NONPOINT SOURCE SUCCESS STORY

Virginia

Best Management Practices Reduced Pollutant Transport in Deep Creek

Waterbody Improved

Nonpoint sources of bacteria, including livestock, pets, humans, and wildlife, impaired two waterbodies of Virginia's Deep Creek watershed. The Virginia Department of Environmental Quality (DEQ) added a 5.67-mile segment in 2010 and an 11.55-mile segment of Deep Creek to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 2010 and 2018, respectively, for a bacteria impairment. Federal and state agencies collaborated with watershed stakeholders for nearly a decade and implemented agricultural best management practices (BMPs) to reduce nonpoint source pollutant loadings. Water quality monitoring data show a decreasing trend in bacteria exceedances in Deep Creek, resulting in the removal of both impaired segments from the state's impaired waters list in CWA Sections 305(b)/303(d) Water Quality Assessment Integrated Reports of 2016 and 2020, respectively.

Problem

The Deep Creek watershed (VAP-J11R-01) is part of the Appomattox River basin (U.S. Geological Survey Hydrologic Unit Code 02080207). The watershed, located in Nottoway and Amelia counties, Virginia, consists of approximately 117,914 acres, with woodland as the primary land use (68%), followed by pasture (21%), barren (4%), wetland (3%), cropland (3%), and residential and commercial (1%) land uses.

The water quality of both segments of Deep Creek was monitored at multiple stations under DEQ's ambient and total maximum daily load (TMDL) monitoring program. The water quality standard (WQS) requires that samples not exceed 235 colony-forming units (cfu) per 100 milliliters (mL) of water for more than 10% of the time, based on a minimum of 12 samples collected monthly or bimonthly. In addition, if a minimum of four weekly samples are collected within any calendar month, a geometric mean must not exceed 126 cfu/100 mL.

One of the impaired segments (VAP-J11R_DPC02A00) flows 5.67 miles between Deep Creek's confluences with Winningham Creek and Little Creek (Figure 1). Two of 12 samples (17%) collected during the 2010 assessment period exceeded bacteria instantaneous WQS for its designated recreation use. As a result, the segment was placed on Virginia's 2010 CWA section 303(d) list of impaired waters.

In 2004, DEQ completed a bacteria TMDL study for the impaired segments 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 in the watershed including livestock, wildlife, pets, failing septic systems, and uncontrolled discharges (e.g., straight pipes).

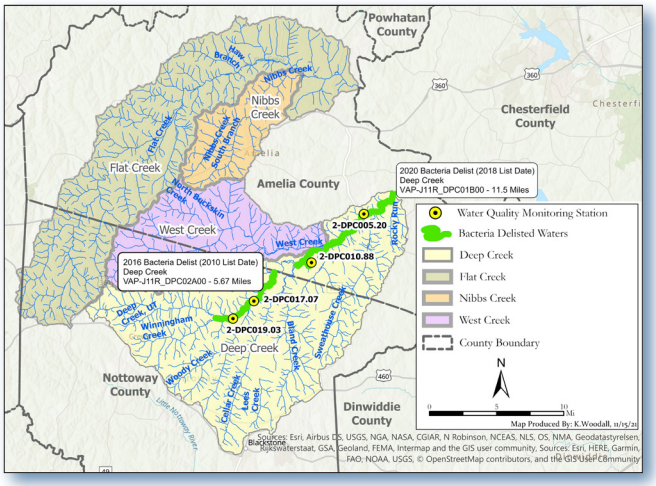

Figure 1. Deep Creek is in south-central Virginia.

An 11.54-mile impaired segment (VAP-J11R_DPC01B00) between Deep Creek's confluences with Spindlers Run and Beaverpond Creek (Figure 1) was originally listed on the 303(d) list for a bacteria impairment in 2002, but became fully supporting in the 2016 assessment period following BMP implementation in the watershed (see the previously published NPS Success Story titled "Adding Best Management Practices Reduces Bacteria in Deep Creek," which

Photo courtesy of PSWCD

Figure 2. Livestock exclusion stream fencing installed in Deep Creek watershed.

features this segment). However, samples collected in 2018 showed that three of 12 samples (25%) failed to meet the state's bacteria-based WQS for its designated recreation use. Consequently, the segment was placed back on Virginia's 2018 CWA section 303(d) list of impaired waters. This highlights the difficulty of addressing NPS pollution, and the need for program consistency in monitoring and adapting to changing conditions.

Story Highlights

BMPs in Deep Creek watershed have been implemented since 2002, with joint efforts among Virginia's Department of Conservation and Recreation (DCR), the Piedmont Soil and Water Conservation District (PSWCD) and other local and government agencies and stakeholders. DEQ, in coordination with other state agencies, developed a TMDL implementation plan in 2008 and quantified various control measures required to attain water quality goals.

From 2008 to 2018, various agricultural and residential BMPs were installed in Deep Creek watershed, including nine residential septic projects; 2,372 acres of harvestable cover crops; 2,300 acres of small grain and mixed cover crops; 1,466 acres of legume-based cover crops; 176 acres of continuous no-till forage production; 3,410 feet of stream protection; 1,121 acres of nutrient management; 92 acres of afforestation of farmland; and 14 miles of stream exclusion fencing and the addition of alternative water sources that prevented approximately 802 livestock from accessing the creek (Figure 2). The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) worked with landowners to complete 2,470 feet of stream fencing maintenance and approximately 29 acres of woodland buffer through its Conservation Reserve Enhancement Program (CREP), a voluntary land improvement program that helps agricultural producers protect environmentally sensitive land, waters, and wildlife habitat.

PSWCD and NRCS staff conducted individual visits with farmers and hosted watershed tours to promote BMP implementations and water quality improvement programs. The agencies coordinated outreach activities including field days for farmers and community meetings for residents to educate the community about the water quality status of various waterbodies and benefits of conservation programs in the watershed. The efforts resulted in a significant improvement in water quality of Deep Creek and adjoining watersheds.

Results

Implementation of these BMPs has resulted in a decline of bacteria loadings in both segments of Deep Creek. In the 5.67-mile segment (VAP-J11R_DPC02A00), *Escherichia coli* bacteria exceedance rates dropped from 17% in 2010 to 7% (4 of 60 samples) in 2016, below the 10% threshold level. In the 11.54-mile segment (VAP-J11R_DPC01B00), *E. coli* dropped from 25% in 2018 to 7% (4 of 58 samples) in 2020. This decline in bacteria rates allowed DEQ to remove the 5.67-mile segment from the impaired waters list in 2016 and the 11.54-mile segment in 2020.

Partners and Funding

Water quality improvement in Deep Creek has been the result of active cooperation of PSWCD, DCR, DEQ, Virginia Department of Health, Virginia Cooperative Extension, Amelia and Nottoway county governments, and NRCS. The PSWCD organized community outreach and administered BMP implementation projects. State-funded PSWCD staff work with stakeholders and landowners in the project area.

The BMPs were installed using multiple funding sources for a total BMP cost of $1,166,657, including Commonwealth of Virginia cost-share funds ($506,168), the state portion of NRCS CREP ($82,901), and private sources including landowner contributions ($570,388). In addition, the CWA section 319(h) grant program provided ($39,400) to fund BMPs projects and nonpoint source staff that managed the project and provided technical assistance, in conjunction with ongoing implementation projects in the adjoining Flat Creek, Nibbs Creek, and West Creek watersheds.

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