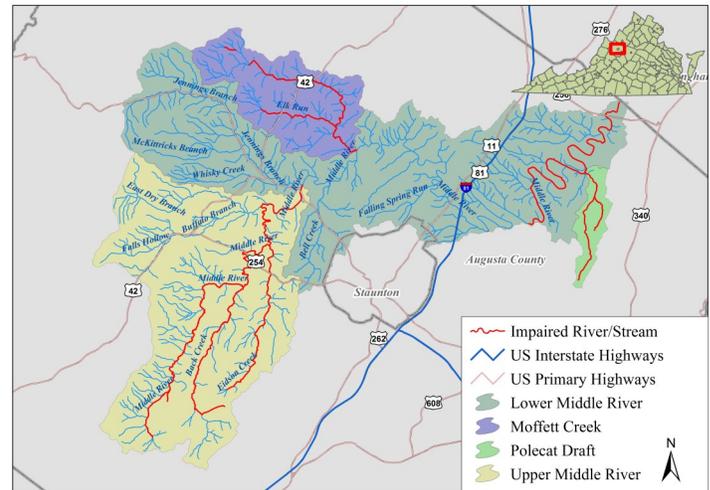


Project Location and Background

The Middle River, Jennings Branch, Moffett Creek, Polecat Draft and its tributaries, part of the Shenandoah River Basin are located in Augusta County, Virginia. Middle River and its tributaries were placed on Virginia’s Section 303(d) Total Maximum Daily Load Priority List and Report for exceeding the state’s water quality standard for bacteria and the General Standard (benthic). Bacteria TMDLs for all creeks and benthic TMDLS for Upper Middle River and Moffett Creek were completed in 2004. A TMDL implementation plan was completed in December 2009. An implementation project targeting agricultural activity was conducted by Headwaters Soil and Water Conservation District and other partners intermittently between July 2006 and June 2018.



Implementation Highlights

The Middle River TMDL implementation project was administered by the Headwaters Soil and Water Conservation District (HWSWCD). It was directed at agricultural BMP implementation, and HWSWCD worked with other partners including USDA-NRCS to meet agricultural BMP goals. Table 1 shows BMPs implemented since the project began in July 2006 and overall implementation goals for the project area. Of note, a total of 1,225 BMPs were installed including 137 livestock exclusion and stream protection practices that fenced livestock from over 62 miles of stream. An additional 10.5 miles of stream exclusion fencing was maintained, extending its life expectancy. During the project period, a tremendous amount of work was completed related to cover crops and vegetated cover. A total of 828 acres of permanent vegetative cover was installed on cropland and critical areas. Another 10,037 acres of cover crops were installed in small grains, legumes, and mixed crops, and 11,930 acres of harvestable cover crops were planted. A total of 19 animal waste control facilities were constructed, and three loafing lot management systems installed. Over 900 acres of buffers were installed or created, 5,536 acres of pasture was improved, and 65 acres of pasture was reforested.

Note that not all BMP goals included in the IP are shown in the table due to the extensive nature of the overall BMP list. (continued on page 2)

Table 1: Middle River BMP Summary: July 2006—June 2018

Control Measure	Units	Goal	Installed	%
Agricultural				
Stream Exclusion and Protection—Fencing (incl.	F	677,952	385,377	57
Stream Exclusion and Protection—Fencing (incl.	S	399	137	34
Improved Pasture	A	73,828	5,536	7
Buffer installed or created	A	962	903	94
Reforestation of Pasture	A	n/a	65	n/a
Permanent Vegetative Cover on Cropland and critical areas	A	35	828	2,366
Small Grain, Mixed and Legume Cover Crops	A	n/a	10,037	n/a
Animal Waste Control Facilities	S	49	19	39
Loafing Lot Management systems	S	n/a	3	n/a
Harvestable Cover Crop	A	n/a	11,930	n/a

A = Acres, F = Linear Feet, S = System; Note: BMP counts only include Federal (319) and state funding. Federally funded NRCS EQIP funded practices are not included.

MIDDLE RIVER WATERSHED

Implementation Highlights— Continued

HWSWCD established a Middle River partnership with support from the Chesapeake Bay Funders Network, which provided funding for technical assistance, outreach materials, and agricultural BMP cost-share. Through this partnership, HWSWCD explored innovative ways to address leased land and BMP implementation in specific subwatersheds. The partnership contracted with a local agronomist to work with producers on pasture management.

