NONPOINT SOURCE SUCCESS STORY

Virginia

Implementing Best Management Practices Reduced Bacteria Loading and Improved Biological Health in the Middle River Watershed

Waterbodies Improved

In 2008, two segments of Middle River (23.15 miles and 2.92 miles) were listed as impaired on Virginia's Clean Water Act (CWA) Section 303(d) Total Maximum Daily Load (TMDL) Priority List and Report. The segments were not attaining Virginia's bacteria water quality standards (WQS) for designated recreation (swimming) use. The 23.15-mile segment was later listed in 2010 for not attaining Virginia's WQS for aquatic life use. Installing best management practices (BMPs) helped enhance water quality and biological health in the Middle River by reducing bacteria and sediment transport. These improvements prompted the two segments of the Middle River to be removed from the impaired waters list in Virginia's 2016 305(b)/303(d) Water Quality Assessment Integrated Report.

Problem

The Middle River watershed (VAV-B12R) is in Augusta County, Virginia. It empties into the South Fork of the Shenandoah River, which is a tributary of the Potomac River (Figure 1). The Middle River watershed spans approximately 54,151 acres, with agriculture as the primary land use (62%), followed by forest (31%) and urban/developing area (7%) land uses.

The Middle River was sampled for bacteria at station 1BMDL022.09 under the Virginia Department of Environmental Quality's (DEQ's) ambient monitoring program. The 2001–2006 assessment of segments VAV-B12R_MDL01A00 (23.15 miles) and VAV-B12R_MDL01B10 (2.92 miles) showed that 2 of 10 samples (20%) exceeded the *Escherichia coli* bacteria WQS of a maximum value of 235 colony-forming units (cfu) per 100 milliliters (mL) for more than 10% of total samples. Based on this, DEQ added both segments to Virginia's CWA section 303(d) impaired waters list for the 2008 assessment period.

Biological assessments were also conducted for the 23.15-mile segment under DEQ's probabilistic monitoring program in 2002, 2003 and 2008. The biological integrity scores (Virginia Stream Condition Index [VSCI]) included 58 (in spring and fall 2002), 58 (in spring 2003), 61 (in fall 2003) and 55 (in fall 2008). A VSCI score of 60 is required for WQS attainment. Because it did not meet the WQS, DEQ added the segment to Virginia's CWA section 303(d) list of impaired waters for the 2010 assessment period.

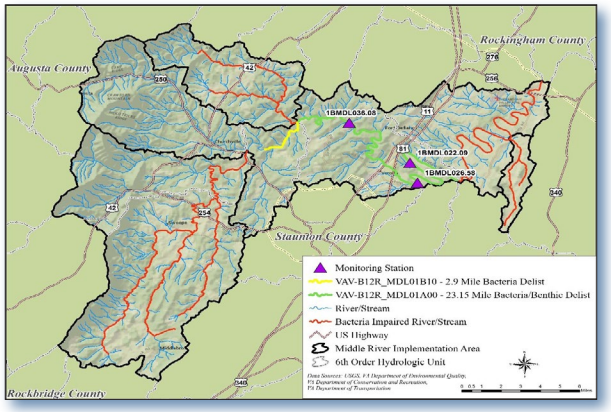

Figure 1. Location of monitoring stations and delisted segments in Augusta County's Middle River watershed in western Virginia.

DEQ developed a bacteria and benthic TMDL for Middle River watershed in 2004, which identified key pollution sources for the bacteria impairments (livestock, failing septic systems, pets and wildlife) and for the benthic impairment (sediment). In 2010, Virginia Department of Conservation and Recreation (DCR) developed an implementation plan with input from federal and state agencies, Headwaters Soil and Water Conservation District (HWSWCD), and watershed stakeholders and landowners. The plan quantified various control measures needed to reduce bacteria and sediment transport to the Middle River.

Story Highlights

Federal, state, and local agencies and stakeholders cooperated to install BMPs. HWSWCD and other agencies conducted outreach activities to increase environmental awareness and promote BMP implementation in the watershed; these included watershed visits, group contacts, presentations at stakeholder meetings and flyer mailings.

