VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

# Cleaning Up Impaired Waters

## TMDL Progress Report 2007

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The Virginia Department of Environmental Quality monitors the state's rivers, lakes and tidal waters for pollutants every year. DEQ works to determine if the public can use them for recreational activities, fishing, drinking and harvesting of shellfish, and whether the waters can support healthy habitats for animals and other wildlife that live within them. If pollution amounts are too high, the waters cannot support their designated uses and fail to meet Virginia water quality standards. These waters are considered impaired or unhealthy.

DEQ must establish a total maximum daily load, or TMDL, for each impaired water. A TMDL represents the total amount of a pollutant a water body can contain and still meet water quality standards. DEQ, communities, local governments and other state agencies work together to clean up impaired waters.

## How it works

Developing a TMDL is the first of three major steps in improving the quality of an impaired water. To restore water quality, pollutant levels have to be reduced to the TMDL amount.

To develop a TMDL, the state considers:

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- Naturally occurring concentrations of pollutants in the impaired waters.
- Pollution from fixed locations, such as a pipe or ditch (point sources).
- Pollution sources without a single point of origin, such as runoff from agricultural activities and urban areas (nonpoint sources).
- Seasonal variations.

DEQ leads the development of the TMDL, and the Virginia Department of Conservation and Recreation and the Virginia Department of Mines, Minerals and Energy provide assistance. Once a TMDL has been completed, it is submitted to the U.S. Environmental Protection Agency for approval.

The next step is the development of a cleanup plan. The plan, also called a TMDL implementation plan, describes ways to reduce pollution levels in the stream, and includes a schedule of actions, costs and monitoring. During this phase, DCR takes the lead, and DEQ and DMME provide assistance. While TMDL development is pollutant specific, cleanup plans are designed to address multiple water quality problems within a watershed. The development of the TMDL and the cleanup plan involve input from the public, industries, local governments and other stakeholders during technical advisory committees, meetings and comment periods.

The final step is the implementation of the cleanup plan. During this phase, DEQ and its partners work to achieve a TMDL by reducing pollution according to the best management practices established in the plan. Best management practices are effective and practical ways to prevent or reduce pollution from nonpoint sources to ensure water quality. They could range from repairing septic systems and establishing storage areas for animal waste to planting vegetation.

A TMDL is the total amount of a pollutant a water body can contain and still meet water quality standards.

Three major steps in the TMDL process:

1 DEQ and partners conduct a TMDL study with public input.

2 During the development of a cleanup plan, agencies work with the public to identify ways to improve water quality.

3 Communities, individuals and agencies implement pollution reduction practices.

## Progress and future efforts

DEQ has successfully met the demands of a rigorous development schedule. The agency completed 344 TMDLs from 1999 to 2006, and more than 200 have been contracted for completion by 2008. There are 1,487 waters remaining on the impaired waters list that will require a TMDL.

> Best management practices, such as planting vegetation along stream banks and repairing septic systems, prevent or reduce water pollution.

By May 2006, Virginia had completed implementation plans covering 60 TMDLs or impairments and had scheduled the development of plans covering 47 TMDLs. Completion of implementation plans for the remaining 1,937 impaired segments of waters will depend on available funding and staff.

Cleanup efforts are under way for many impaired streams. Virginia has designated money through 2008 to support cleanup efforts for the majority of the 107 TMDLs with completed or soon-to-be completed cleanup plans. Like implementation plans, cleanup efforts address more than one pollution problem, and they are conducted throughout the watershed.

Many voluntary and government-funded best management practices have been implemented in Virginia. In most watersheds, local soil and water conservations districts or DCR have taken the lead in overseeing the implementation of the best management practices. To determine the success of the practices, DEQ monitors water quality in the impaired waters.

The degree of participation and the variety of stakeholders involved in cleanup efforts vary throughout the state. The longest running efforts to reduce pollution in watersheds with impaired waters have been occurring since 2001 in three watersheds, including the North River watershed. They have involved significant efforts to encourage voluntary stakeholder participation in implementing best management practices. Water quality improvements are observable in these watersheds even though the pollution has not been reduced to the TMDL amount. One of the most recent cleanup efforts is occurring in Virginia Beach. The city and the local planning district are using innovative ideas and technology to improve water quality in the Lynnhaven, Broad and Linkhorn bays.