Table 2: Pollution Reductions for Middle River Watershed

Period	Pathogens (Coliform) (CFU)
July 2006-June 2018	1.46E+16

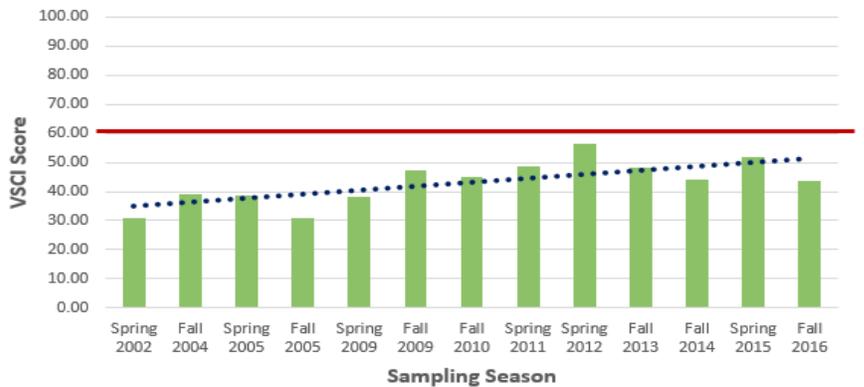
Water Quality Monitoring Results

Water quality data collected by DEQ for the period of 2002 through 2018 were analyzed to determine the impact of BMPs implemented in the project area on *E. coli* violation rates and aquatic life. Monitoring data for biological assessment were collected at station 1BMDL066.05 (Graph 1) of the Upper Middle River. DEQ utilized the Virginia Stream Condition Index (VSCI) to evaluate biological data. A waterbody with a score of 60 or above is considered to be supporting biological integrity and, therefore, is considered to be attaining the aquatic life designated use. The VSCI data shown are below the threshold value of 60 but do show an upward trend, possibly indicating improvements in benthic macroinvertebrate communities.

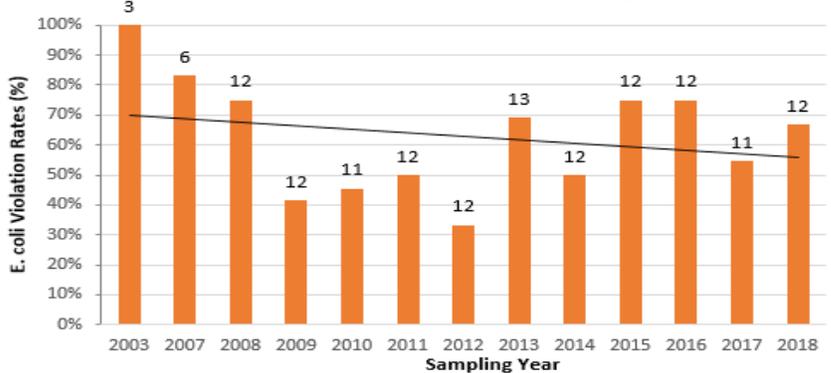
Graphs 3 and 4 show the percent bacteria violation rate for samples collected annually at monitoring station 1BMDL060.48 on the Upper Middle River and 1BMFT001.43 on Moffett Creek, neither of which met the water quality standard of 235 cfu/100 mL. The number of samples collected each year is shown above each bar. The linear regression fitted to the data for Upper Middle River shows a decreasing trend in violation rates over the sampling period.

Graph 1 (Top): Benthic data for Upper Middle River (1-BMDL066.05); Graph 2 (Middle): *E. coli* data for Upper Middle River (1-BMDL060.48); Graph 3 (Bottom): *E. coli* data for Moffett Creek (1-BMFT001.43).

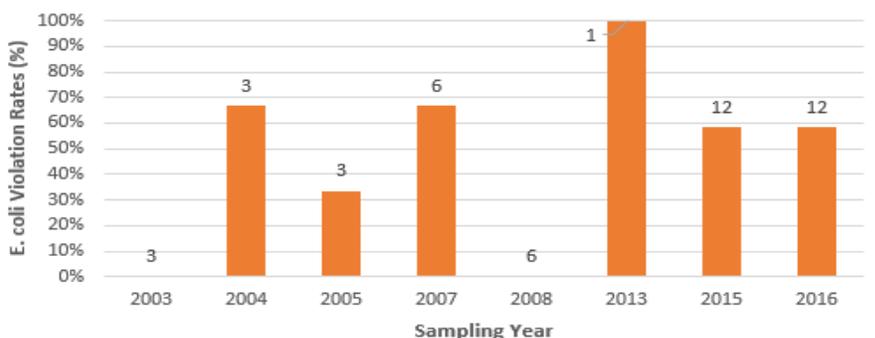
Upper Middle River (1BMDL066.05)
Biologic Monitoring Data Spring 2002-Fall 2016



