Virginia TMDL Program – 2006 Summary of Activities

Supplement to the 2006 Virginia 319 NPS Management Program Report

Virginia Department of Conservation & Recreation

COMMONWEALTH OF VIRGINIA
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Note: Information on the TMDL Development Program and some information in other sections of this report are summarized excerpts from DEQ's report "TMDL Program Six Year Progress Report: 2001-2006" (DEQ, March 2007).

Virginia FY2006 NPS Annual Report – TMDL Program

1.0 - Executive Summary

Since the 2000, Virginia's TMDL Program has made great strides in the development of TMDLs to meet the EPA consent decree, the development of implementation plans (IPs) and the implementation of TMDLs through watershed restoration work. In March 2007, DEQ, in cooperation with the Department of Conservation and Recreation (DCR) and the Department of Mines, Minerals and Energy (DMME), released a report that describes the 6-year progress of TMDL development, implementation plans and the application of best management practices in Virginia's TMDL program. The report is available on DEQ's website at: http://www.deq.virginia.gov/tmdl/pdf/06prgrpt.pdf.

During 2006, DEQ and DCR, along with other agency and non-agency partners, continued to develop and implement TMDLs throughout Virginia. As a result of the work of these agencies in 2006 Virginia developed 90 TMDLs (consent decree, non-consent decree and shellfish) and 9 Implementation Plans. During 2006, there were 10 active §319(h) funded implementation projects. Collectively these projects implemented 274 Best Management Practices (BMPs) that resulted in the reduction of 9.30E+15 colony forming units (CFU) of fecal coliform bacteria, 13,895 pounds of nitrogen, 2,348 pounds of phosphorous, and 1,757 tons of sediment. A full description of the activities undertaken by the TMDL program will be contained in this report. An addition 17 TML implementation projects were started in 2006 but at the time of this report it was too early to report progress.

2.0 - Virginia Total Maximum Daily Load Program

2.1 - Background

Virginia's goal is that all rivers, lakes, streams and tidal waters attain the appropriate beneficial uses. These beneficial uses are described by the following use goals: drinking water, primary contact/swimming, fishing, shellfishing, and aquatic life. These uses are protected by application of the state's numeric and narrative water quality criteria. When the beneficial uses are not being met these waters are considered "impaired" and the state must take steps to meet water quality standards to ensure that water quality is restored. One very important step in restoring water quality in the impaired streams is the development of Total Maximum Daily Loads, or TMDLs. The goal of Virginia's Total Maximum Daily Load (TMDL) program is to achieve attainment of water quality standards. The Commonwealth achieves this goal by means of a three-phase process: TMDL development, development of TMDL Implementation Plans (IP) and/or permit conditions, and implementation of permit conditions and/or best management practices. TMDL Reports, Implementation Plans and Implementation progress updates are available on the Department of Environmental Quality's (DEQ) TMDL website at http://www.deq.virginia.gov/tmdl.

TMDLs are required for water bodies that are determined to be impaired. In general, TMDL development is required under Section 303(d) of the Federal Clean Water Act and the U.S. Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR Part 130). The Virginia TMDL program is also governed by a federal court Consent Decree that lays out a schedule for TMDL development through 2010 for waters identified as impaired by 1998. For all other water bodies, TMDL development will be scheduled within 8-12 years of finding the water body impaired.

The TMDL process begins with the development of a TMDL that, when implemented, will result in the attainment of existing water quality standards. In order to develop a TMDL, background concentrations, point source loadings (i.e. loadings from sources permitted to discharge to state waters under Virginia Pollutant Discharge Elimination System (VPDES) permits), and non-point source loadings are considered. A TMDL also accounts for seasonal variations and includes a margin of safety. A TMDL study identifies sources of pollution and reductions needed from the identified pollutants to attain water quality standards. Pollution from both point sources such as residential, municipal, or industrial discharges and nonpoint sources such as residential, urban, or agricultural runoff are included in the TMDL study.

2.2 - TMDL Development

The Virginia TMDL program to date has successfully met the demands of a rigorous development schedule. Table 1 below summarizes the TMDLs that have been developed from 1999 through June 2006. As of May 2006, Virginia had completed 344 TMDLs, 168 for free flowing streams and 107 for shellfish closures and de-listed an additional 72 impairments.

Table 1 - Impairments with TMDLs Developed from 1/1/99 – 6/30/06
(Excerpted from DEQ *"TMDL Program Six Year Progress Report: 2000-2006")*

	Total	Bacteria[a]	Benthic[b]	PCB	Nitrate	pH	DO	Amonia	Temp
TMDLs Completed (CD and Non CD)	344	168 (nonshellfish) 107 (shellfish)	61	5	2	0	1	0	0
Consent Decree Delistings	72								
- full	65	41[c]	8	0	1	5[e]	5[e]	1	4
- partial	7[d]	2	3	0	0	1	1	0	0

a - TMDLs were completed for 168 non shellfish and 107 shelfish bacteria impairments
b - 76 TMDLs were completed on 61 segments identified as impaired for benthics
c - The bacteria delists include 18 non shellfhish and 23 shellfish
d - Three of the partial delists will not be credited as complete until 2008 or 2010 when the remaining impairments are addressed.
e – de-listing as a result of natural conditions.

For this report, a TMDL segment described as a 'consent decree segment' is defined as such by the 1999 federal Consent Decree, which extends until May 1, 2010. 'Consent decree segments' may include one or more impairments per segment. Some waters that are not consent decree segments are included in the tables as well. These waters are specifically labeled as non-consent decree or 'non CD' segments. The numbers for non-consent decree impaired segments were obtained from the 2006 305(b)/303(d) Water Quality Assessment Integrated Report. After May 2010, DEQ will develop a new TMDL development schedule to address the impaired waters added to the 303(d) list since 1998, using the guidance of completing TMDLs within 12 years of listing. Approximately 175 segments have been contracted for completion by May 1, 2008. Approximately 134 consent decree waters remain and are scheduled for TMDL development by 2010.

Table 2 – Summary TMDL Development of Consent Decree Segments
(Excerpted from DEQ "TMDL Program Six Year Progress Report: 2000-2006")

Total Waters under Consent Decree (CD)	**657**
Freshwater CD Waters Completed or Delisted in 1999 - 2006	218
Freshwater CD Waters Contracted for 2008	115
Shellfish CD Waters Completed or Delisted in 2004 - 2006	131
Shellfish CD Waters Due in 2008	59
Remaining CD Waters to be completed by 2010	**134**

2.3 - Implementation Plans

Once the TMDL study (i.e., development phase) is complete, the report is submitted to EPA for approval. Following EPA's approval of the TMDL, development of an Implementation Plan (IP) is the next step. Virginia state law (1997 Water Quality Monitoring, Information, and Restoration Act (§62.1- 44.19:4 through 19:8 of the Code of Virginia), or WQMIRA, requires the development of a TMDL IP. There is not a mandated schedule as to when an IP is to be developed upon approval of the TMDL. Local or state agencies, as well as community watershed groups, can take the lead in developing TMDL IPs. The IP describes the measures that must be taken to reduce pollution levels in the stream, and includes a schedule of actions, costs, and monitoring. DCR and DEQ have both worked on the development of approved Implementation Plans. Figure 1 illustrates the distribution of IPs and funding source by watershed throughout Virginia. It should be noted that the IPs for implementation earmarked for funding by 'Targeted WQIF' are being completed by a combination of in-house efforts by DEQ and DCR staff in addition to §319(h) funded contractual support.

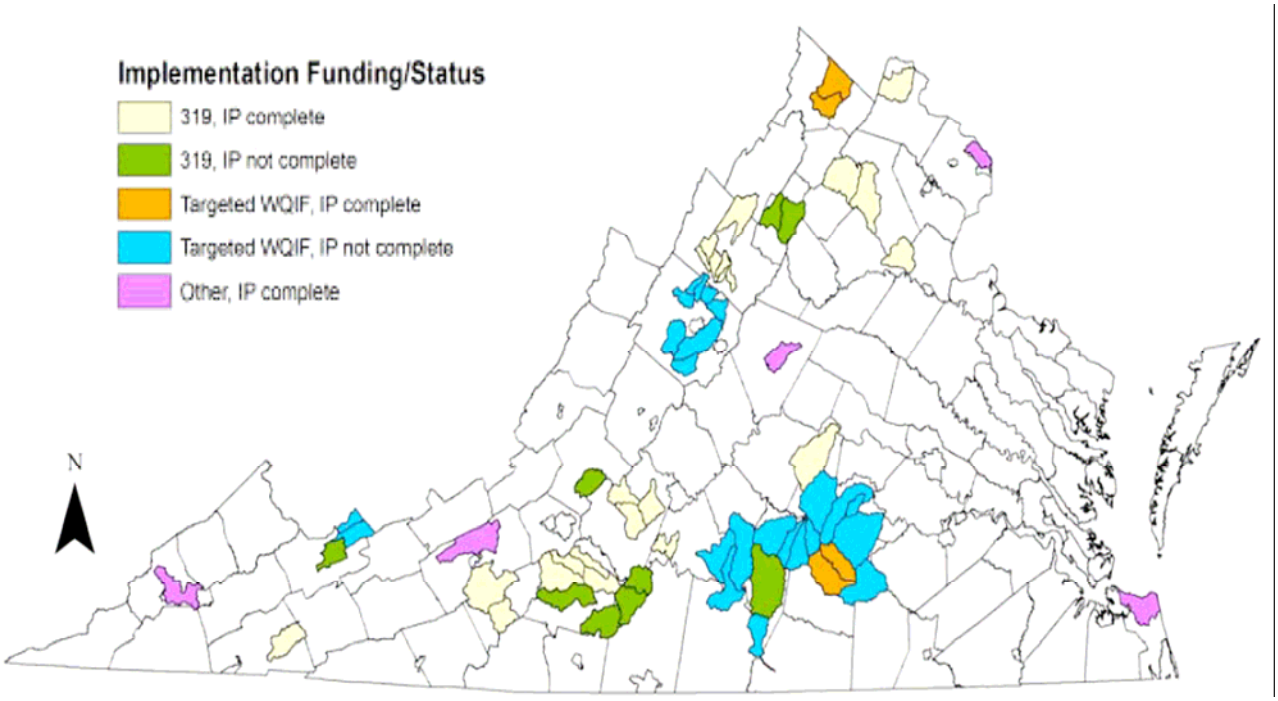


Figure 1 – Implementation Status and Funding by Watershed (Source *"TMDL Program Six Year Progress Report: 2000-2006," DEQ 2007)*

EPA require states to report their success of implementing watershed plans to meet EPA performance measure WQ-28 "*Number of watershed-based plans, supported under State NPS Management Programs since the beginning of FY 2002 that have been substantially implemented."* In 2006 DCR and DEQ completed 9 implementation plans covering 24 TMDL segments (five of these plans utilized §319(h) funds). To date 21 IPs have been completed, covering over 60 TMDL segments and 76 impairments (Table 3).