## North River watershed

Four tributaries in Rockingham County within the North River watershed are impaired because of high bacteria levels, and three of the streams are impaired because they cannot support a healthy environment for animals, called benthic macroinvertebrates, that live on the bottoms of streams. While water quality goals have yet to be reached for these streams, five years of implementation of more than 100 best management practices in this mostly rural watershed have resulted in better water quality.

*Kayakers stop for a view of the North River Gorge in Rockingham County. Reducing bacteria in the impaired streams of the North River watershed will enable the public to use the streams for recreational activities.*

Three of the North River's tributaries have lower bacteria levels and two of them have better aquatic habitats than they did five years ago because of pollution reduction efforts. In addition, the North River, which was not directly included in the implementation plan, has had no bacteria violations in the past two years and has shown a significant improvement in the habitat available for aquatic animals.

The cleanup plan has also had additional benefits. Although the plan for the watershed was designed to reduce bacteria, several of the required agricultural and residential best management practices have reduced nutrient levels. These practices included:

- Excluding livestock from streams.
- Restoring stream banks.

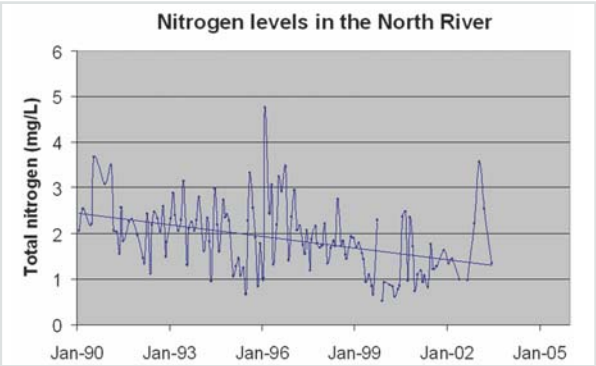
- Planting vegetated buffers that reduced sediment and nutrient transport to the stream.

- Improving the management of pastures used for livestock grazing.

- Repairing septic systems.

- Removing six straight pipes in one tributary's watershed that conveyed untreated human waste to a stream.

When tested for nutrients, most of the sites in the watershed showed a trend of less nutrient pollution in the waterways over time. This improvement is significant because the North River and its tributaries are in the Chesapeake Bay watershed, which has excess nutrient levels. Nutrient pollution is the most significant obstacle to restoring the health of the Chesapeake Bay and its tidal rivers.




*The graph shows a decrease in average nitrogen levels over time or a decreasing trend (shown as the straight blue line) from 1990 to 1995. The North River showed one of the strongest decreasing trends for nitrogen, the main contributor to nutrient pollution in the Chesapeake Bay. The decrease is significant because the North River watershed encompasses improvements in several of the upstream tributaries.*



## Water quality snapshot

DEQ regularly monitors water quality in streams throughout Virginia to ensure that the streams can support healthy aquatic communities. Specifically, DEQ looks at benthic macroinvertebrates, or animals that live and feed at the bottom of waterways. Benthic macroinvertebrates include insects like mayflies (right) and other animals such as mussels, crayfish and worms. These animals are good indicators for long-term conditions because they live in one area of a stream for most of their lives. Key bug families in these communities are sensitive to pollution and will typically be present where there is good water quality, appropriate habitat conditions and little or no pollution.

So, what makes a healthy habitat for aquatic communities?

- Temperature is important because it influences the activities of aquatic organisms along with the oxygen levels in water. Just like humans, bugs require oxygen to survive. If temperatures rise, then oxygen levels fall.

- The acidity or lack of acidity in a stream must be within a certain range to support a healthy community. The acidity or basic (alkaline) properties in the water are measured on a pH scale.

- Nutrients in forms of nitrogen and phosphorus, like fertilizers, are present in nearly all streams. However, increased levels of nutrients can cause too much algae growth, leading to a shortage of oxygen.

