NONPOINT SOURCE SUCCESS STORY

Virginia

Agricultural Best Management Practices Reduce Bacteria Transport in the Little Cub Creek Watershed

Waterbody Improved

Nonpoint source runoff from agricultural and residential land uses, livestock and wildlife led to increased bacteria loading in Virginia's Little Cub Creek. A 9.21-mile-long segment failed to attain the 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) placed the segment of Little Cub Creek on Virginia's 2006 Clean Water Act (CWA) section 303(d) list of impaired waters for *Escherichia coli* bacteria. Landowners implemented agricultural best management practices (BMPs) in the Little Cub Creek watershed and its upstream areas, which significantly reduced bacterial loadings and allowed the impaired segment to meet water quality standards and support its recreation designated use. As a result, DEQ removed the Little Cub Creek segment (9.21 miles) from the state's impaired waters list in 2016.

Problem

Little Cub Creek flows into Cub Creek, which drains portions of Appomattox and Charlotte counties in south-central Virginia. Cub Creek ultimately empties into the Roanoke River (referred to as the Staunton River locally). The two primary land uses in the 95,332-acre Cub Creek watershed include forested land (70 percent) and agricultural land (24 percent). The remaining 6 percent of land uses include open water and residential and open lands.

DEQ collected water quality data on Little Cub Creek during the 2000–2004 assessment period. Out of 12 samples total, four samples (33 percent) had *E. coli* 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 placed a 9.21-mile-long segment of Little Cub Creek (VAW-L37R_LUB1A06) on Virginia's 2006 CWA section 303(d) List of Impaired Waters for *E. coli* bacteria (Figure 1). A total maximum daily load (TMDL) developed in 2006 identified livestock, human (failing septic systems), pet, agricultural and urban land uses, and wildlife as primary sources contributing to bacteria loadings in the watershed.

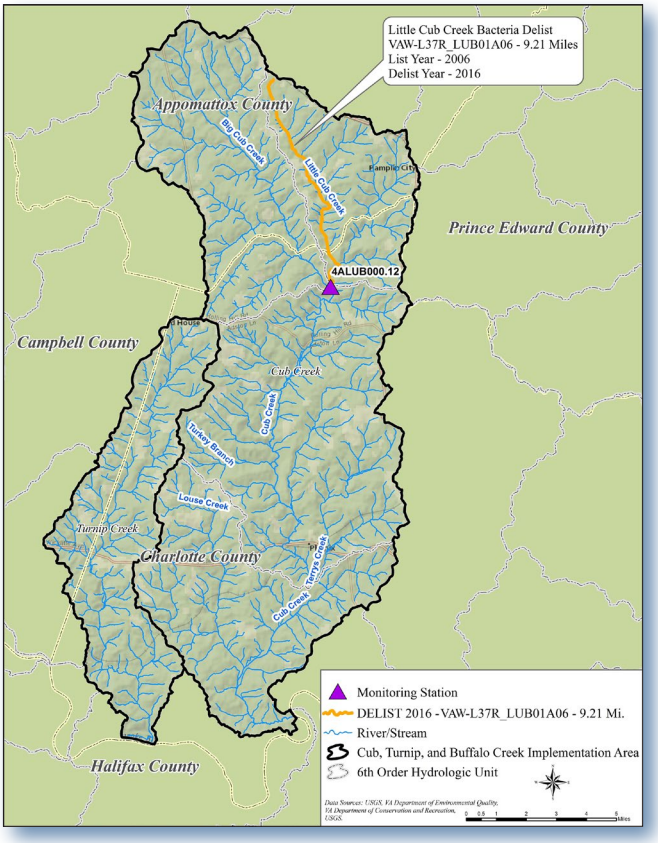

Figure 1. Delisted segment and bacteria monitoring station in the Little Cub Creek watershed.