In the summer of 2006, DCR TMDL staff, with input from DCR and DEQ regional staff, produced a ranking of TMDLs completed as of May 2006 (with the exception of shellfish TMDLs) for the development and scheduling of implementation plans. The developed ranking of 125 impaired stream segments was based on a set of nine criteria. These segments were grouped into 55 proposed implementation plans based on location, locality and SWCD boundaries, impairment complexity and recommendations from regional DEQ and DCR staff. Based on available funding and staffing, a list was

developed of 14 implementation plans (covering 36 segments and 49 impairments) proposed to start by October 2007 (Table 4). Anticipated time to complete each of the IPs is approximately 9 months. These areas were selected based on the rankings, basin distribution, staff time, targeting of WQIA funds to TMDLs, and complexity of the impairments.

Table 3 – Summary of Completed Implementation Plans (IP)

Watershed (# of TMDLs)	Location	Impairment	Agency Lead	IP Complete
Middle Fork Holston (3)	*Washington Co.*	*Fecal Coliform (FC)*	*DCR*	*2001*
North River (4)	*Rockingham Co.*	*FC, Benthic (Be), NI*	*DCR*	*2001*
Upper Blackwater River (4)	*Franklin Co*	*FC*	*DCR*	*2001*
Catoctin Creek (4)	*Loudoun Co.*	*FC*	*DCR*	*2004*
Holmans Creek (2)	*Shenandoah Co.*	*FC*	*DCR*	*2004*
*Four Mile Run (1) **	*Arlington & Alexandria*	*FC*	*DEQ*	*2004***
Willis Creek (1)	*Cumberland & Buckingham*	*FC*	*DCR*	*2005*
*Chowan Study Area (8)**	*(Multiple counties)*	*FC*	*DEQ*	*2005***
*Moore's Creek (1) **	*Charlottesville, Albermale Co.*	*FC*	*DEQ*	*2005***
*Guest River (5) **	*Wise, Scott, Dickenson*	*Be*	*DEQ*	*2005*
*Lower Blackwater, Maggoddee & Gills Creek (3)**	*Franklin Co.*	*FC*	*DCR*	*2005*
*Lynnhaven (Shellfish) (1)**	*VA Beach*	*FC, Be*	*DEQ*	*2005***
Cooks Creek and Blacks Run (4)	*Rockingham Co., City of Harrisonburg*	*FC, Be*	*DCR*	*2006*
Thumb, Deep, Carter & Great Runs (4)	*Fauquier and Stafford Counties*	*FC, E. coli*	*DCR*	*2006*
Big Otter (5)	*Bedford & Campbell Co.*	*FC*	*DCR*	*2006*
Dodd Creek and Mill Creek (2)	*Floyd & Montgomery Co.*	*FC*	*DCR*	*2006*
Little Creek and Beaver Creek (3)	*Bristol, Washington Co.*	*FC, E.coli, Be*	*DCR*	*2006*
*Stroubles Creek (1) **	*Montgomery Co*	*Be*	*DEQ*	*2006***
*Back Creek (2) **	*Pulaski Co.*	*E. coli, Be*	*DEQ*	*2006/07***
*Abrams & Opequon Creek (5)**	*Frederick & Winchester Co*	*E. coli, Be*	*DEQ*	*2006***
*Knox & PawPaw Creek (2) **	*Buchanan Co.*	*E. coli, Be*	*DEQ*	*2006***

TOTAL IPs Completed = Plans (21), Segments (60), impairments (76)
Note: All IPs were funded by §319(h), except those done in-house by either DCR or DEQ, indicated by a (*). For all completed IPs, except those indicated with (**), implementation is being partially or fully funded by Section 319(h) funds.

Table 4 – Status Progress of Implementation Plan (IP) Development

Watershed (# of TMDLs)	HU	Location	Impairment	Agency Lead	IP Start
Hawksbill & Mill Creek (2)	*B38, B39*	*Page Co.*	*E. coli*	*DCR*	*10/1/06***
Looney Creek (1)	*I26*	*Botetourt Co.*	*E. coli*	*DCR*	*10/1/06***
Upper Clinch River (1)	*P01*	*Tazewell Co.*	*Benthic (Be)*	*DCR*	*12/1/06*
Falling River (1)	*L34*	*Campbell Co.*	*E. coli*	*DCR*	*2007*
*Mossy Creek, Long Glade Run, & Naked Creek (4)**	*B19, 24, 28*	*Augusta/ Rockingham Co.*	*Fecal Colifrom (FC), Be*	*DCR/DEQ*	*2007*
Pigg River (6)	*L13 - L18*	*Franklin and Pittslyvania Co.*	*E. coli*	*DEQ*	*2007*
Twittys Creek & Ash Camp Creek (2)	*L39*	*Charlotte*	*E. coli, Be*	*DEQ*	*2007*
Spring, Little Sandy, Bush, Briery Sayler Crk (5)	*J02 - J06*	*Prince Edward & Amelia Co*	*E. coli*	*DCR*	*2007*
Cub, Turnip & Buffalo Creek (3)	*L36-37, L40*	*Charlotte*	*E. coli*	*DEQ*	*2007*
Flat, Nibbs, Deep and West Creeks (4)	*J08-09, J11*	*Amelia & Nottoway Counties*	*E. coli, Be*	*DEQ*	*2007*
Laurel Fork (1)	*N37*	*Tazewell*	*E. coli, Be*	*DCR*	*2007*
Bluestone River (1)	*N36*	*Tazewell*	*E. coli, Be*	*DCR*	*2007*
*South & Christian R (3) **	*B14, B30*	*Augusta*	*FC, Be*	*DCR*	*2007*
Moffett Crk, Upper/Lower Middle River, Polecat Draft (4)	*B10, 13, 15*	*Augusta*	*FC*	*DCR*	*2007*

TOTAL IPs In Progress = Plans (14), Segments (36), impairments (49)
Note: All IPs are being funded by §319(h), except those done in-house by either DCR or DEQ, indicated by a (*). For all IPs currently in progress, except those indicated with (**) which are being funded by 319, funding from WQIF is being targeted for their implementation.

2.4 - Watershed Restoration and TMDL Implementation:

2.4.1 - History of TMDL Implementation Program:

The goal of this program is to implement on-the-ground activities, through TMDL watershed implementation plans, that result in watershed restoration and increased water quality improvements and ultimate delisting of impaired stream segments. Virginia uses a staged approach to many TMDLs, which provides opportunities for periodic evaluation of the effectiveness of the implementation actions and adjustment of efforts to achieve water quality objectives in a timely and cost-effective manner. The history of TMDL implementation in Virginia dates back six years ago when DCR started three pilot TMDL implementation projects. As of December 2006, the program consists of 33 active, organized implementation projects funded through a variety of federal, state, local and non-profit sources (Table 5).

Table 5: Status of TMDL/ Watershed Implementation Projects

Watershed Area	TMDL Segment	Water quality Improvement	Year Start	Lead Agency	Funds Used
Projects 1-12 are being funded by 319(h) funds administered by DCR					
1-North River	VAN-B21R, B22R, B27R & B29R	Moderate improvement	2001	DCR	§319(h)
2-Middle Fork Holston River	VAS-O05R	Moderate improvement	2001	DCR	§319(h)
3-Upper Blackwater River	LAW-L08R	Some improvement	2001	DCR	§319(h)
4-Catoctin Creak	VAN-A-02R	Too early to determine	2005	DCR	§319(h)
5-Holmans Creek	VAV-B45R	Too early to determine	2005	DCR	§319(h)
6-Willis River	VAC-H36R	Improvement	2005	DCR	§319(h)
7-Lower Blackwater River	VAW-L09R, L10R and L11R	Too early to determine	2006	DCR	§319(h)
8-Cooks Creeks & Blacks Run	VAV-B25R & B26R	Too early to determine	2006	DCR	§319(h)
9-Thumb, Great, Carter & Deep Runs	VAN-E01R, E02R & E10R	Too early to determine	2006	DCR	§319(h)
10-Big Otter River	VAW-L23R, L25R, L27R, & L28R	Too early to determine	2006	DCR	§319(h)
11-Mill and Dodd Creeks	VAW-N20R & N21R	Not started	2007	DCR	§319(h)
12-Little and Beaver Creeks	VAS-O07	Not started	2007	DCR	§319(h)
Projects 13-16 have received some WQIA RFP funds (and other funds as well)					
13-Moore's Creek	VAV-H28R	Too early to determine	2005	DCR	RFP
14-Guest River	VAS-P11R	Too early to determine	2005	DCR	§319(h), RFP
15-Opequeon Creek	VAV-B09R	Too early to determine	2006	DCR	WQIF, RFP
16-Stroubles Creek	VAW-N22R	Too early to determine	2006	DCR	RFP
Projects 16-20 are not receiving designated funding from WQIF, RFP or 319(h)					
17-Four Mile Run	VAN-A12R	No improvement	2002	DEQ	OTHER
18-Middle Creek/Tazewell County	VAS-P03R	Delisted 2006	N/A	DMME	OTHER
19-Quail Run/Rockingham County	VAV-B35R	Delisted 2005	N/A	DEQ	OTHER
20-Lynnhaven (Shellfish)	VAT-V08E	Too early to determine	2005	DEQ	OTHER
Projects 21-33 have received some WQIA RFP funds (and other funds as well)					
21-Chowan Study Area	VASC-K14R, K15R, K16R, VAP-K22R, K24R, K25R and K32R	Too early to determine	2005	DEQ	WQIF
22-Falling River	VAW-L34R	Too early to determine	2006	DCR/NRCS	WQIF
23-Mossy & Naked Creeks, Long Glade Run	VAV-B19R, B24R, B28R	Too early to determine	2006	DCR/NRCS	WQIF
24-Pigg River (Blue Ridge SWCD)	VAW-L14R, L15R, L16R, L17R	Too early to determine	2006	DCR/NRCS	WQIF
24-Pigg River (Pittsylvania SWCD)	VAW-L13R, L17R, L18R	Too early to determine	2006	DCR/NRCS	WQIF
26-Twittys and Ash Camp Creeks	VAC-L39R	Too early to determine	2006	DCR/NRCS	WQIF
27-Cub, Turnip and Buffalo Creek	VAC-L36R, L37R, L40R	Too early to determine	2006	DCR/NRCS	WQIF
28-Flat, Nibbs, Deep, West Creeks	VAP-J08R, J09R, J11R	Too early to determine	2006	DCR/NRCS	WQIF
29-Moffett Creek, Middle River, Polecat Draft	B10, B13, B15	Too early to determine	2006	DCR/NRCS	WQIF
30-Christians Creek & South River	B14, B30	Too early to determine	2006	DCR/NRCS	WQIF
31-Upper Clinch River	VAS-P01R	Too early to determine	2006	DCR/NRCS	WQIF
32-Spring et. al	VAC-J02R-J06R	Too early to determine	2006	DCR/NRCS	WQIF
33-Abrams& Opequon Creeks	VAV-B08R	Too early to determine	2006	DCR/NRCS	WQIF

2.4.1.1 - Pilot Projects:

(Middle Fork Holston River, Upper Blackwater River and North River). These three projects ended their 5-year implementation phase at the end of 2006 and all three will continue in 2007 for a sixth and

potentially final year of implementation funded through 319(h). All projects have shown some water quality improvements due to BMP installation. Two of the projects (Middle Fork and North River) had sub-watersheds nominated and accepted as Success Stories by EPA Headquarters for 2005 and 2006. It was primarily due to these successes that it was decided to fund a 6th year of implementation for these 3 projects to finish up contractual commitments for BMPs and to work towards de-listing in three watersheds that are close. During 2007 an analysis of implementation success will be completed for all 3 projects to determine the ability of furthering implementation to meet water quality standards. Please reference the Case Study Section later on in this report for more details on these projects.