- Healthy bug communities prefer streams that have a variety of rock sizes. They also require that these rocks be relatively free of fine materials like silt and sand. Many bugs live on the sides and undersides of the rocks and lose their living spaces if fine materials fill these areas.

- The amount of vegetation on the stream banks also influences aquatic communities. Some groups of bugs eat leaves that fall into streams from the banks. In addition to providing food, vegetation shades the stream and keeps water temperatures lower and oxygen levels higher than those without vegetation.

## Lynnhaven, Broad & Linkhorn bays

Virginia Beach is implementing a clean-up plan to improve water quality in the Lynnhaven, Broad and Linkhorn bays with innovative approaches and technology.

The Lynnhaven, Broad and Linkhorn bays in Virginia Beach are impaired because bacteria levels in water samples are higher than the allowable amounts. DEQ, the Hampton Roads Planning District Commission and Virginia Beach completed a cleanup plan to reduce bacteria levels in the bays in June 2006, and Virginia Beach has been implementing measures since then to reduce pollution.

From the beginning of the process, Virginia Beach dedicated resources and personnel to develop and implement measures to reduce bacteria contamination in the watersheds. The city is also taking a proactive approach by addressing potential threats to water quality before they can cause problems.

Numerous significant projects are under way or planned. They include:

- Using six solar aerators in two storm water management impoundments. The aerators have improved dissolved oxygen levels in one bay and improved water clarity and reduced blue-green algae in two bays; reductions in bacteria and nutrient contributions to the receiving waters of the Lynnhaven River are anticipated.

- Installing anti-microbial mats (called centipedes) inside storm water pipes to reduce bacteria levels in the water passing over them.

- Starting a $4.6 million effort to retrofit many of its sewage pump stations with generator hookups and electric generators that will allow city personnel to provide auxiliary power when severe storm events cause power disruptions.

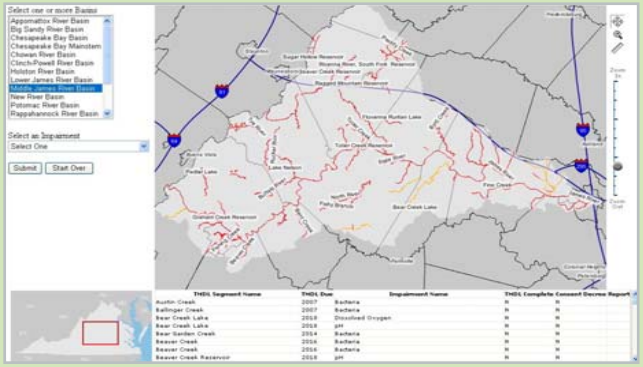
- Undertaking a boater pump-out program for the Lynnhaven River watershed in partnership with the Hampton Roads Sanitation District. Boaters will receive sewage pumpouts of their vessels at no cost to prevent sewage discharges into the Lynnhaven waters during boating season. At the city's request, DEQ petitioned EPA to declare the Lynnhaven watershed a "no discharge zone," in which sewage discharge from boats is prohibited. EPA has approved the request.

- Partnering with the U.S. Army Corps of Engineers and DCR to stabilize the eroding shoreline connecting Linkhorn and Broad bays in conjunction with a federal maintenance dredging project.

- Undertaking an extensive public education campaign that includes watershed and storm drain identification markers and a pet waste awareness component.

Virginia Beach and its partners estimate that implementing these projects to improve water quality, restore habitats and ensure infrastructure integrity will cost

