Looney Creek *E. coli* TMDL Implementation Plan

Executive Summary

Prepared for:
Virginia Department of Conservation and Recreation

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Table of Contents

Table of Contents i
Introduction 1
Review of the Total Maximum Daily Load (TMDL) Study 3
Public Participation 4
Assessment of Needs 4
Agricultural BMPs 4
Residential BMPs 5
Full-Time Equivalents (FTEs) 7
Implementation 7
Potential Funds 7
Timeline and Milestones 8
Targeting 10
Costs and Benefits 10
Costs 10
Benefits 11
Stakeholders' Roles and Responsibilities 13
Monitoring 13
Education 13
Governmental Responsibilities 14
List of Acronyms 17

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Introduction

The Clean Water Act (CWA) that became law in 1972 requires that all U.S. streams, rivers, and lakes meet certain water quality standards. The CWA also requires that states conduct monitoring to identify polluted waters or those that do not meet standards. Through this required program, the state of Virginia has found that many stream segments do not meet state water quality standards for protection of the five beneficial uses: recreation, aquatic life, wildlife, fishing/shellfishing, and drinking.

When a stream fails to meet the standards, it is listed as impaired on the CWA's Section 303(d) list, also known as the Dirty Waters List. Looney Creek (VAW-I26R) was listed as impaired on Virginia's 1998 Dirty Waters List due to violations of the State's water quality standards for fecal coliform. The bacteria TMDL for Looney Creek was determined for the stream as listed in the 1998 Dirty Waters List, from the confluence of Mill and Back Creek to the James River confluence, a total of 2.48 miles. This stream segment has remained on the 2002, 2004 and the 2006 lists (Figure 1). Until fecal bacteria levels are reduced in Looney Creek, full immersion swimming is discouraged. The Virginia Department of Environmental Quality (VADEQ) completed the bacteria TMDL for Looney Creek in May 2004.

For every stream on the Dirty Waters List, the CWA and the U.S. Environmental Protection Agency (EPA) (40 CFR Part 130) both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a stream. That is, it sets limits on the amount of pollution that a stream can tolerate and still maintain water quality standards. The TMDL results are explained in the Review of the TMDL Development Study section of this booklet.

Once a TMDL is developed and approved by the EPA and the State Water Control Board (SWCB), measures must be taken to reduce pollution levels in the stream. The next step in the process is the development of an Implementation Plan (IP). This plan dictates how the TMDL goals can be accomplished in the watershed (drainage areas) with the impaired streams. The IP describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in a staged process. This booklet summarizes the IP for the *E. coli* bacteria impairment in Looney Creek.

Looney Creek is near Buchanan, Virginia within the James River Basin (Figure 1). The Looney Creek watershed is approximately 40,000 acres almost entirely within Botetourt County.

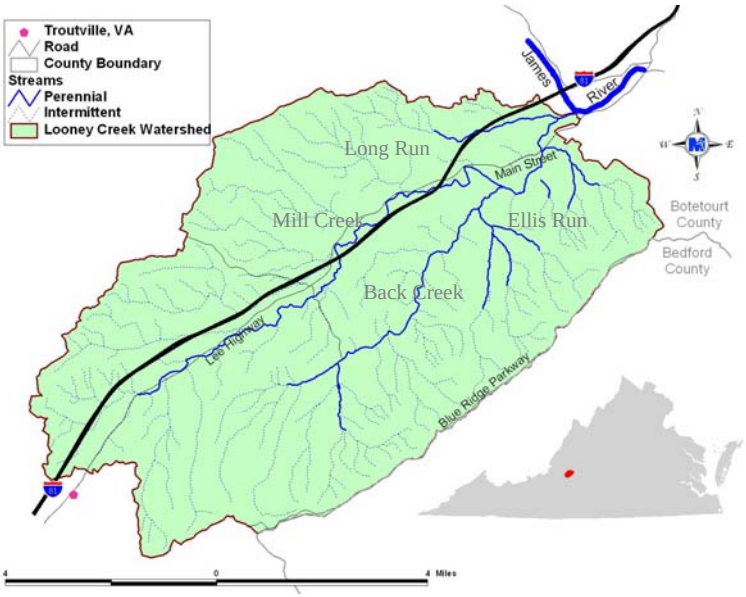

Figure 1. The Looney Creek watershed.

In fulfilling the state's requirement for the development of a TMDL IP, a framework has been established for reducing *E. coli* levels, and achieving the water quality goals for the Looney Creek impaired segment. With successful completion of the IP, Virginia begins the process of meeting these water quality goals, and natural resources will be enhanced. Additionally, approval of the IP will increase the opportunities for funding during implementation.

This booklet is an abbreviated version of the full IP report, which can be obtained by contacting the VADEQ or the Virginia Department of Conservation and Recreation (VADCR) offices. Agency contact information can be found on the back of this pamphlet.