2.4.1.2 - Non-Pilot §319(h) Projects:
DCR commenced three implementation projects in 2005 (Catoctin Creek, Holmans Creek and Willis River) and four additional projects in 2006 (Lower Blackwater River, Cooks Creek & Blacks Run, Big Otter River, and Thumb, Deep Carter and Great Runs). In 2007 DCR will begin 2 more §319(h) funded projects, bringing the total number of active TMDL Implementation Projects funded with §319(h) funds in 2007, to 12 watersheds.

2.4.2 - Funding of Implementation:

As the agency taking the lead in TMDL watershed implementation, DCR utilizes both state general funds and §319(h) funds to pay for DCR regional staff to provide project management and technical support to watershed stakeholders to implement these projects. Prior to July 2006, the only targeted funding available for TMDL implementation in Virginia has been from EPA's 319 program. This funding can be used to pay for agricultural BMPs, urban BMPs, and residential BMPs such as failing on-site septic systems, technical assistance (provided through Soil and Water Conservation Districts and local Health Departments) and outreach/technology transfer. In 2005 approximately over $1.3 million was spent on TMDL implementation. In 2006, over $1.9 million was spent on TMDL implementation for 10 projects.

Due to the limited amount of §319(h) funds available, Virginia identifies and leverages additional funding to fully implement the TMDLs, especially with regard to agricultural BMPs. Starting in July 2006, DCR began targeting a portion of the Water Quality Improvement Fund (WQIF) agricultural cost-share funds to eight (8) Soil and Water Conservation Districts to fund 15 implementation projects in 46 TMDL segments. In addition to the targeted cost-share, DCR allocated state general funds to provide technical assistance staff for these 8 districts to allow them to utilize the cost-share funds and get projects on the ground. Approximately $4,822,500 is contracted to Districts for Agricultural BMP installation for implementation of TMDLs during state fiscal year 2006-2008 (Table 6).

Table 6: Funding Summary for SWCD TMDL Targeted Implementation

District	TA	WQIF Cost-share	TOTAL
Blue Ridge	$ 110,000	$ 500,000	$ 610,000
Headwaters	$ 110,000	$ 627,500	$ 737,500
Lord Fairfax	$ 110,000	$ 360,000	$ 470,000
Piedmont	$ 220,000	$ 1,050,000	$ 1,270,000
Pittsylvania	$ 110,000	$ 600,000	$ 710,000
Robert E. Lee	$ 55,000	$ 250,000	$ 305,000
Southside	$ 110,000	$ 300,000	$ 410,000
Tazewell	$ 110,000	$ 200,000	$ 310,000
TOTAL	$ 935,000	$ 3,887,500	$ 4,822,500

These eight districts implement agricultural BMP to implement TMDLs for 46 segments for 57 impairments across Virginia (Table 7).

Table 7: WQIF Funded Targeted TMDL Implementation Projects

District	Basin	TMDL ID	Name	City/County	Miles	Impairment[a]
Blue Ridge	Roanoke	VAW-L14R	Upper Pigg River	Franklin	35.06	Bc
Blue Ridge	Roanoke	VAW-L14R	Story Creek	Franklin	11.66	Bc
Blue Ridge	Roanoke	VAW-L15R	Big Chestnut Creek	Franklin	12.88	Bc
Blue Ridge	Roanoke	VAW-L16R	Lower Pigg River	Franklin	28.92	Bc
Blue Ridge	Roanoke	VAW-L17R	Snow Creek	Franklin	10.98	Bc
Headwaters	Shenandoah/Potomac	VAV-B10R	Middle River	Augusta	15.71	Bc/Be
Headwaters	Shenandoah/Potomac	VAV-B13R	Moffett Creek	Augusta	8.95	Bc/Be
Headwaters	Shenandoah/Potomac	VAV-B14R	Christians Creek	Augusta	31.52	Bc/Be
Headwaters	Shenandoah/Potomac	VAV-B15R	Middle River	Augusta	18.12	Bc
Headwaters	Shenandoah/Potomac	VAV-B15R	Polecat Draft	Augusta	7.47	Bc
Headwaters	Shenandoah/Potomac	VAV-B19R	Mossy Creek	Augusta & Rockingham	9.65	Bc/Be
Headwaters	Shenandoah/Potomac	VAV-B24R	Long Glade Run	Augusta & Rockingham	10.74	Bc
Headwaters	Shenandoah/Potomac	VAV-B28R	Naked Creek	Augusta	3.74	Bc
Headwaters	Shenandoah/Potomac	VAV-B30R	South River	Augusta	11.79	Bc
Lord Fairfax	Shenandoah	VAV-B08R	Opequeon Creek	Clarke & Frederick	33.7	Bc/Be
Lord Fairfax	Shenandoah	VAV-B09R	Abrams Creek	Frederick & Winch.	10.8	Bc/Be
Piedmont	Chowan	VASC-K14R	Nottoway River	Nottoway & PE	17.76	Bc
Piedmont	Chowan	VASC-K15R	Little Nottoway River	Nottoway	9.85	Bc
Piedmont	Chowan	VASC-K16R	UT-Hurricane Branch	Nottoway	1.12	Be
Piedmont	James	VAC-J02R	Spring Creek	Prince Edward	5.5	Bc
Piedmont	James	VAC-J03R	Little Sandy Creek	Prince Edward	7.35	Bc
Piedmont	James	VAC-J04R	Bush River	Prince Edward	5	Bc
Piedmont	James	VAC-J05R	Briery Creek	Prince Edward	9.94	Bc
Piedmont	James	VAC-J06R	Saylers Creek	PE & Amelia	9.08	Bc
Piedmont	James	VAP-J08R	Flat Creek	Amelia	3.99	Bc
Piedmont	James	VAP-J09R	Nibbs Creek	Amelia	5.43	Bc
Piedmont	James	VAP-J11R	Deep Creek	Nottoway	18.67	Bc/DO
Piedmont	James	VAP-J11R	West Creek	Nottoway & Amelia	7.22	Bc
Pittsylvania	Roanoke	VAW-L13L	Leesville Lake	Pittsylvania	154 ac.	Bc
Pittsylvania	Roanoke	VAW-L13R	Old Womans Creek	Pittsylvania	4.86	Bc
Pittsylvania	Roanoke	VAW-L17R	Snow Creek	Pittsylvania	10.98	Bc
Pittsylvania	Roanoke	VAW-L18R	Pigg River	Pittsylvania	28.92	Bc
Robert E. Lee	Roanoke	VAC-L36R	Turnip Creek	Campbell	NA	Bc
Robert E. Lee	Roanoke	VAC-L37R	Cub Creek	Appomattox	NA	Bc
Robert E. Lee	Roanoke	VAW-L34R	Falling River	Campbell	17.92	Bc
Southside	Chowan	VASC-K14R	Big Hounds Creek	Lunenburg	10.35	Bc
Southside	Chowan	VASC-K14R	Nottoway River	Lunenburg	17.76	Bc
Southside	Roanoke	VAC-L36R	Turnip Creek	Charlotte	2.7	Bc
Southside	Roanoke	VAC-L37R	Cub Creek	Charlotte	14.21	Bc
Southside	Roanoke	VAC-L39R	Twittys Creek	Charlotte	7.24	Be
Southside	Roanoke	VAC-L39R	Ash Camp Creek	Charlotte	7.46	Be/Bc
Southside	Roanoke	VAC-L40R	UT-Buffalo Creek	Charlotte	2.88	Bc
Southside	Roanoke	VAW-L34R	Falling River	Charlotte	NA	Bc
Tazewell	New	VAS-N36R	Bluestone River	Tazewell	6.05	Bc/Be
Tazewell	New	VAS-N37R	Laurel Fork	Tazewell	2.91	DO/Bc/Be
Tazewell	Tennessee/Big Sandy	VAS-P01R	Upper Clinch River	Tazewell	5.5	Be

a - Impairments (Be)=Benthics, (Bc)=Bacteria

In addition to WQIF cost-share (WQIF) and the §319(h) funded projects, several other TMDL implementation plans are being implemented with other funding sources such as WQIF Request for Proposals (RFP) and local resources.

2.4.3 - Measurable Environmental Results:

It is generally too early to show water quality improvements and results for projects in the early stages of implementation (perhaps less then two years old). It should be noted that since 2001 when the three pilot projects were initiated, the State's water quality bacteria standard has been modified twice. In each case the revision has been more conservative and this has impacted the achievement of measurable progress for water quality improvements.

However there are several projects that are showing marked improvement in water quality (Table 8). For most of the projects it is to early in the implementation process to determine if there are water quality improvements. However Willis River may be an exception to that rule. This project has shown remarkable success in the short 18 months it has been active. A full description of this project can be found in the Case Studies Section of this report. Two of the projects first started by DEQ and/or DMME have resulted in removal from the 303(d) list in 2005 and/or 2006.