## Online mapping of impaired waters



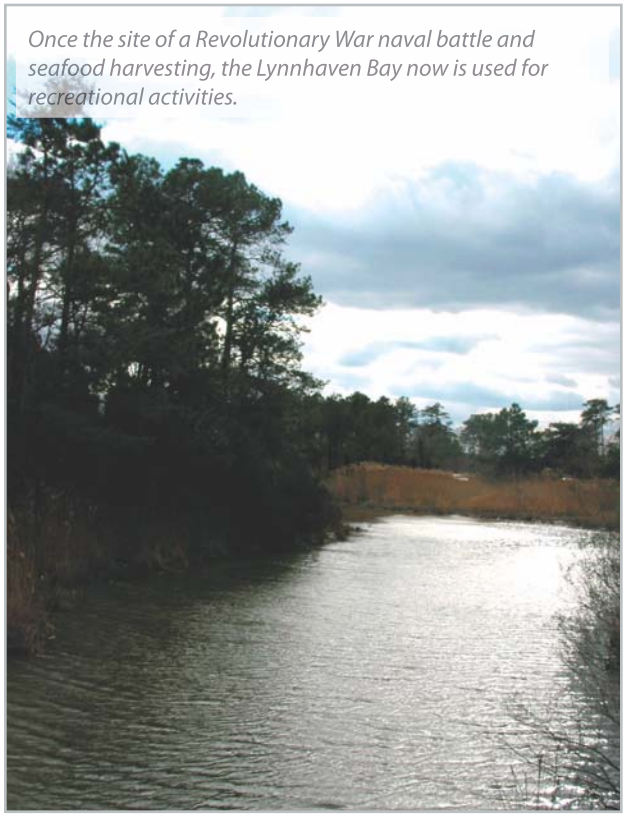
A mapping application showing progress in the TMDL program is now available online. DEQ partnered with Virginia Commonwealth University to develop a mapping application that provides an at-a-glance look at TMDL development by basin or watershed. The application is located at *gaia.vcu.edu/website/tmdl*.

- To begin, select one or more basins from the drop down list and select the "submit" button.

- Once the map loads, you may refine your search by pollutant. Impaired streams with completed TMDLs are displayed in orange. Streams without TMDLs are shown in red.

- The table includes a list of all streams in the map view and links to TMDL reports when available.

- To start a new search, select the "start over" button.



*Once the site of a Revolutionary War naval battle and seafood harvesting, the Lynnhaven Bay now is used for recreational activities.*

about $10 million. More information about the city's water quality improvement efforts is available on the Virginia Beach website at *www.vbgov.com.*

## Emerging Issues

New and challenging water quality issues have emerged as Virginia works to clean up impaired waters. These issues include PCB chemicals (polychlorinated biphenyls) in the Potomac River, mercury in the South River and water pollution associated with abandoned mine lands in southwest Virginia. Identifying sources and determining how the pollutants move throughout the ecosystem are two significant challenges in establishing TMDLs for these waters. These issues are made more complex because the pollution is mostly a legacy issue, meaning that pollution releases happened in the past. In addition, the contaminated waters cover a large geographic area.

### *PCBs*

Elevated levels of PCBs have been found in fish from the waters of the tidal Potomac River and its bays. Virginia's primary focus is on the tidal bays and tributaries of the western shore. The PCB levels prohibit or restrict the consumption of some fish from the tidal Potomac River and its incoming streams. Virtually all portions of the Potomac estuary, beginning at the fall line and extending to the mouth, are impaired. Virginia, Maryland and Washington, D.C., are required to develop TMDLs to determine how much PCBs need to be reduced. Because the Potomac estuary is an interstate water body, the three jurisdictions have decided to maximize their efforts by conducting joint data collection and basing the TMDLs on a shared modeling and analysis strategy. The Interstate Commission on the Potomac River Basin is assisting the jurisdictions by coordinating data collection and providing technical support in data analysis and the construction of modeling tools. The time line for completing this TMDL is driven by a court-ordered deadline for Washington, D.C., that dictates the TMDL must be completed by September 2007.

### *Mercury*

Since 1977, approximately 25 miles of the South River and the full 105 miles of the South Fork Shenandoah River have been posted with fish consumption advisories due to mercury contamination. The Virginia Department of Health advises people not to eat wild fish from the South River downstream of the DuPont footbridge in Waynesboro and to eat only limited amounts of fish from the South Fork Shenandoah River. Due to the

### Finding solutions to water pollution

DEQ's Valley Regional Office in partnership with the Shenandoah Valley Soil and Water Conservation District received a grant to make over four Rockingham County homes and businesses with the "Common Sense Solutions to Water Pollution" project. The project, spearheaded by the conservation district, is geared toward educating and reaching the homeowner. DEQ and the conservation district sponsored an essay contest during October 2006. The top four winners received the outdoor makeovers.

