.



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