Table 8: Status of TMDL/ Watershed Implementation Projects

Watershed Area	TMDL Segment	Water quality Improvement	Year Start	Lead Agency	Funds Used
1-North River*	VAN-B21R, B22R, B27R & B29R	Moderate improvement in 2 of 4 subwatersheds	2001	DCR	§319(h)
2-Middle Fork Holston River*	VAS-O05R	Moderate improvement	2001	DCR	§319(h)
3-Upper Blackwater River	LAW-L08R	Some improvement	2001	DCR	§319(h)
4-Catoctin Creak	VAN-A-02R	Too early to determine	2005	DCR	§319(h)
5-Holmans Creek	VAV-B45R	Too early to determine	2005	DCR	§319(h)
6-Willis River	VAC-H36R	Some improvement	2005	DCR	§319(h)
7-Lower Blackwater River	VAW-L09R, L10R and L11R	Too early to determine	2006	DCR	§319(h)
8-Cooks Creeks & Blacks Run	VAV-B25R & B26R	Too early to determine	2006	DCR	§319(h)
9-Thumb, Great, Carter & Deep Runs	VAN-E01R, E02R & E10R	Too early to determine	2006	DCR	§319(h)
10-Big Otter River	VAW-L23R, L25R, L27R, & L28R	Too early to determine	2006	DCR	§319(h)
11-Mill and Dodd Creeks	VAW-N20R & N21R	Not started	2007	DCR	§319(h)
12-Little and Beaver Creeks	VAS-O07	Not started	2007	DCR	§319(h)
13-Moore's Creek	VAV-H28R	Too early to determine	2005	DCR	RFP
14-Guest River	VAS-P11R	Too early to determine	2005	DCR	§319(h), RFP
15-Opequeon Creek	VAV-B09R	Too early to determine	2006	DCR	WQIF, RFP
16- Stroubles Creek	VAW-N22R	Too early to determine	2006	DCR	RFP
17-Four Mile Run	VAN-A12R	No improvement	2002	DEQ	OTHER
18-Middle Creek/Tazewell County	VAS-P03R	Delisted 2006	N/a	DMME	OTHER
19-Lynnhaven (Shellfish)	VAT-V08E	Too early to determine	2005	DEQ	OTHER

(*) selected as a EPA Headquarters '319(h) Success Story'

2.4.3.1 - BMP Implementation:

The TMDL program and its partners work to achieve water quality standards by reducing pollution through installing the BMPs that are established in the implementation plan. BMPs are effective and practical ways to prevent or reduce pollution from nonpoint sources to ensure water quality. They can range from repairing and/or installing septic systems, stream fencing, and planting riparian buffers. For the most part all projects were very successful in continuing their installation of BMPs. From October 2005 through December 2006, 10 active 319 projects installed 274 BMPs using 319 funds. Table 9 summarizes the BMPs installed for all ten projects funded through 319(h) during 2006.

Table 9: Section 319(h) TMDL Implementation Projects – BMP Installation October 2005-December 2006																
Type	NM- 3	RB-1	RB-2	RB-3	RB-4	RB-5	SL-1	SL-6	SL-8	SL-8b	WP-2A	WP-2B	WP-2T	WP-4	WP-4B	Total
Middle Fork Holston River		27		1	1		3	6		15	1			2		56
Upper Blackwater River					2	1		3							3	9
North River	3	15		5	2	2	2	1	3	53					2	88
Catoctin Creek		2		4	2	1		3					8			20
Holmans Creek		40		6	3	1		1			1	1				53
Willis River		5						13								18
Cooks Creek and Blacks Run		5	2	2		1	1			4						15
Lower Blackwater River					1			3								4
Big Otter River								9								9
Thumb, Deep, Carter and Great Runs								2								2
Total	3	94	2	18	11	6	6	41	3	72	2	1	8	2	5	274

Note: Definition of BMPs installed

NM-3: Sidedress Application of Nitrogen on Corn
RB-1: Septic Tank Pumpout
RB-2: Connection of Malfunctioning On-site Sewage Disposal System or Straight Pipe to Public Sewer
RB-3: Septic Tank System Repair
RB-4: Septic Tank System Installation/Replacement
RB-5: Alternative On-site Waste Treatment Systems
SL-1: Permanent Vegetative Cover on Cropland
SL-6: Grazing land Protection
SL-8: Protective Cover for Specialty Crops
SL8B: Small Grain Cover Crop for Nutrient Management
WP-2A: Streambank Stabilization
WP-2B: Stream Crossings and Harden Access
WP-2T: Animal Waste Control Facility
WP-4: Animal Waste Control Facility
WP-4B: Loafing Lot Management System

2.4.3.2 - Pollution Reductions:

Documenting success and results is important for tracking progress towards full implementation of a TMDL and the eventual de-listing of a particular stream. To track accomplishments, EPA developed Program Activity Measures (PAMs) for all states to report progress and document the success of their nonpoint source pollution control programs. PAM 2, 3, and 4 and WQ-16 are to report "Estimated annual reduction in lbs/tons of nitrogen, phosphorous, and sediment from nonpoint sources to waterbodies.

The TMDL program and its partners work to achieve water quality standards by reducing pollution through installing the BMPs that are established in the implementation plan. BMPs are effective and practical ways to prevent or reduce pollution from nonpoint sources to ensure water quality. They can range from repairing and/or installing septic systems, stream fencing, and planting riparian buffers. Dozens of voluntary and government funded BMPs are also used throughout the watersheds. In 2006, the ten active TMDL implementation projects all achieved various levels of success in implementing BMPs, on-the-ground activities, and progress towards full implementation of their IPs to achieve the ultimate goal of delisting.

The reduction of pollutants through the installation of BMPs is an important part of the TMDL Implementation Projects. Table 10 summarizes the pollutant loads from BMPs implemented during the years 2002-2006 (funded through 319(h) Federal Fiscal Year Grants FFY01-FFY05).

Table 10: Section 319(h) - Pollutant Load Reductions By Project and Program Area July 1 2002-December 31, 2006					
Project Title	**Calendar Year**	**Pathogens (Coliform) CFU**	**Nitrogen lbs/yr**	**Phosphorus lbs/yr**	**Sedimentation-Siltation tons/yr**
Middle Fork Holston TMDL Project	2002-2004	6.40E+15	230.35	4.27	9.35
	2005	2.60E+14	799.5	198.1	63.9
	2006	2.58E+15	6,804.32	1,087.09	1,191.99
	Sub-Total	**7.20E+15**	**7,814.95**	**1,287.77**	**1,264.85**
Blackwater River TMDL Project	2002-2004	2.89E+15	212.01	7.96	7.24
	2005	1.80E+15	46	2.9	1.4
	2006	1.00E+15	22.06	2.9	4.1
	Sub-Total	**5.69E+15**	**274.41**	**13.76**	**12.74**
North River TMDL Project	2002-2004	3.36E+15	319.24	25.99	26.88
	2005	1.02E+15	1,686.10	307.5	192
	2006	4.76E+14	5,756.60	1,145.90	498.7
	Sub-Total	**4.86E+15**	**7,761.94**	**1,479.39**	**717.58**
Catoctin Creek TMDL Project	2005	3.15E+13	225.9	43.2	27.7
	2006	1.07E+14	84.48	1.71	0.59
	Sub-Total	**1.39E+14**	**282.6**	**44.7**	**28.2**
Holmans Creek TMDL Project	2005	4.73E+10	924.5	181.9	110
	2006	3.47E+14	88.7556	0.1	0.03
	Sub-Total	**3.47E+14**	**1,002.70**	**182**	**110.03**
Willis River TMDL Project	2005-2006	2.70E+15	43.59	7.56	1.76
	Sub-Total	**1.40E+15**	**28.8**	**5.1**	**1.19**
Cooks Creek and Blacks Run TMDL Project	2006	2.44E+11	851.46	79.31	50.82
	Sub-Total	**4.73E+10**	**826.36**	**79.31**	**50.82**
Lower Blackwater TMDL Project	2006	9.56E+14	188.49	10.58	2.66
	Sub-Total	**8.52E+14**	**177.57**	**10.58**	**2.44**
Thumb, Deep, Carter and Great Runs TMDL Project	2006	1.905E+14	15.65	6.08	4.48
	Sub-Total	**1.91E+14**	**15.65**	**6.08**	**4.48**
Big Otter River TMDL Project	2006	9.35E+14	39.14	7.04	1.62
	Sub-Total	**9.35E+14**	**39.14**	**7.04**	**1.62**
TMDL 2006 Total	**TOTAL**	**9.30E+15**	**13894.54**	**2348.26**	**1756.75**
TMDL 2002-2006	**Grand Total**	**2.16E+16**	**18,224.11**	**3,115.73**	**2,193.95**

2.4.4 - Watershed Restoration and Delisting

EPA has issued targets to each state to achieve various program activity measures that will help us track our progress towards watershed restoration. **Goal 2**: Safe and Clean Water - Ensure drinking water is safe. **Objective 2**: Protect Water Quality. **Program Measure**: WQ-17 Waterbodies identified by States (in 2000 or subsequent years) as being primarily NPS-impaired that will be partially or fully restored (cumulative) by 2008 and 2012. As of the end of 2006 Virginia is still in progress for meeting these deadlines. As of 2006, 65 free-flowing segments have been approved by EPA de-listing from the Consent Decree since 2002 (Table 11)

Table 11: Delisting of 303(d) Consent Decree Waters 2002-2006 (non-shelfish)