Data retrieved from DCR's BMP tracking system (for the period 2006–2014) shows that BMPs installed included 59,922 linear feet (11.35 miles) of livestock exclusion fencing (Figure 2); 22 acres of stream exclusion with grazing land management; 1,931 acres planted with cover crop; 901 acres of small grain and mixed cover crop for nutrient and residue management; and 114 acres of long-term vegetative cover on crop and pasture lands. The stream fencing excluded approximately 985 livestock from water bodies. Three animal waste control facilities treat 1,069 tons of livestock waste in the watershed annually. In addition, 86 acres of woodland and buffer filter area were planted; 33,894 feet of stream exclusion fencing was repaired and maintained; 48 acres of legume-based cover crop was planted and five animal waste control/composter facilities were installed. Nutrient management plans were written for 79 acres of cropland, and 9 acres were supported for extension of Conservation Reserve Enhancement Program (CREP) watering systems.

Results

DEQ collected bacteria samples through its ambient water quality monitoring program for the 2016 assessment period. Of 12 samples collected in 2009–2014 at station 1BMDL022.09 (segments VAV-B12R_MDL01A00 and VAV-B12R_MDL01B10), none (0%) exceeded the *E. coli* standard (Figure 3). Another 60 samples from an upstream station (1BMDL036.08, within the same assessment unit) had only five exceedances (8.3%) for *E. coli*. Both datasets show full support of the designated recreation (swimming) use.

VSCI data used for the 2016 assessment period at station 1BMDL026.58 show improved scores of 64 and 67 (data were collected in spring 2011 and fall 2012, respectively) (see Figure 3). VSCI scores at an upstream station (1BMDL036.08) were also well above the threshold value of 60. Both datasets indicate full support of aquatic life use.

As a result, DEQ removed both segments (26.07 miles total)—a 23.15-mile segment for bacteria and benthic impairments and a 2.92-mile segment for bacteria impairment—from the state's 2016 303(d)/305(b) Water Quality Assessment Integrated Report.

Courtesy: HWSWCD

Figure 2. Stream livestock exclusion fencing.

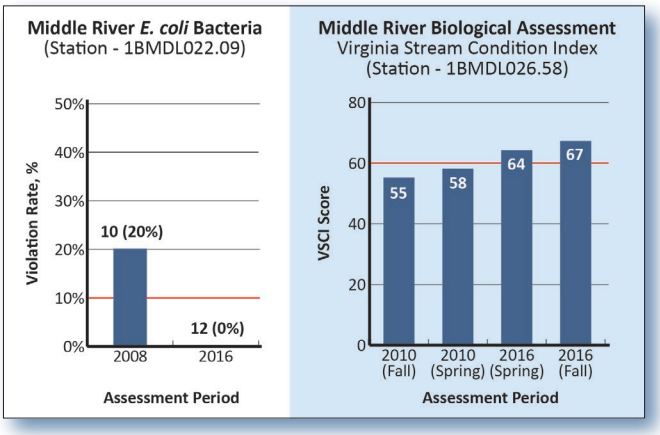

Figure 3. Middle River assessment data.

Partners and Funding

Water quality improvements are due to partnerships among the HWSWCD, local stakeholders and several state and federal agencies, including DCR, DEQ, NRCS and Virginia Cooperative Extension. BMP implementation projects (2006–2014), administered by the HWSWCD, were completed with state funds totaling $819,984, which include contributions to CREP ($254,199), the Virginia Agricultural Cost-share Program ($565,865), the Virginia Natural Resources Conservation Fund (VNRCF) and the Bay Targeted TMDL Program under VNRCF. DCR provided technical assistance funds to HSWCD of at least $50,000 per year (total $300,000). During this period, Virginia CWA Section 319(h) Program funds supported a full-time staff person who provided technical services for the Middle River TMDL Implementation Project (prorated amount of $25,000 per year from 2009–2013) for an estimated contribution of $125,000.

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