The goal was to increase awareness among residents and business owners in the Blacks Run and Cooks Creek watersheds of simple measures to improve water quality. Model homes showcase practices, such as rain gardens, rain barrels, pet waste digesters, septic system pumpouts (if necessary) and soil tests, that anyone can implement to clean up Blacks Run and Cooks Creek. These practices will reduce bacteria, sediment and phosphorus as part of the TMDL cleanup plan, completed in March 2006. The grant was awarded by DCR using money from Virginia's Water Quality Improvement Fund.

fish consumption advisories in these water bodies, DEQ considers these waters impaired. To address this impairment, DEQ is developing a TMDL with the U.S. Geologic Survey and EPA for mercury in the South River.

Mercury contamination in the South River resulted from historic releases by a DuPont manufacturing facility in Waynesboro. There are approximately 1,800 pounds of mercury in downstream river sediments and 97,200 pounds of mercury in floodplain soils. Mercury levels in fish tissue have not declined in the 29 years since contamination in the river was first discovered; however, the water quality standard, which was developed to be protective of fish tissue, has not been exceeded. This contradiction suggests the standard may not be adequate, and it may require the development of a new standard for mercury levels in fish tissue.

*Pollution and sediment used to drain into Ely Creek in Lee County (left). Now water quality in the stream has improved due in part to a wetland that was constructed to the left of the stream (right).*

### *Abandoned mine lands*

Considerable progress has been made in reclaiming or restoring abandoned mine lands, but challenges still exist. Although about 13,000 acres of abandoned mine lands have been restored, there are more than 50,000 acres that remain. Many of southwestern Virginia's impaired waterways will not improve until these lands can be reclaimed. Alternative sources of funding and approaches to stream improvement by restoring abandoned mines or remining need to be implemented. The program will continue to evaluate the effectiveness of remining and cleaning up abandoned mine waste piles.

## Timing and funding

Through a consent order, a federal court established a schedule for TMDL development in Virginia through 2010 for waters identified as impaired since 1998. For other waters, DEQ schedules the development of TMDLs within eight to 12 years of finding the waters impaired. High priority TMDLs are added as needed and as resources permit. DEQ takes human health, threatened and endangered species, geographic coverage and stakeholder interest into account when assigning priorities.

For the last seven years, funds appropriated by DCR, DEQ and DMME for developing the implementation plans have equaled less than 10 percent of the funds available for development of the TMDLs. This imbalance has resulted in a backlog of completed TMDLs without cleanup plans or on-the-ground implementation.

To increase the pace of water quality improvements, DEQ plans to increase the resources available for the development of implementation plans. The agency will shift about 15 percent of available funds from developing TMDLs to implementation plans by 2010 and increase the shift to 50 percent beyond 2010. This approach will only be pursued as long as the consent decree schedule can be met.

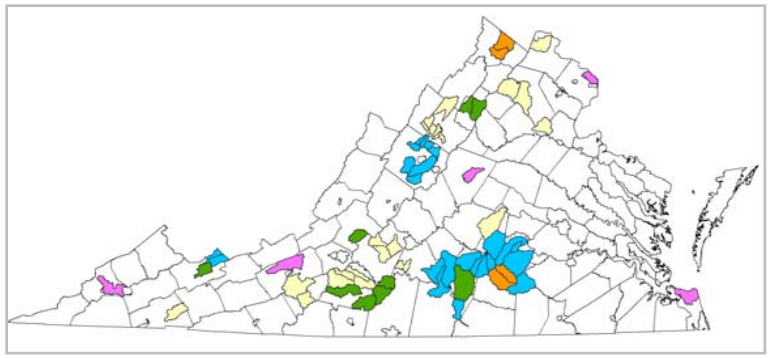
The agency also plans to increase efforts to implement the cleanup plans. DEQ will look at opportunities to increase participation levels in two key programs — stream fencing and the repair or replacement of failing septic systems — and accelerate implementation of other priority cleanup plans. Plans also call for increased coordination between DEQ and its state partners and for a review of regulatory tools to ensure adequate implementation of conservation practices.