Year	Waterbody ID	USGS HU	Stream	CityCounty	River Basin	Length	Units	Pollutant	Source	Delist
2006	VAT-D07E	02080108	Lake Wesley	Virginia Beach	Bay/CoastAL			DO		T
2006	VAT-D02R	02080110	Petit Branch	Accomack	Bay/CoastAL	1.25	Miles	NH3	UNK	T
2004	VAT-K36R	03010202	Blackwater River	Southampton, Isle of Wight	Chowan	7.41	Miles	pH	Nat. Cond.	T
2006	VAT-K40R	03010205	Northwest River		Chowan			DO, pH		T
2004	VAT-K30R	03010201	Nottoway River	Southampton	Chowan			DO	Nat. Cond.	T
2004	VAP-K07R	03010204	Roses Creek	Brunswick, Alberta	Chowan	3.15	Miles	FC/BC	NPS/PS	PARTIAL
2007	VAP-K22R	03010201	Sappony Creek	Dinwiddie, Sussex	Chowan	20.19	Miles	DO	Nat. Cond.	T
2006	VAT-K35R	03010202	Seacock Swamp (Lower)	Sussex	Chowan	2.47	Miles	pH	Nat. Cond.	T
	VAT-K27R	03010201	Three Creek	Southampton	Chowan	10.91	Miles	DO, pH	Nat. Cond.	T
	VAP-G03R	02080206	Bailey Creek	Hopewell City	James	7.8	Miles	DO/FC	UNK	PARTIAL
2006	VAV-I31R	02080202	Bratton Run	Rockbridge	James	11.06	Miles	Temp	Nat. Cond.	T
2006	VAC-H12R	02080203	Buffalo River	Nelson	James	2.45	Miles	BC	UNK	T
2004	VAV-I35R	02080202	Cedar Grove Branch	Rockbridge	James	4.71	Miles	FC	NPS	T
	VAP-G06R	02080206	Chickahominy River	Hanover, Henrico	James	10.3	Miles	DO, pH	UNK, Nat.	F
2007	VAP-G08E	02080206	Chickahominy River	Charles City, James City	James	1.31	Sq Mi	pH	UNK	T
2006	VAT-G10R	02080206	College Run	Surry	James	6.22	Miles	DO	Nat. Cond.	T
	VAP-H33R	02080205	Deep Creek	Powhatan	James	11.2	Miles	DO	UNK	T
2004	VAP-G09R	02080206	Diascund Creek	New Kent	James	6.89	Miles	pH	Nat. Cond.	T
2008	VAT-G12R	02080208	Eley Swamp	Suffolk	James	4.4	Miles	pH	Nat. Cond.	F
2006	VAV-I28R	02080201	Elk Creek	Rockbridge	James	6.21	Miles	Temp	Nat. Cond.	T
	VAP-G02R	02080206	Fourmile Creek	Henrico	James	3.2	Miles	pH/FC	UNK/Natural	T
	VAP-G03R	02080206	Gunns Creek	Charles City	James	4.64	Miles	pH	Nat. Cond.	T
	VAW-I09R	02080201	Jackson River	Alleghany, Covington	James	0.55	Miles	FC/BC/DO	NPS/PS	PARTIAL
	VAW-I09R	02080201	Jackson River	Alleghany, Covington, Clifton Forge	James	24.09	Miles	FC/BC/DO	NPS/PS	PARTIAL
2002	VAW-H01R	02080203	James River	Bedford, Amherst	James	5.71	Miles	FC	NPS	T
2000	VAV-I33R	02080202	Kerrs Creek	Rockbridge	James	11.49	Miles	BC	NPS	T
2006	VAC-H17R	02080203	Little Georgia Creek	Buckingham	James	6.03	Miles	FC	UNK	T
2004	VAV-I35R	02080202	Mill Creek	Rockbridge	James	8.6	Miles	FC	NPS	T
	VAP-G08R	02080206	Morris Creek	Charles City	James	7.73	Miles	DO,pH/FC	UNK	T
2006	VAV-H27R	02080204	N.F. Rivanna River	Albemarle	James	6.35	Miles	BC	UNK	T
2006	VAV-H10R	02080203	Piney River	Nelson	James	11.04	Miles	FC	UNK	T
2002	VAV-H29R	02080204	Rivanna River	Albemarle, Fluvanna	James	13.13	Miles	FC	NPS	T
2000	VAV-H16R	02080203	Rockfish River	Nelson County	James	4.87	Miles	BC	UNK	T
2002	VAV-H26R	02080204	S.F. Rivanna River	Albemarle, Charlottesville	James	3.58	Miles	FC	UNK	T
2007	VAP-J16R	02080207	Swift Creek	Chesterfield	James	1.61	Miles	DO	Nat. Cond., UNK	T
2007	VAT-G11E	02080206	Warwick River	Newport News	James	0.21	Sq Mi	FC	UNK	T
	VAP-G06R	02080206	White Oak Swamp	Henrico	James	6.7	Miles	pH/FC	UNK	F
2006	VAS-N02R	05050001	New River	Grayson	New	0.6	Miles	BC	UNK	T
2006	VAV-B18R	02070005	Beaver Creek		Potomac/Shenadoah			BC		T
2006	VAV-B52R	02070006	Cedar Creek	Shenandoah	Potomac/Shenadoah	18.94	Miles	Temp	Nat. Cond.	T
2004	VAV-B21R	02070005	Dry River	Rockingham	Potomac/Shenadoah	2.86	Miles	Temperature	Nat. Cond.	T
2008	VAV-B06R	02070004	Hogue Creek	Frederick	Potomac/Shenadoah	16.76	Miles	Temp	Nat. Cond.	T
	VAV-B45R	02070006	North Fork Shenandoah River	Rockingham , Shenandoah, Broadway, Timberville, Mt. Jackson	Potomac/Shenadoah	4.86	Miles	BC	NPS	T
2004	VAV-B22R	02070005	North River	Rockingham	Potomac/Shenadoah			Nitrate		T
2004	VAN-E10R	02080103	Alcotti Run	Stafford	Rappahannock	1.94	Miles	FC	UNK	T
	VAP-E23R	02080104	Cat Point Creek	Richmond	Rappahannock	3.1	Miles	pH	UNK	F
2004	VAN-E20R	02080104	Claiborne Run	Stafford	Rappahannock	5.19	Miles	FC	UNK	T
2000	VAN-E09R	02080103	Mountain Run	Culpeper	Rappahannock	7.58	Miles	FC/BC	UNK	PARTIAL
2006	VAN-E06R	02080103	Thorton River	Rappahannock	Rappahannock	5.4	Miles	FC	UNK	T
2006	VAC-L71R	03010105	Banister River	Halifax	Roanoke	12.26	Miles	FC	UNK	T
2002	VAW-L42R	3010103	Dan River	Patrick	Roanoke	10.16	Miles	FC	NPS	T
2006	VAC-L57R	03010103	Dan River	Pittsylvania	Roanoke	14.42	Miles	FC	UNK	T
2002	VAW-L42R	03010103	Dan River	Patrick	Roanoke	10.16	Miles	FC	NPS	T
2004	VAC-L41R	03010102	Difficult Creek	Halifax	Roanoke	5.8	Miles	FC	UNK	T
2002	VAW-L61R	03010104	Fall Creek	Danville City	Roanoke	12.18	Miles	FC	NPS	T
2004	VAW-L08R	03010101	Middle Blackwater River	Franklin	Roanoke	15.78	Miles	FC/BC	NPS	PARTIAL
2006	VAW-L12L	03010101	Smith Mountain Lake	Bedford	Roanoke	8650	Acres	DO	Stratification	T
	VAS-P21R	06010206	East and West Batie Creek	Lee	Tennessee/Big Sandy	0.74	Miles	DO	NPS	T
2002	VAS-Q11R	05070202	McClure River	Dickenson	Tennessee/Big Sandy	14.25	Miles	FC	NPS	T
2006	VAS-P03R	06010205	Middle Creek	Tazewell	Tennessee/Big Sandy	10.7	Miles	BC	MINE	T
2004	VAS-O09R	06010101	North Fork Holston River	Smyth	Tennessee/Big Sandy	5.69	Miles	BC	NPS	T
2004	VAS-O13R	06010101	North Fork Holston River	Scott County	Tennessee/Big Sandy	5.2	Miles	FC	NPS	T
2006	VAN-F06R	02080106	North Fork Hickory Creek	Louisa	York			pH		T
2006	VAP-F12R	02080106	Pamunkey River	Hanover	York	18.85	Miles	FC	UNK	T

2.4.5 - Water Quality Improvements and Future Actions

A growing challenge for the program is the transition from developing TMDLs to actual water quality improvements. Virginia has been operating to implement TMDLs using existing nonpoint source programs and funding sources despite glaring inadequacies in staff and funding to handle the volume of TMDLs. Existing resources include regulatory permitting programs from DEQ, DCR 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 grant funding for the implementation of best management practices and technical assistance in watersheds with approved implementation plans.

As a result of the Governor's Natural Resources Partnership Agenda, DEQ, DCR, VDACS and VDH began discussions and development of strategies to identify and replace straight pipes on impaired streams and to utilize the Agricultural Stewardship Act to correct pollution sources on impaired streams. These efforts were being coordinated with the state's Watershed Permitting and Planning Task Force but an overall strategy has not been officially adopted and there was no activity regarding this action in 2006. DEQ is the lead agency for this effort

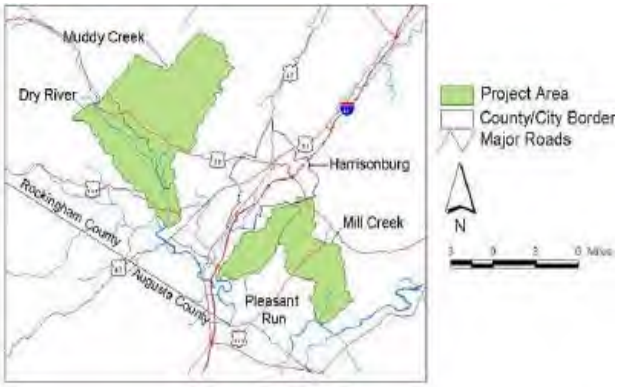
Despite the challenges, Virginia's TMDL program has shown that properly applied and maintained best management practices result in measurable improvements in water quality. It will be the goal of Virginia's natural resource agencies to work with the general public to take this success to the next level by successful remediation of some impaired streams within the next few years.

3.0 - Case Studies: Summary of On-Going TMDL Implementation

This section provides more detailed information on several of the completed IPs including a summary of the best management practices currently in place and water quality changes over the past 10 years (approximate). The TMDL IP watersheds discussed in this section include North River, Middle Fork Holston River, Willis River, and Blackwater River which are largely rural watersheds dominated by agricultural non-point source pollution. Other implementation projects include a discussion on the Batie Creek Project. Calendar year 2006 was the fifth year of BMP implementation for the three "pilot" TMDL implementation projects that were initiated in late 2001. These projects are based on TMDL implementation plans that were developed for bacteria impairments on 13 stream segments. The pollution load reductions and the number of BMPs implemented in the North River, Blackwater River, and Middle Fork Holston River watersheds from 2001 through 2006 are summarized in Tables 9-10 of the previous section. The specific BMPs by impaired stream segment and the load reductions achieved are provided to EPA Region III semi-annually.

3.1 - North River TMDL Implementation Project 2001-2006

3.1.1 – Project Location



In 2006 DCR, in conjunction with the Shenandoah Valley Soil and Water Conservation District (SVSWCD) in Rockingham County, Virginia, completed its fifth year of a 5-year TMDL implementation project to reduce fecal coliform, and nitrate levels and address benthic impairments in four creeks that drain to the North River (Dry River, Muddy Creek, Pleasant Run, and Mill Creek) through implementation of agricultural and residential BMPs in accordance with previously published and approved TMDLs and a TMDL watershed IP. North River is a tributary of the South Fork of the Shenandoah River (HUC 02070005), which in turn is a tributary of the Potomac River, which discharges into the Chesapeake Bay. The project area is located approximately 3-5 miles west or southwest of Harrisonburg, VA, in Rockingham County. Figure 2 illustrates the North River TMDL Project area.

3.1.2 - Implementation Highlights

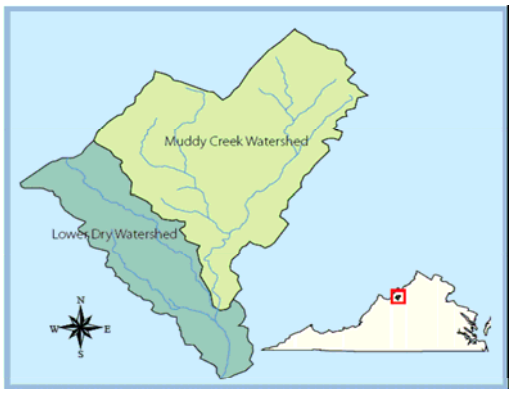
TMDL staff at the Shenandoah Valley SWCD has been successful in working with the community within the North River TMDL area as a result of continued mailings, educational programs, and public update meetings regarding the participation in the project, water quality improvements, and future plans for implementation. To date, 114 cost-share contracts have been written, 256 individuals have attended educational and outreach activities and 452 farms visits have been made. BMP implementation activities for the North River TMDL Project are summarized in Table 12.