Upper Middle River (1-BMDL060.48)
*% Violation Rates: *E. coli* Standard*



Moffett Creek (1-BMFT001.43)
*% Violation Rates: *E. coli* Standard*



Partnerships and Education or Outreach

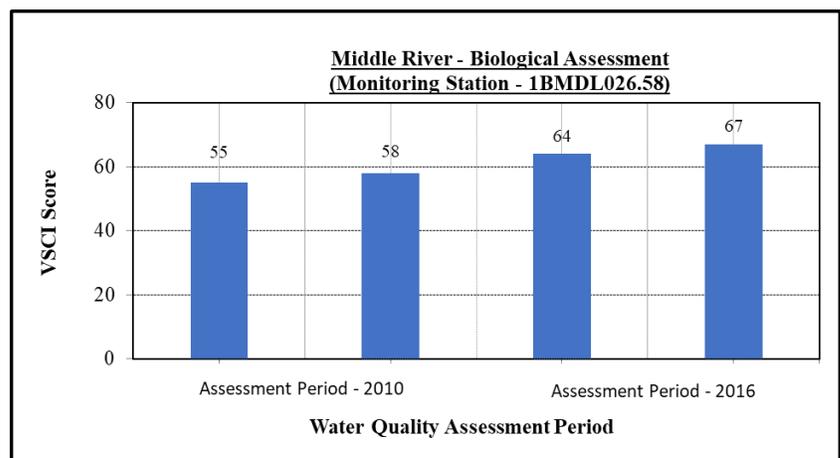
During the implementation project period, HSWCD worked hard to develop partnerships and to provide education and outreach opportunities to engage farmers and landowners and encourage the installation of targeted conservation practices. For example, HSWCD established a Middle River partnership with support from the Chesapeake Bay Funders Network, which included the American Farmland Trust and Augusta County Farm Bureau. Through this partnership, the HSWCD explored innovative ways to address leased land and BMP implementation. The partnership contracted with a local agronomist to work with producers to encourage pasture management. Various events were held, such as the “Tools and Technology for Better Grazing” field day.

DRAFT Water Quality Success Story: Biological Health Improved with Agricultural BMPs in Middle River Watershed, Virginia

In 2010, a 23.15-mile segment of Middle River was listed as impaired on Virginia’s Section 303(d) Total Maximum Daily Load (TMDL) Priority List and Report due to violations of the state’s General Standard (benthic). A benthic TMDL for Middle River watershed was developed in 2004 by DEQ with sediment identified as the primary pollutant source. In 2010, Virginia Department of Conservation and Recreation (DCR) developed an implementation plan with extensive input from Headwater Soil and Water Conservation District (HWSWCD) and watershed stakeholders and landowners. Best Management Practices (BMPs) installed in the watershed helped in reducing sediment transport and improving benthic macroinvertebrate communities and biological health of the Middle River. This improvement led to the impaired segment being removed from the state’s impaired waters list in the Virginia’s 2016 305(b)/303(d) Water Quality Assessment Integrated Report.

These improvements are reflected through biological assessment at station 1BMDL026.58 (Graph 4). The VSCI data for the 2016 assessment period indicated improvement in benthic macroinvertebrate communities. The data fully support aquatic life use status for the segment. Accordingly, a 23.15-mile long segment was delisted in 2016. A DRAFT NPS success story has been submitted for EPA approval and publication.

Graph 4: Virginia Stream Condition Index for two assessment periods, in Middle River watershed (station 1BMDL026.58), Augusta County, Virginia. .



Project Funding

Altogether, \$4,689,264 of federal and state cost-share funds and local or landowner match were administered from DCR and DEQ to HSWSCD to complete 1,225 BMPS between July 2006 and June 2018. State Water Quality Improvement Fund and Virginia Natural Resources Commitment Fund, administered by DCR, contributed \$2,929,677, a majority of the of cost-share funds. DCR also contributed an estimated \$245,000 (estimated \$35,000/year for seven years) for technical assistance funding to HSWSCD to run the targeted implementation project from 2007-2013. DEQ contributed \$70,355 of Section 319(h) cost-share funds. An additional \$66,000 of local funds and match were contributed by sources administered by Headwaters SWCD, including from the Chesapeake Bay Funders Network.

Closeout Analysis

The Middle River Implementation Project was active for two phases, Phase One from 2006-2013 funded exclusively with state resources and Phase Two from 2015-2017 funded with both state and federal Section 319 funds. BMP installation was mildly successful in meeting implementation goals; however, the project did hit some barriers, especially as related to achieving only 7% of the significant pasture management acreage goal. Project highlights include the following:

- ⇒ As shown in Table 1, stream exclusion fencing (linear feet) and the number of system installed met 57% and 34% of the IP goal, respectively. The project also resulted in meeting 94% of its goal for establishing riparian buffers. It did, however only meet 7% of its pasture management goals
- ⇒ A partnership developed among state, federal, and local agencies and stakeholders contributed to implementation.
- ⇒ Despite significant program promotion, BMP inquiries and sign-up were relatively low for pasture management.
- ⇒ One of the innovative ideas that resulted from this project was the work performed by the contracted agronomist, who attempted to work with farmers from a more holistic perspective when it came to pasture management. The work completed led to some real changes in management, though much of it could not be quantified. HSWSCD



also worked closely with Cooperative Extension to explore mechanisms for livestock exclusion on rented land using moveable fencing and solar-powered watering systems. They piloted the system on a farm in the Middle River Watershed and hosted several farm tours for a diverse group of interested stakeholders.

Photo 1: Stream livestock exclusion fencing, Middle River watershed, Augusta County, Virginia (Courtesy: HSWSCD).

For More Information Please Contact:

Sara Bottenfield, DEQ TMDL NPS Coordinator
sara.bottenfield@deq.virginia.gov, (540) 574-7872

John Kaylor, Conservation Specialist
jkaylor@co.augusta.va.us; (540)248-0148 ext.2