Key components of the implementation plan are:

- Review of the TMDL Development Study
- Public Participation
- Assessment of Needs
- Implementation
- Cost/Benefit Analysis
- Stakeholders' Roles and Responsibilities

Review of the Total Maximum Daily Load (TMDL) Study

The greatest portion of the Looney Creek watershed is located in Botetourt County, Virginia. The estimated human population within the Looney Creek watershed is 4,116. The major land use in this watershed is forest.

Bacterial Source Tracking (BST) is intended to aid in identifying the fecal bacteria sources (human, pets, livestock, or wildlife) of fecal contamination in water bodies. The BST results were used to determine the distribution of fecal bacteria in Looney Creek. Figure 2 summarizes two different methods of averaging the BST results for Looney Creek. All four sources were present in the Looney Creek stream samples.

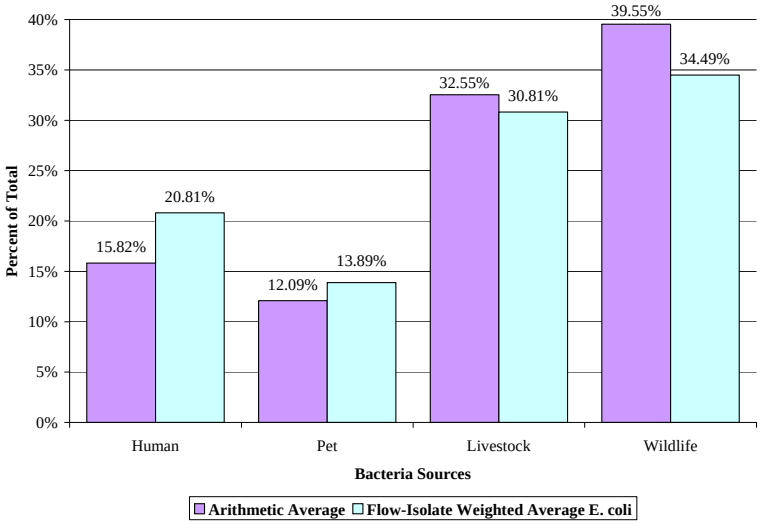

Figure 2. The Bacterial Source Tracking (BST) results for Looney Creek.

Looney Creek does not meet the current bacteria water quality standard for the recreation use (swimming). Any water sample from the stream must be equal to or less than 235 colony forming units per 100 millileters (cfu/100mL). If two or more samples are collected in one month the geometric mean of this data must be equal or less than 126 cfu/100mL.

A summary of the Stage I and Stage II (Final) *E. coli* allocations from the TMDL study is given in Table 1. The Stage I scenario results in an estimated 11% violations of the single sample state bacteria standard (235 cfu/100mL), which may allow for de-listing. Stage II is the scenario that will attain the

anthropogenic load reductions required by the TMDL. Reductions to wildlife fecal bacteria (shaded in Table 1) is not addressed in this implementation plan.

Table 1. Load reductions scenarios for Looney Creek.

Stage	Human	Livestock	Pet	Wildlife	Total
Stage I	99%	99%	99%	0%	60%
Stage II (Final)	99%	99%	99%	50.5%	80%

Public Participation

Public participation took place on three levels. First, open meetings were held to inform the public of the end goals and status of the project, as well as provide a forum for soliciting participation in the smaller, more targeted meetings. Second, specialized working groups were assembled to discuss specific implementation strategies for the different sources of bacteria in the watershed. The working groups included residential, agricultural, and government. Third a Steering Committee was formed with representation from VADEQ, VADCR, Mountain Castles Soil and Water Conservation District (MCSWCD), Southeast Rural Community Assistance Project, Inc. (SERCAP), Botetourt County government, Roanoke Valley Alleghany Regional Commission, representatives from the working groups, and citizens.

The actions and commitments described in this document are drawn together through input from citizens of the watershed, county governments, VADCR, VADEQ, VDH, Virginia Cooperative Extension (VCE), the Natural Resources Conservation Service (NRCS), MCSWCD, and MapTech, Inc. Every citizen and interested party in the watershed area is encouraged to become involved in the implementation process and contribute in any way that helps in restoring the health of the stream.

Assessment of Needs

Agricultural BMPs

In order to meet the strict bacteria reductions in the Looney Creek waters, streamside fencing is required to exclude cattle from the stream. This will eliminate direct livestock defecation in the stream and prevent the trampling of the stream banks. Below is a picture of a calf not excluded from the stream and the resulting muddy, trampled stream bank. The quantity of streamside fencing required during implementation was determined through spatial analyses of land uses, the stream network, and archived data. This data was combined to establish estimates of control measures (also called Best Management Practices - BMPs) required overall, in the watershed. Additionally, input from local agency representatives and citizens was used to verify the analyses.

The length of fencing required on perennial streams in the Looney Creek watershed is approximately 68,583 feet. The streamside fencing exclusion systems that need to be installed through the watershed are: 40 Grazing Land Protection Systems (SL-6), 4 Stream Protection System (WP-2T), and 20 Hardened Crossings. An addition 6,340 feet of fence is estimated to need repair during the implementation time period.