Table 12 - BMP Summary for the North River Watershed (October 1, 2001-December 31, 2006)

Control Measure	Units	Unit Needs	Project Total	% Target
Agriculture Program				
Stream Exclusion Fencing	Feet	612,480	60,720	10%
Vegetative Cover on Critical Areas	Acres	5,154	2,259	44%
Forested Riparian Buffer	Acres	n/a	26.5	
Nutrient Management Practices	Acres	n/a	515.1	
Cover Crop	Acres	n/a	587.9	
Vegetative Cover on Cropland	Acres	n/a	60.3	
Animal Waste Control Facility	System	n/a	1	
Loafing Lot Management	System	n/a	6	
Residential Program Septic System Pump Out	System		27	
Septic System Repair	System	10	12	120%
Sewer Connections	System		0	
Septic System Installation	System	17	5	29%
Alternative Waste Treatment System	System	27	5	19%
Total On-Site System Installation	System	54	22	

3.1.3 - Muddy Creek and Lower Dry River:

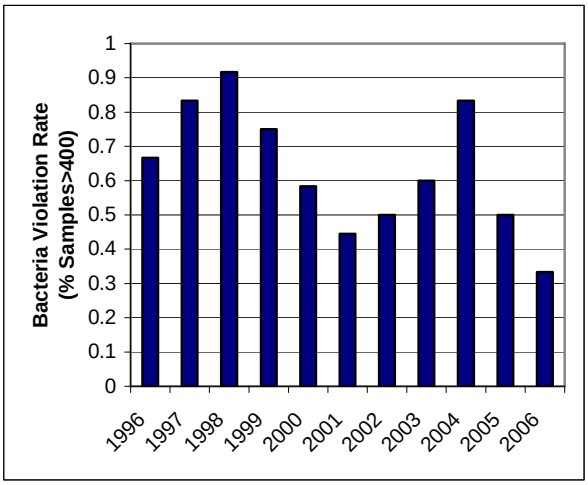
In 2006 the North River Project received a big honor by having its sub-watershed projects in the Muddy Creek and Lower Dry River selected as a "Success Story" by EPA Headquarters in Washington, DC. Part of the reason for this honor is due to the fact that Lower Dry River water quality results show that the watershed is approaching the 10% violation rate threshold for 303(d) listing of bacteria impairments. According to DEQ monitoring data throughout the Shenandoah Valley from 1995-2000 and 2000-2004 (47 stations total), Dry River ranked as the 5th most improved stream and Muddy Creek the 6th most improved in the Valley. A DEQ comparison violation rates before and after TMDL activities commenced shows a marked decrease in the violation rate for bacteria.



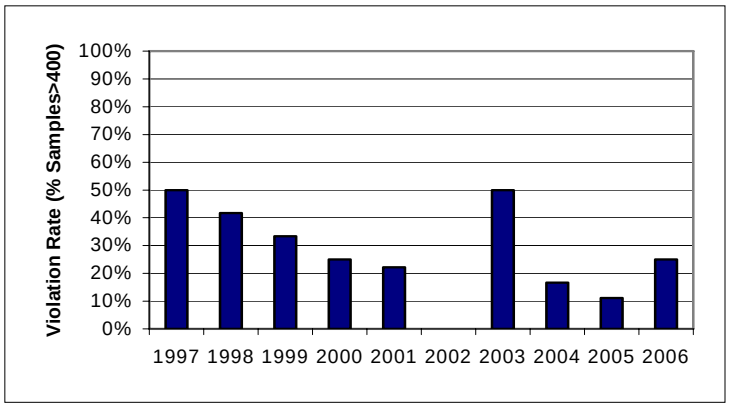
Residential and agricultural successes have largely been the result of partnerships between the Shenandoah Valley Soil and Water Conservation District (SVSWCD) and several state agencies including the Virginia Departments of Conservation and Recreation and Environmental Quality, Virginia Cooperative Extension, Rockingham County Farm Bureau, and USDA - Natural Resources Conservation Service. Numerous tours have been held to promote the agricultural and residential BMPs offered under the TMDL implementation plan, along with presentations at civic clubs throughout the watersheds, postcard mailings advertising the program, personal contacts with farmers and residents, and meetings updating the community about the water quality improvements. As of March 2007, there has been 11.5 miles of livestock stream exclusion fencing installed in the Muddy Creek and Lower Dry River watersheds along with an average of 1,200 acres per year of cover crops planted for uptake of nutrients. Over 80% of the exclusion fencing installed in the watersheds was done voluntarily without the use of cost share funds. Homeowners have also played a large role in the improvements made in water quality in these areas. Since 2002 there have been thirty septic tank pump-outs, twenty septic system repairs and replacements, and five alternative waste treatment systems installed to replace failing septic systems and straight pipes.

3.1.3.1 - Water Quality Improvements

The Virginia Department of Environmental Quality (DEQ) monitors the impaired streams through the agency's ambient monitoring program. Significant improvements in violation rates of the bacteria standard have since been observed, with Muddy Creek dropping from a high of a 90% violation rate in 1998 to a 32% violation rate in 2006 (Figure 2.). Similar improvements were observed in the Dry River, which dropped from its highest violation rate of 50% in 1997 to 25% in 2006.



Above: Violation rate of the 400 colony forming units/100 ml standard for fecal coliform in Muddy Creek



Left: Violation rate of the 400 colony forming units /100 ml standard for fecal coliform in Lower Dry River.

Probably the best news in monitoring results yet is the trend in the North River itself, which benefits from the combined efforts in all upstream tributaries. Of the 13 samples collected in the two years from 2004 and 2005, none of the samples violated the bacteria water quality standard.

3.1.3.2 - Voluntary BMP Installation:

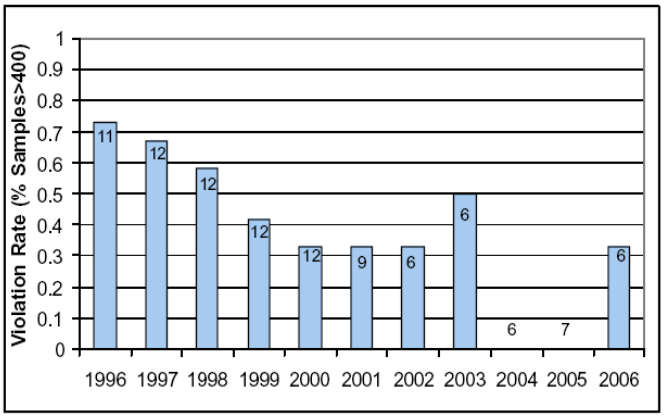
Voluntary fencing in Muddy Creek

As of March 2006, there has been 11.5miles of exclusion fencing installed in the Muddy Creek and Lower Dry River watersheds along with an average of 1200 acres per year of cover crops planted for uptake of nutrients. Over 80% (8.3 miles) of the exclusion fencing installed in the watersheds was done voluntarily without the use of cost share funds. Homeowners have also played a large role in the improvements made in water quality in these areas. Over the past four years, there have been thirty septic tank pump-outs, thirteen septic system repairs and replacements, and five alternative septic system installations to replace failing septic systems. The Old Order Mennonite communities in which extensive voluntary best management practices, such as stream exclusions and crossings, loose housing barns, and numerous manure storage units have been installed have displayed a stewardship ethic in implementing pollutant source reductions. These practices have greatly influenced improvements in water quality seen throughout the TMDL implementation project. Due to religious beliefs, this community does not accept any financial assistance for installing BMPs. However, the community strongly recognizes the connection between land use and water quality and took the initiative to install environmentally friendly practices to control runoff from nutrients and sediment from entering the streams.

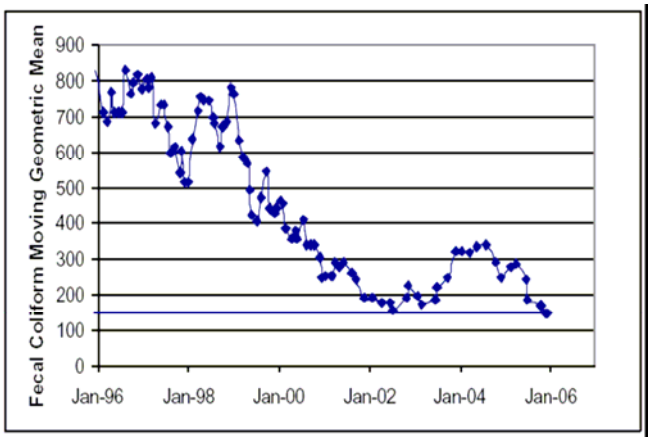
3.1.4 - Impacts of Implementation:

Though the North River itself is not directly included in the Implementation Plan, implementation activities in the North River tributaries have benefited the water quality of the North River itself.

"North River has had no bacteria violations in 2004 and 2005. In 2006 two of six samples violated water quality standards. Durting the past 10 years, fecal coliform concentrations have exceeded the water quality standard 39% of the time. When comparing earlier data in the watershed (1997-2001) to more recent data (2002-2006), however, the average of the yearly violation rates drops from 47% for 1997-2001 to just 23% for 2002-2006. This is the greatest decrease in fecal coliform violation rates within the North River IP area, and it represents the cumulative impact of implementation activities in the contributing tributaries. 2004 and 2005 both show a 0% violation rate. The rolling geometric mean indicates that fecal coliform concentrations have continued to steadily decline throughout this period." - Excerpted from DEQ *"TMDL Program Six Year Progress Report: 2000-2006"*



Violation Rate of Fecal Coliform in the North River 1996-2006

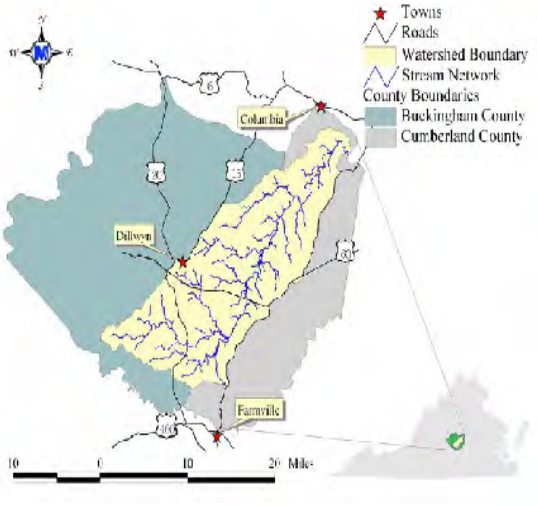


Moving Geometic Mean of Fecal Coliform in the North River 1996-2006

3.2.0 - Willis River TMDL Implementation Project 2005-2006

3.2.1 – Project Location

In 1996, the Willis River was placed on the Commonwealth of Virginia's 1996 303(d) list because of violations of the fecal coliform bacteria water quality standard. The fecal coliform TMDL for the Willis River watershed was completed in 2002. In 2005, DCR and Peter Francisco Soil and Water Conservation District, with extensive input, started a 5-year TMDL project to reduce fecal coliform levels in the Willis River through implementation of agricultural and residential BMPs in accordance with an approvable TMDL IP. The Willis River (HUC 02080205, VAC-H36R-01) is part of the James River Basin, located in Cumberland County and Buckingham County, Virginia.



