



NONPOINT SOURCE SUCCESS STORY

Virginia

Adding Best Management Practices Reduces Bacteria in Deep Creek

Waterbody Improved

Bacteria from nonpoint sources of pollution, including livestock, pets, humans and wildlife, impaired several waterbodies within Virginia's Deep Creek watershed. The Virginia Department of Environmental Quality (DEQ) added an 11.55-mile-long segment of Deep Creek to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 2002 for a bacteria impairment. State and federal agencies collaborated with watershed stakeholders to implement agricultural best management practices (BMPs) to reduce nonpoint source pollutant loadings. Water quality monitoring data show a decreasing trend in bacteria violation rates in Deep Creek, resulting in the removal of the impaired segment from the state's impaired waters list in the 2016 CWA Sections 305(b)/303(d) Water Quality Assessment Integrated Report.

Problem

Virginia's Deep Creek watershed drains portions of Nottoway and Amelia counties in the Appomattox River Basin. The 117,914 acre (ac) watershed includes woodland as the primary land use (68%), followed by pastureland (21%), barren land (4%), wetland (3%), cropland (3%), and residential and commercial land (1%).

The water quality in Deep Creek was monitored at Station 2-DPC005.20 under Virginia DEQ's ambient and total maximum daily load (TMDL) monitoring program. From 1995 to 2000, 10 of 29 samples collected (34%) violated bacteria instantaneous water quality standards (WQS) and failed to meet state's bacteria-based WQS for its designated recreation (swimming) use. Consequently, a segment of Deep Creek (VAP-J11R_DPC01B00) was placed on Virginia's 2002 CWA section 303(d) list of impaired waters. The impaired segment begins at the confluence with Spindlers Run and continues downstream to the confluence with Beaverpond Creek (Figure 1).

In mid-2003, the state changed its bacteria WQS to one based on *Escherichia coli* bacteria. The new WQS required that samples not violate the single sample maximum value of 235 colony-forming units (cfu) per 100 milliliters (mL) of water more than 10% of the time, based on a minimum of 12 samples collected monthly or bimonthly. If a minimum of four weekly samples are collected within any calendar month, a geometric mean must not exceed 126 cfu/100 mL.

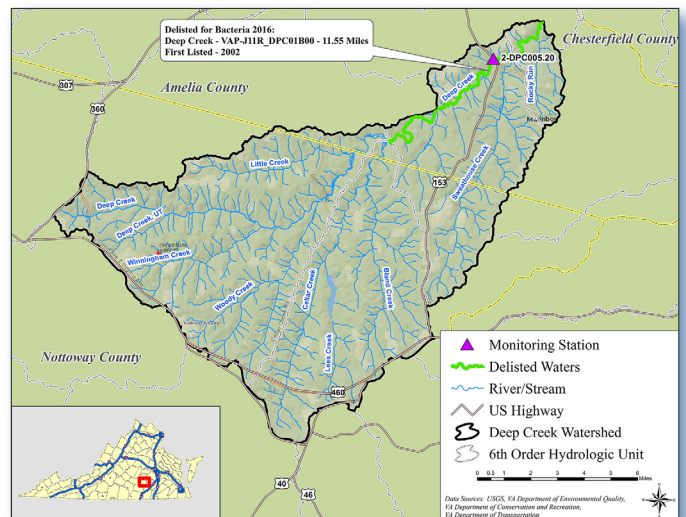


Figure 1. The impaired segment and monitoring station are on lower Deep Creek in southern Virginia.

In 2004, DEQ completed a bacteria TMDL study for impaired streams of Deep Creek in conjunction with other impaired segments of the nearby Flat, Nibbs and West creeks in the Appomattox River watershed. The study identified a number of nonpoint sources of bacteria, including grazing livestock, wildlife, pets, and failing septic systems and uncontrolled discharges (e.g., straight pipes). The TMDL stated that bacteria loads from nonpoint source categories—livestock, humans, pets, and wildlife—need to be reduced significantly to meet the TMDL load allocation and attain WQS in Deep Creek watershed.

Story Highlights

In 2002 Virginia's Department of Conservation and Recreation (DCR) and the Piedmont Soil and Water Conservation District (PSWCD), along with other stakeholders, initiated water quality improvement efforts in the Deep Creek watershed. In coordination with other state agencies, DEQ developed a TMDL implementation plan in 2008 and quantified the control measures necessary to achieve water quality goals.

In 2002–2014, landowners installed various agricultural BMPs, including 25 miles of stream exclusion fencing; 3,926 ac of harvestable cover crops; 1,603 ac of small grain and mixed cover crops; 1,583 ac of legume-based cover crops; and 176 ac of continuous no-till forage production. Project partners also installed two animal waste control facilities and established 138 ac of forest on former cropland, hayland and pastureland. The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) worked with landowners to install approximately 167 ac of woodland buffer through its Conservation Reserve Enhancement Program (CREP), a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, water and wildlife habitat (Figure 2).

PSWCD and the NRCS conducted numerous field visits and watershed tours to promote agricultural BMP implementation and water quality improvement programs. These agencies coordinated outreach activities to farmers and other residents and organized group meetings to update the community about the water quality status of waterbodies in the watershed. The efforts resulted in a significant increase in agricultural BMP implementation in the Deep Creek and adjoining watersheds.

Results

Implementing agricultural BMPs has resulted in a continual decline in pollutant levels in Deep Creek. The *E. coli* bacteria data collected at monitoring station 2-DPC005.20 shows a decreasing trend in bacteria exceedance rates. In the 2007–2012 assessment period, 12 out of 82 samples (15%) exceeded *E. coli* WQS, and in 2009–2014 assessment period, 11 out of 113 samples (less than 10%) exceeded *E. coli* WQS (Figure 3). These exceedance rates are significantly lower than the 34% found during 1995–2000 period. As a result, in 2016 DEQ removed an 11.55-mile-long segment of Deep Creek from the list of impaired waters.



Photo: PSWCD

Figure 2. This stream crossing prevents cows from accessing the creek.

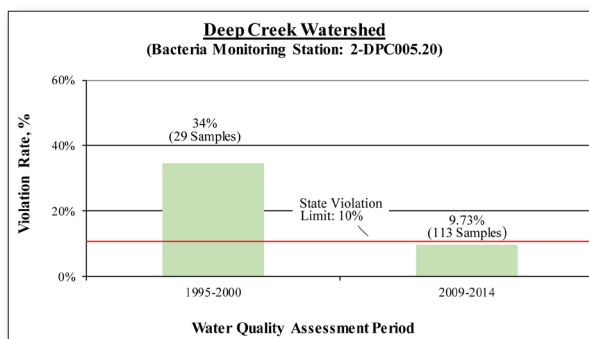


Figure 3. Bacteria violation rates in Deep Creek before and after project implementation.

Partners and Funding

Project success has been the result of partnerships between the PSWCD, DCR, DEQ, Virginia Cooperative Extension, Amelia and Nottoway county governments, and NRCS. The PSWCD led community outreach and administered the implementation program.

The BMPs were installed using multiple funding sources (totaling \$2,096,736): state of Virginia agricultural cost-share (VACS) funds, including the Water Quality Improvement Fund (\$485,647), contribution to NRCS CREP fund (\$88,814), the Targeted TMDL fund (\$215,321), tax credits (\$76,665), and contributions from farmers and others (\$1,230,289). DCR also provided about \$180,000 to administer the projects and the Virginia General Assembly provided about \$200,000 for project support. CWA section 319(h) funded about 5% of staff and technical assistance, in conjunction with the adjoining Flat, Nibbs, and West creek watersheds.



U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-20-001F
February 2020

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