Successful implementation of efforts to achieve water quality standards requires the collaboration of several federal, state and local groups. These groups provide technical assistance and financial incentive programs that support TMDL implementation and environmental conservation. However, the only targeted, dedicated funding available for TMDL implementation has been from EPA. The funding can only be used to pay for limited best management practices in agricultural, urban and residential

areas. This has led to a significant gap between funding needs and available money.

Despite the challenges, DEQ projects that, assuming level funding sources and accurate estimates, the agency will be able to meet the consent order schedule and complete the development of the TMDLs required by 2010. Because there are no new authorities for enforcing TMDLs, it has been Virginia's expectation to implement TMDLs using existing programs and funding sources. Existing resources include permits from DEQ and DMME that limit discharges to state waters. These programs are utilized when stream impairments are attributed to a permitted facility. For non-permitted activities, Virginia's approach has been to use incentive-based programs such as the Virginia Agricultural Cost Share Program and the State Revolving Loan Fund. Virginia also offers dedicated funding for the implementation of best management practices in watersheds with approved implementation plans.

*On the cover (left to right): Kayakers travel on the North River. A DEQ biologist collects water quality samples. The James River , portions of which are impaired, in Richmond.*



*The proposed approach for targeting state funds is aggressive, with areas receiving funding over the next two years (shown in orange and blue) approximately equal to the combined areas funded during the previous seven years using federal funds (shown in yellow and green). Virginia uses a staged approach when implementing many TMDLs, providing opportunities for periodic evaluation and adjustment of efforts to achieve water quality objectives in a timely and cost-effective manner. Pink areas have completed cleanup plans.*

## How you can help

More information about cleanup efforts in your community is available on the DEQ website at *www.deq.virginia.gov/tmdl.* You can also contact the TMDL coordinator at each of DEQ's seven regional offices.

**Northern Virginia Regional Office**
**(703) 583-3800**
Counties of Arlington, Caroline, Culpeper, Fairfax, Fauquier, King George, Loudoun, Louisa, Madison, Orange, Prince William, Rappahannock, Spotsylvania and Stafford; and the cities of Alexandria, Fairfax, Falls Church, Fredericksburg, Manassas and Manassas Park.

**Valley Regional Office**
**(540) 574-7800**
Counties of Albemarle, Augusta, Bath, Clarke, Fluvanna, Frederick, Greene, Highland, Nelson, Page, Rockbridge, Rockingham, Shenandoah and Warren; and the cities of Buena Vista, Charlottesville, Harrisonburg, Lexington, Staunton, Waynesboro and Winchester.

**Piedmont Regional Office**
**(804) 527-5020**
Counties of Amelia, Brunswick, Charles City, Chesterfield, Dinwiddie, Essex, Gloucester, Goochland, Greensville, Hanover, Henrico, King and Queen, King William, Lancaster, Mathews, Middlesex, New Kent, Northumberland, Powhatan, Prince George, Richmond, Surry, Sussex and Westmoreland; and the cities of Colonial Heights, Emporia, Hopewell, Petersburg and Richmond.

**Southwest Regional Office**
**(276) 676-4800**
Counties of Bland, Buchanan, Carroll, Dickenson, Grayson, Lee, Russell, Scott, Smyth, Tazewell, Washington, Wise and Wythe; and the cities of Bristol, Galax and Norton.

**South Central Regional Office**
**(434) 582-5120**
Counties of Amherst, Appomattox, Buckingham, Campbell, Charlotte, Cumberland, Halifax, Lunenburg, Mecklenburg, Nottoway, Pittsylvania and Prince Edward; and the cities of Danville and Lynchburg.

**Tidewater Regional Office**
**(757) 518-2000**
Counties of Accomack, Isle of Wight, James City, Northampton, Southampton and York; and the cities of Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach and Williamsburg.

**West Central Regional Office**
**(540) 562-6700**
Counties of Alleghany, Bedford, Botetourt, Craig, Floyd, Franklin, Giles, Henry, Montgomery, Patrick, Pulaski and Roanoke; and the cities of Bedford, Clifton Forge, Covington, Martinsville, Radford, Roanoke and Salem.