3.2.2 - Implementation Highlights

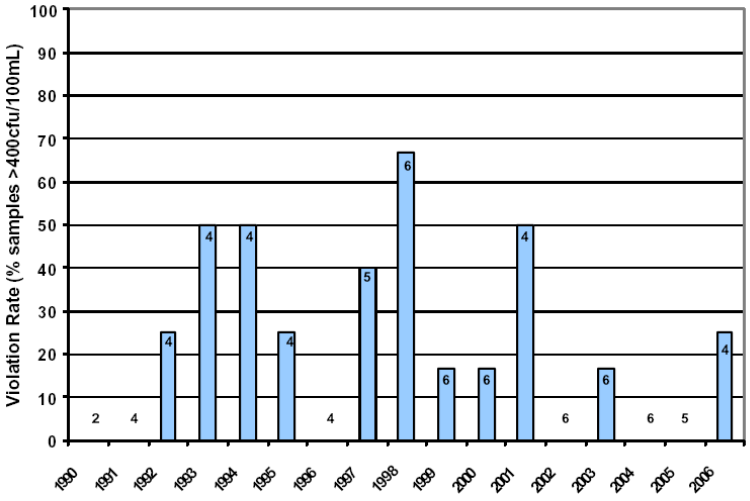
In July of 2005 implementation efforts began in earnest. As of March 2007 there was 18 miles of livestock exclusion stream fencing installed or contracted, removing 2,500 livestock units from having direct stream access. One loafing lot management system was contracted; seven septic tank pumpouts, one septic system repair and two septic system installations were contracted or completed.

Best Management Practice	Units or extent
Livestock stream exclusion	18 miles
Livestock loafing lot management systems	1 system
Septic tank pumpouts	7 systems
Septic system repairs	1 systems
Septic system replacements	2 systems

BMPs contracted or installed in the Willis River from August 2005 through March 2007.

3.2.3 - Water Quality Improvements

The Virginia Department of Environmental Quality (DEQ) monitors the impaired streams through the agency's ambient monitoring program. The chart to the left shows violation rates of the bacteria standard from the period of 1990 through 2006 are shown for each year. Yearly violation rates dropped following the TMDL development in 2002. No violations of the bacteria water quality standard were recorded in 2002, 2004, or 2005. The rate rebounded slightly in 2006. This overall watershed is approaching the 10% violation rate threshold for delisting the Willis River from the Impaired Waters List. The middle section of the river from the confluence with Tongue Quarter Creek to the confluence with Buffalo Creek (18.03 miles) is a de-list candidate in 2006 because data shows that bacteria levels are now below the violation threshold.



Violation rate of the 400 colony forming units per 100 ml standard for fecal coliform in Willis River

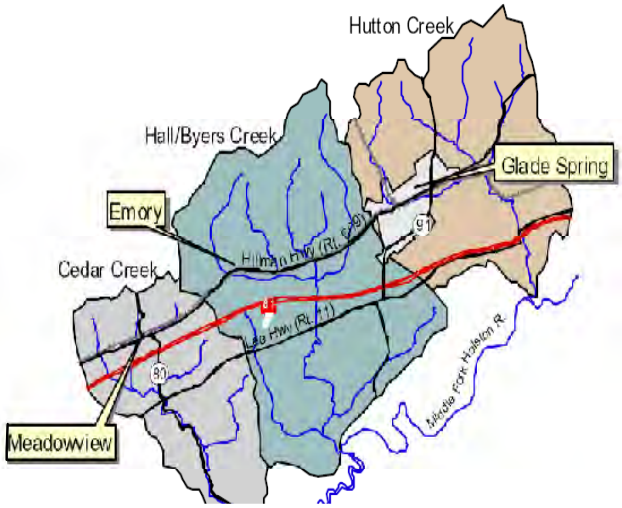
3.3 - Middle Fork Holston River TMDL Implementation Project 2001-2006

3.3.1 - Background

Cedar, Hall/Byers and Hutton Creeks were placed on the Virginia 303(d) List of Impaired Waters in 1998 for violations of the bacteria water quality standard and for general standard - benthic impairments due to excess inputs of sediment. Various agricultural and residential best management practices (BMPs) have been installed through a TMDL implementation project initiated by the Virginia Department of Conservation and Recreation (DCR) in 2001. These BMPs address primarily livestock and cropland management, and the improvement of on-site sewage disposal at residences in the watersheds.

3.3.2 - Project Area

Cedar, Hall/Byers and Hutton Creeks (also known as Three Creeks), are located in southwest Virginia in Washington County approximately 10 miles east of Abingdon (Figure 1). All three creeks drain to the Middle Fork Holston watershed in the Tennessee/Big Sandy River Basins. The Cedar, Hall/Byers and Hutton Creek watersheds consist of 21,770 acres and the predominant land uses are agriculture (69%), urban and residential land (13%) and forest (18%). The total number of livestock in the watersheds (primarily dairy cattle and beef) is 6,590. There are a total of 1,139 residents and businesses in the watersheds served by septic systems.



Fiaure 1. *Three Creeks Proiect Area*

3.3.3 - Implementation Highlights and Water Quality Improvements

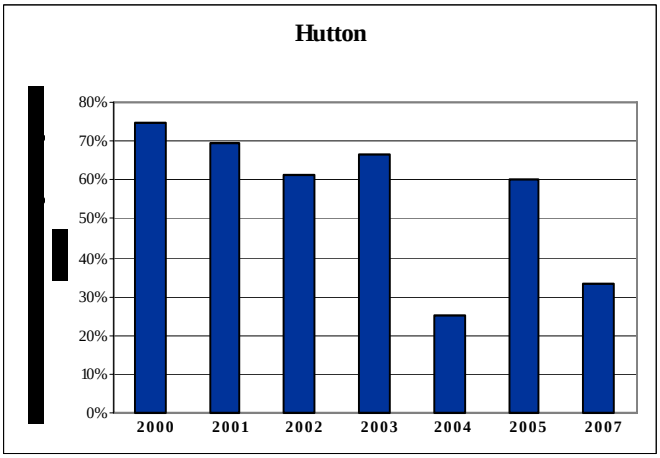
As of March 2007, there has been 20 miles of livestock stream exclusion fencing installed in the Three Creeks watersheds along with 821 acres of cover crops planted to reduce sediment runoff from cropland (Figure 2). The implementation plan calls for 39 miles of stream fencing. Obviously, reaching 20 miles of exclusion to date is the result of a high level of livestock producer participation. Each agricultural producer in the project area has personally been contacted about the water quality impairments and what corrective actions are needed. Homeowners have also played a large role in the improvements made in water quality. Since 2002 there have been 231 septic tank pump-outs, 15 septic system repairs, seven septic system installations for failures or straight pipes, one alternative waste treatment systems installed, and four dwellings connected to public sewer.

Best Management Practice	Units or extent
Livestock stream exclusion	20 miles
Animal waste storage facility	3 system
Cover crops	821 acres
Septic tank pumpouts	231 systems
Sewer connections	4 systems
Septic system repairs	15 systems
Septic system replacements	7 systems
Alternative waste treatment systems	1 system

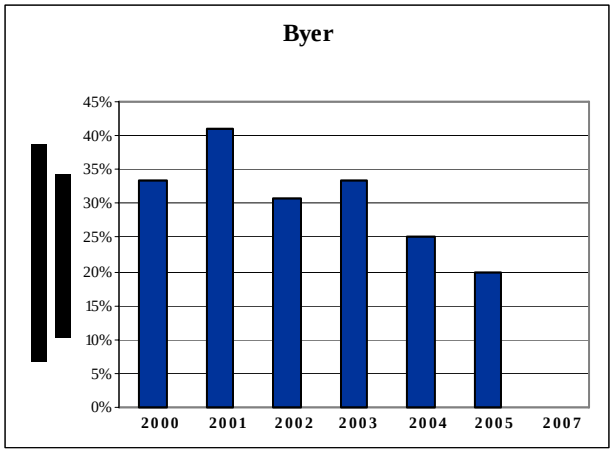
BMPs installed in Three Creeks Project area from January 2002 through March 31, 2007

The Virginia Department of Environmental Quality (DEQ) monitors the impaired streams through the agency's ambient monitoring program. Significant improvements in violation rates of the bacteria standard have since been observed in all three watersheds. For example, in Hall/Byers Creek the bacteria violation rate dropped from a high of a 41% in 2001 to a 20% violation rate in 2006. There have not been any violations in 2007 to date. Improvements were observed in Hutton Creek with

the bacteria violation rate dropping from 75% in 2000 to 25% in 2004. The violation rate in 2007 has been 33% to date.



Violation rate of the 1,000 colony forming units per 100 ml standard for fecal coliform in Hutton Creek



Violation rate of the 1,000 colony forming units/100 ml standard for fecal coliform in Hall/Byers Creek

3.3.4 - Partners and Funding

The Holston River Soil and Water Conservation District (HRSWCD) agreed to take on the responsibility of overseeing both the agricultural and residential programs during the implementation project. Two full-time staff positions have been funded at HRSWCD to work with landowners in the project area. Several partners have contributed to the success of this project including the HRSWCD, DCR, DEQ, Natural Resources Conservation Service, Tennessee Valley Authority, and the U.S. Fish and Wildlife Service. Since 2002, $2.2 million dollars of state and federal cost-share funds has been spent in the Three Creeks project area. A large percentage of these funds were directed to several large animal waste facilities on dairy and beef operations.

Installation of alternative waste treatment system

Livestock stream exclusion and riparian buffer along Hutton Creek

3.4.0 – Upper Blackwater River TMDL Implementation Project 2001-2006

3.4.1 – Watershed Description and Water Quality Conditions

The project area focuses on a portion of the Blackwater River Watershed, located in Franklin County, Virginia and approximately 15 miles south of Roanoke. The area contains four watersheds – North and South Forks of the Blackwater River Fork, Upper Blackwater River and Middle Blackwater River, which ultimately drain into Smith Mountain Lake, a reservoir of the Roanoke River. The Roanoke River flows southeast through two additional reservoirs, eventually emptying into the Abermarle Sound. The entire project area consists of 70,303 acres and the predominant land uses are forest (64%), agriculture (32%) and residential land (4%).