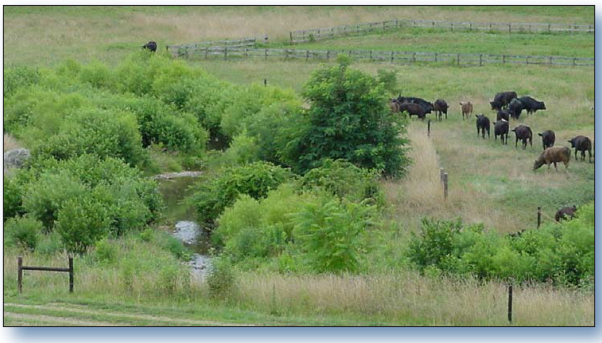

Photo: Robert E. Lee SWCD

Figure 2. Stream fencing reduced bacteria loading.

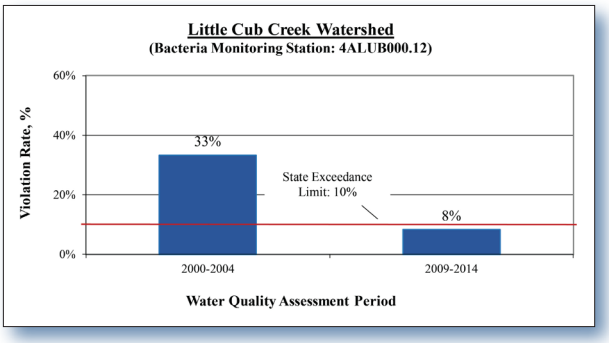

Figure 3. Bacteria violation rates declined in the creek.

Story Highlights

In 2009, Virginia Department of Conservation and Recreation (DCR) developed an implementation plan for the Cub Creek watershed with the support of local stakeholders and state agencies. BMP implementation projects started soon after. State and local government agencies conducted outreach activities with landowners and farmers to enhance water quality awareness and 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, cost-share programs and their benefits for watershed stakeholders.

Through these combined efforts, landowners installed numerous BMPs in the watershed. Approximately 53,340 linear feet (10 miles) of stream exclusion fencing with grazing management and riparian buffers were installed, which prevented 240 beef cattle from accessing the water (Figure 2). Other BMPs added in 2005–2014 include 47 acres of afforestation of crop, hay and pasture lands; 25 acres of long-term continuous no-till plantings; 35 acres of long-term vegetative cover on cropland; and 32 acres of continuous high-residue, minimal-soil-disturbance tillage practices. One loafing lot management system was installed to reduce bacteria transport in surface runoff.

Results

DEQ's monitoring staff collected 12 water samples on Little Cub Creek during the 2009–2014 assessment period. Of those, only one sample (8 percent) exceeded 235 cfu/100 mL *E. coli*—meeting the state's bacteria water quality standard (Figure 3) and fully supporting its primary contact recreation designated use. As a result, DEQ removed the impaired segment (9.21 miles) from the 2016 CWA sections 305(b)/303(d) Water Quality Assessment Integrated Report.

Partners and Funding

Water quality improvements are largely due to 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, DCR, DEQ, 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 $400,215 in cost-share funds from the Virginia Water Quality Improvement Fund (WQIF) for the Virginia Agricultural Cost-Share Program ($170,873), and from WQIF for the Southern Rivers Targeted TMDL Program ($229,342) for BMP installation. Farmers and other entities contributed $118,896 for BMP installation. The SWCD staff provided significant staff time and assistance to farmers over the implementation project period. Most of the SWCD technical assistance funding was provided by DCR; each SWCD received approximately $125,000 from Virginia's WQIF ($25,000 per year for 5 years) to administer the targeted TMDL program. Each SWCD also received state general funds to help administer cost-share programs (about $75,000/year per SWCD). CWA section 319 funds supported DCR and DEQ staff time to oversee the TMDL project and provide implementation guidance ($10,000/year for 5 years). DEQ also supported water quality monitoring.

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