



NONPOINT SOURCE SUCCESS STORY

Virginia

Implementing Agricultural Best Management Practices Reduces Bacteria Levels in the Cub Creek Watershed

Waterbodies Improved

Nonpoint source runoff from residential and agricultural land uses, livestock, and wildlife led to high counts of bacteria in Virginia's Cub Creek. Two segments failed to attain their primary contact recreation designated use due to violations of the state's water quality standard for bacteria. As a result, the Virginia Department of Environmental Quality (DEQ) added two segments of Cub Creek to Virginia's Clean Water Act (CWA) section 303(d) list in 2006 and 2008, respectively, for *Escherichia coli* bacteria. Landowners implemented agricultural best management practices (BMPs) in the Cub Creek watershed, which significantly reduced bacterial loadings and allowed the creek to meet water quality standards and support its recreation designated use. As a result, DEQ removed the two segments of Cub Creek (14.07 miles total) from Virginia's 2012 list of impaired waters for *E. coli* bacteria.

Problem

The Cub Creek watershed drains portions of Appomattox and Charlotte counties in south-central Virginia. Cub Creek empties into the Roanoke River (referred to locally as the Staunton River). The Cub Creek watershed area draining to the impaired segments consists of approximately 95,332 acres, primarily comprised of forested land (70 percent) and agricultural land (24 percent). Bacteria loadings from livestock, human sources (septic systems), agricultural and urban land uses, and wildlife led to high bacteria counts in Cub Creek.

DEQ collected water quality samples on Cub Creek in 2003 and 2004. Approximately 24 percent of samples had *E. coli* bacteria levels that exceeded 235 colony-forming units per 100 milliliters (cfu/100 mL). These results violated the state *E. coli* single sample maximum bacteria criterion, which requires that no more than 10 percent of samples (based on a minimum of 12 samples) have *E. coli* levels exceeding 235 cfu/100 mL. As a result, DEQ added two segments of Cub Creek to Virginia's CWA section 303(d) list of impaired waters for *E. coli* bacteria—an 8.35-mile segment (VAC-L37R_CUB01A00) in 2006 and a 5.72-mile segment (VAC-L37R_CUB01B08) in 2008 (Figure 1). In 2006 DEQ developed a bacteria total maximum daily load (TMDL) for this watershed.

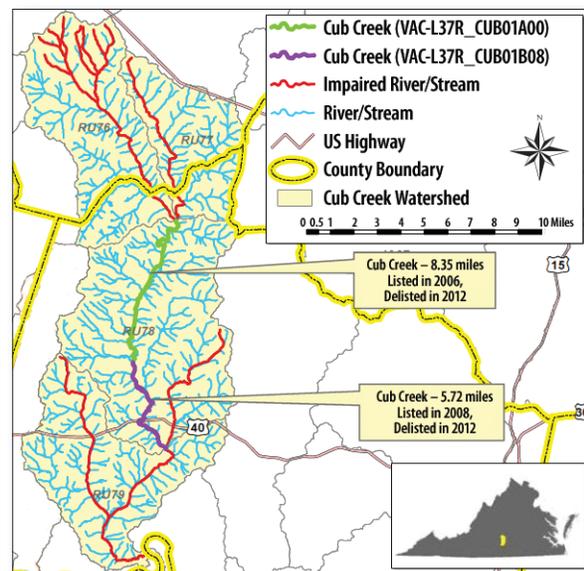


Figure 1. Two segments in Virginia's Cub Creek were delisted as impaired for bacteria.

(VAC-L37R_CUB01B08) in 2008 (Figure 1). In 2006 DEQ developed a bacteria total maximum daily load (TMDL) for this watershed.



Figure 2. Installing livestock exclusion fencing and adding alternative water sources helped to reduce bacteria loadings in the stream.

Project Highlights

After the Cub Creek bacteria TMDL was developed, watershed stakeholders (i.e., state and local government, conservation organizations, and landowners) developed and began carrying out a structured TMDL implementation plan. Through these combined efforts, landowners installed numerous BMPs

between 2006 and 2013, including 71,948 linear feet (13.6 miles) of livestock exclusion fencing with grazing management (Figure 2), 62 acres of reforestation of erodible crop and pasture lands, 57 acres of continuous no-till, 35 acres of permanent vegetative cover on cropland, 21 acres of small-grain cover crop, 1,330 linear feet of stream protection and one loafing lot management system.

State and local government agencies conducted a combination of outreach activities for landowners and farmers to encourage them to implement agricultural BMPs. Outreach efforts included farm tours, personal communications, publication of articles in local newspapers, and distribution of TMDL brochures explaining eligible BMPs and their benefits for Cub Creek watershed stakeholders.

Results

Data calculations from the Virginia Department of Conservation and Recreation (DCR) BMP Tracking Database indicated that installing BMPs in the watershed significantly reduced nonpoint source pollutant loadings, including bacteria. DEQ collected 15 samples on Cub Creek during 2009 and 2010. Of those, only one sample (6.7 percent of all samples collected) exceeded 235 cfu/100 mL *E. coli*—meeting the state's bacteria water quality standard (Figure 3). As a result, DEQ removed the two Cub Creek segments (14.07 miles total) from the state's list of impaired waters for bacteria in 2012. Both segments now support their primary contact recreation designated use.

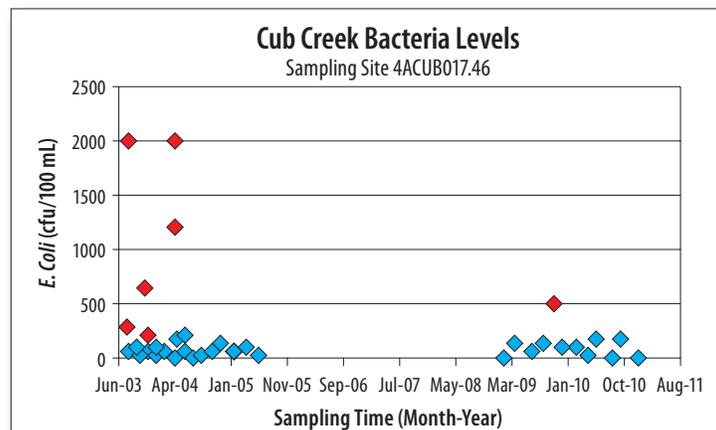


Figure 3. Water quality data show that violations of the 235 cfu/100 mL *E. coli* bacteria water quality criterion (denoted by red dots) declined significantly after farmers installed BMPs.

Partners and Funding

The water quality improvement in Cub Creek has largely been the result of partnerships between the Southside and Robert E. Lee soil and water conservation districts (SWCDs) and several federal and state agencies, including the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), DCR, DEQ, the Virginia Department of Health and the Virginia Cooperative Extension Service. The TMDL implementation project, administered by the Southside and Robert E. Lee SWCDs, included agricultural cost-share funding, technical assistance for landowners and outreach activities. To offset the costs of implementing BMPs, farmers received \$7,243 in NRCS Environmental Quality Incentive Program funds and a combined \$484,598 from the Virginia Water Quality Incentive Fund and the Virginia Natural Resources Commitment Fund. The state of Virginia also provided \$36,619 in the form of tax credits issued to farmers implementing BMPs. SWCD staff provided significant technical assistance to farmers over the 5-year project period. Most of the staff time was supported through DCR with approximately \$125,000 from Virginia's General Fund (\$25,000 per year for 5 years). Some CWA section 319 funds supported DCR staff time as they provided project oversight and guidance for TMDL implementation. DEQ provided water quality monitoring support.



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