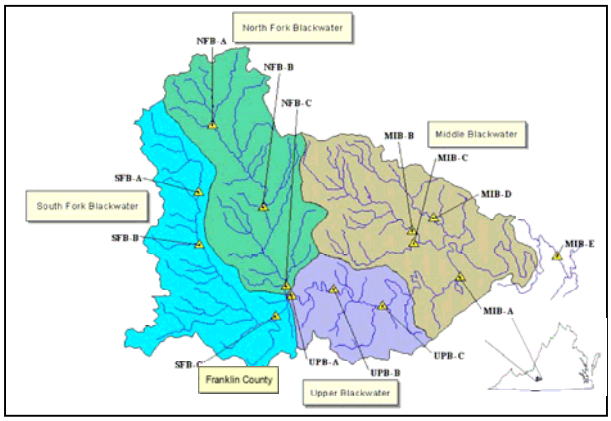


Figure 1. *Upper Blackwater River TMDL Project*

In 1998, the North Fork, South Fork, Upper and Middle Blackwater River were placed on the Virginia 303(d) List of Impaired Waters for violations of the fecal coliform water quality standard, and the North Fork and Upper Blackwater were listed for violations of the general standard – benthic impairments. The fecal coliform TMDLs were completed in 2000 and the benthic TMDLs were approved in 2004.

3.4.2 – Implementation and WQ Highlights

The level of agricultural participation in the Upper Blackwater TMDL Project has not been significant, 19 BMPs have been installed over the life of the project. The implementation plan calls for 70 miles of stream fencing. Despite lower levels of participation, as of March 2007, there has been 8 miles of livestock stream exclusion fencing installed in the four Blackwater River watersheds (Table 1). Participation in this project has allowed us to meet more then 10% of our goal for livestock exclusion. Over the last 5-year, 29 residential practices, or 193% of the TMDL goal, have been installed. The water quality in the mainstem of the Blackwater River, which should be influenced by BMPs

Control Measure	Units	Needed Units	# Installed	%
Agriculture Program				
Stream Exclusion Fencing	feet	389,600	38,576	10%
Vegetative Cover on Critical Areas	acres	n/a	4.7	
Forested Riparian Buffer	acres	n/a	3.1	
Stream Bank Stabilization	feet	n/a	320	
Loafing Lot Management	system	n/a	4	
Woodland Buffer Filter Area	feet	n/a	2,700	
Animal Waste Control Facility	system	n/a	3	
Residential Program				
Septic System Pump-out	system	n/a	0	193%
Sewer Connections (RB2)	system	n/a	3	
Septic System Repair (RB-3)	system	n/a	1	
Septic System Installation (RB-4)	system	7	24	
Alternative Waste Treatment Systems	system	8	1	
Total Residential System Installation		15	29	193%

Table 1: BMP Summary for the Blackwater River

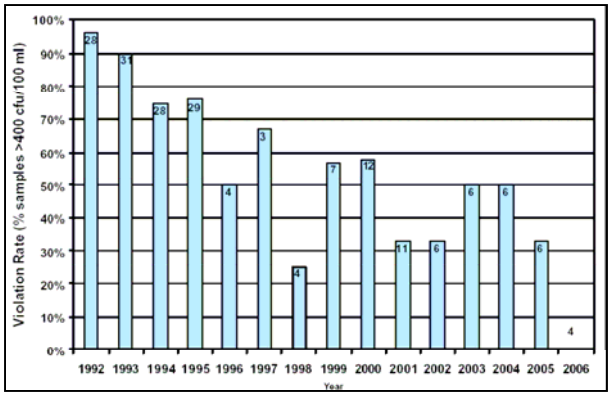


Table 2: Bacteria Violation Rate and number of samples in the Mainstem Blackwater

installed in the North Fork, Upper, and South Fork Blackwater River segments. Over the last 10 years, fecal coliform concentrations have exceeded the water quality standard 53% of the time (Table 2). When comparing data prior to TMDL activities in the watershed (1992-1995) to more recent data (2000-2006), however, the violation rate drops from an average of 67% for 1992-1995 to an average of 37% for 2000-2006. Recent violation rates show a very positive trend in improving water quality in the mainstem of the Blackwater River. Water quality data in 2005 shows only 2 of 6 samples violating standards, while in 2006 none of the 4 samples violated standards.

3.5.0 - Batie Creek Restoration: Protecting Unique Karst Habitats
Lee County, VA

3.5.1 – Executive Summary
Batie Creek, which flows through a karst region of Lee County in southwest Virginia, was impaired because of low dissolved oxygen levels. The lack of dissolved oxygen, caused by inflows of anoxic leachate from a lumber company's improper disposal of sawdust, negatively impacted a population of endangered cave isopods in Batie Creek's headwaters. With help from an array of partners led by the 319-funded work of the Virginia Department of Conservation and Recreation, Karst Program, the company removed and reused most of the decomposing sawdust. Dissolved oxygen levels have rebounded, prompting the removal of Batie Creek from the impaired waters list in 2006.

3.5.2 - Existing Conditions
Batie Creek's base flow originates with two springs: Batie East and Batie West. The springs are fed by water flowing through caves formed in Lee County's karst geology. Karst occurs in areas where limestone bedrock has dissolved over geologic time, forming caves and sinkholes. Underground streams and springs are common. The caves of Lee County host a diverse and abundant fauna of cave-adapted invertebrates, including Thompson Cedar Cave, where, in the 1960s, researchers had originally discovered the first Lee County Cave Isopod (*Lirceus usdagalun).* This aquatic crustacean was later found to exist in just a handful of caves in the area.

Thompson Cedar Cave Falls

3.5.3 - Problem
In the late 1980s and early 1990s, the sawdust disposal activities of a lumber company generated anoxic leachate rich in lignins and tannins. These leachates contaminated the entire ¾ mile length of Batie Creek, from headwater springs to confluence with the Powell River. A visit by cave biologists to Thompson Cedar Cave in 1987 revealed that the sinkhole marking the cave's entrance had been filled with sawdust. The decomposition of the sawdust generated anoxic leachate that drained into the cave, eliminating nearly all aquatic life, including the rare isopod. In 1992, the U.S. Fish and Wildlife Service (USFWS) listed the Lee County Cave Isopod as endangered under the provisions of the Endangered Species Act.

Researchers noted that the water quality degradation seen in the Thompson Cedar Cave stream coincided with similar degradation in the Batie Creek Springs, particularly Batie West. By observing the degradation pattern and the relative positions of the cave and Batie West Spring, researchers realized that the two were hydrologically connected. Dissolved oxygen levels at Batie West Spring from the late 1980s through the early 1990s ranged from 1.0 to 5.5 mg/l, while generally reducing over that time period. During that period, all but one reading was below the standard of 5.0 mg/l for surface streams. The DCR Karst Program documented this contamination and notified the Virginia Department of Environmental Quality (DEQ) who conducted water quality studies of the area. In 1998 Batie Creek was listed by DEQ on the 303(d) list as impaired because dissolved oxygen levels were less than half of the 5.0 mg/l necessary to support aquatic life.

3.5.4 - Project Highlights
In the late 1980s, following the discovery of sawdust at Thompson Cedar Cave, the Virginia Cave Board established a voluntary agreement with the lumber company to have the sawdust removed from the cave entrance. The reprieve was temporary. During the 1990s, the sawmill's production increased, generating vast sawdust stockpiles that led to further contamination of the Batie Creek system (see photo).

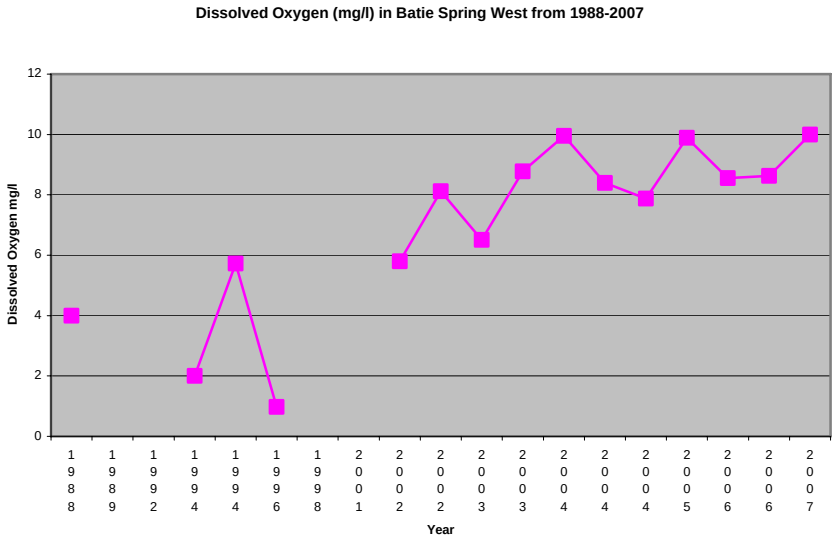
Leachate from this 20-foot wide sawdust ridge contaminated Thompson Cedar Cave, located at left.

In 1994, the Virginia Department of Conservation and Recreation's (DCR) Division of Soil and Water Conservation provided EPA Section 319 funding to DCR's Division of Natural Heritage to establish the Virginia Karst Program. Remediation of Batie West Spring and Thompson Cedar Cave was one of the new program's top priorities. Since voluntary agreements had failed, DCR Karst Program staff pursued regulatory action. They established the Batie Creek Task Force and gathered data. DCR Karst Program staff performed dye trace studies that verified the connection between the cave stream and Batie West Spring. In 1998, independent reports by Virginia Water Resources Center and Virginia DEQ established the dissolved oxygen impairment of Batie Creek and identified breakdown of the sawdust as the culprit. As a result of data provided by DCR Karst Program, DEQ added Batie Creek to its impaired waters list.

DEQ quickly issued a consent decree to the lumber company, which allowed the company to continue operating if the sawdust was removed within five years. The company found a way to dispose of newly generated and recent sawdust elsewhere, but older material remained a problem. In 2000, DCR Karst Program staff developed a strategy involving multiple partners to address the historic sawdust stockpile issue. The Cave Conservancy of the Virginias funded Virginia Tech researchers who proved that decomposing sawdust could be used to amend soil at mined land reclamation projects. Then the DCR Karst Program took these results to the US Fish and Wildlife Service and the Tennessee Valley Authoritywho teamed up to fund the transport of sawdust to project sites for use as a soil amendment in mined land reclamation.

3.5.5 - Results

By summer 2002, dissolved oxygen levels had rebounded to 5.8 mg/l, allowing aquatic life, including the Lee County Cave Isopod, to return to Thompson Cedar Cave. DCR Karst Program staff believes some isopods had survived in an uncontaminated upstream cave. As of January 2007, an insignificant amount of actively decomposing sawdust remained on the lumber company's property. Dissolved oxygen values at Batie West Spring have remained healthy since 2001. In 2006, Virginia DEQ removed Batie Creek from the list of impaired streams.



Dissolved Oxygen (mg/l) in Batie Spring West from 1988-2007.

From 1994 thru 2006 Virginia DCR's Division of Soil and Water Conservation has provided more than $1.3 million in the form of annual EPA Section 319 grants to Virginia DCR's Natural Heritage Program to fund the Karst Program. Approximately $250,000 in Section 319 funding to the Karst Program has gone towards providing technical and staff support in order for the Karst Program to spearhead interagency efforts to remediate the Batie Creek system.