Additional BMPs are required on pasture and cropland. Improved pasture management includes the maintenance of an adequate forage height (3-inch minimum) during the growing season, control of woody vegetation, and distribution of manure through managed rotational grazing. Manure incorporation is a practice in which farmers spread manure and then disk the land. The disking mixes manure with soil and has shown to keep manure and nutrients on the land longer. A vegetated buffer is an area next to a stream where cattle are not allowed and vegetation is established. The area between the fence and stream filters bacteria from runoff from adjacent land. Buffers must be 35 feet wide on average to be eligible for any state or federal cost-share money. Farm retention ponds are stormwater facilities that include a permanent pool of water in which runoff during storm events may be temporarily stored. Estimates of all agricultural BMPs needed for full implementation in the watershed are listed in Table 2. The VADCR labels are shown in parenthesis.

Residential BMPs

In order to meet the strict bacteria reductions in the Looney Creek waters, all failing septic systems and straight pipes should be identified and corrected during implementation. The picture below shows a straight pipe supplying untreated human waste to a creek. The estimated numbers of straight pipes and failing septic systems were reported in the TMDL and are shown in Table 2.

Other residential corrective actions proposed for Looney Creek to reduce sources of bacteria include septic tank pump-outs (100 septic tanks) and a pet litter control program. This program consist of educating homeowners of cleaning up after their pet(s), along with posting signs, supplying pick-up bags for dog feces and trash cans in public dog walking areas.

Table 2. BMPs needed to meet the TMDL in the Looney Creek watershed.

Best Management Practice	Unit	Amount	Unit Cost $
Agricultural			
Grazing Land Protection System (SL-6)	System	40	$15,000
Stream Protection System (WP-2T)	System	4	$6,200
Hardened Crossing	System	20	$1,800
Streamside Fence Maintenance – perennial	Foot	6,340	$3.50
Waste Storage Facility (WP–4) – Horse	System	1	$25,700
Waste Storage Facility (WP–4) – Dairy	System	1	$50,000
Loafing Lot Management System (WP–4B) – Dairy	System	1	$30,000
Improved Pasture Management	Acre	9,467	$80
Agricultural Sinkhole Protection (WQ–11)	Feet	4,000	$3
Manure Incorporation – Cropland	Acre	318	$18
Vegetated Stream Buffer – Cropland	Acre	4	$600
Farm Retention Pond(s)	Acres–Treated	2,996	$138

Table 2. BMPs needed to meet the TMDL in the Looney Creek watershed (continued).

Best Management Practice	Unit	Amount	Unit Cost $
Residential			
Septic Systems Pump-out (RB-1)	System	100	$200
Septic System Repair (RB-3)	System	16	$3,000
Septic System Installation/Replacement (RB-4)	System	77	$4,500
Alternative Waste Treatment System Installation (RB-5)	System	10	$22,500
Residential Pet Waste Program	Program	1	$3,750
Residential Pet Waste Composters	Number	453	$50
Vegetated Buffers	Feet	100,810	$0.29

Full-Time Equivalents (FTEs)

Historical work records of the MCSWCD were utilized to determine the level of agricultural technical assistance needed to complete implementation. Based on these analyses, it was determined that approximately 1 FTE would be needed over the course of 5 years to achieve implementation of the Stage I agricultural control measures for Looney Creek. One FTE is equal to one full–time staff member. Quantification analyses showed that one residential FTE was needed to provide technical assistance during Stage I (five years). During Stage II (2 years) only 1 FTE will be required to complete the implementation of both the agricultural and residential BMPs.

Implementation

Potential Funds

Potential funding sources available during implementation were identified during plan development. Detailed descriptions can be obtained from the SWCD, VADCR, NRCS, and VCE. Sources include:

- Federal Clean Water Act 319 Incremental Funds
- Virginia Agricultural Best Management Practices Cost-Share, Tax Credit, or Loan Programs
- Virginia Small Business Environmental Assistance Fund Loan Program
- Virginia Water Quality Improvement Fund (WQIF)
- Conservation Reserve Program (CRP)
- Conservation Reserve Enhancement Program (CREP)
- Environmental Quality Incentives Program (EQIP)
- Wildlife Habitat Incentive Program (WHIP)
- Wetland Reserve Program (WRP)
- Clean Water State Revolving Fund

Timeline and Milestones

The end goals of implementation are restored water quality of Looney Creek and the removal of it from Virginia's Dirty Waters List. Progress will be assessed during implementation through the tracking of BMP installations and continued water quality monitoring.

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the amount of BMPs installed each year, while water quality milestones establish the corresponding improvements in water quality that can be expected. The milestones described here are intended to achieve full implementation of proposed BMPs within 7 years, leaving five years to assess water quality for de-listing. A timeline with expected pollutant reductions are shown in Figure 3.

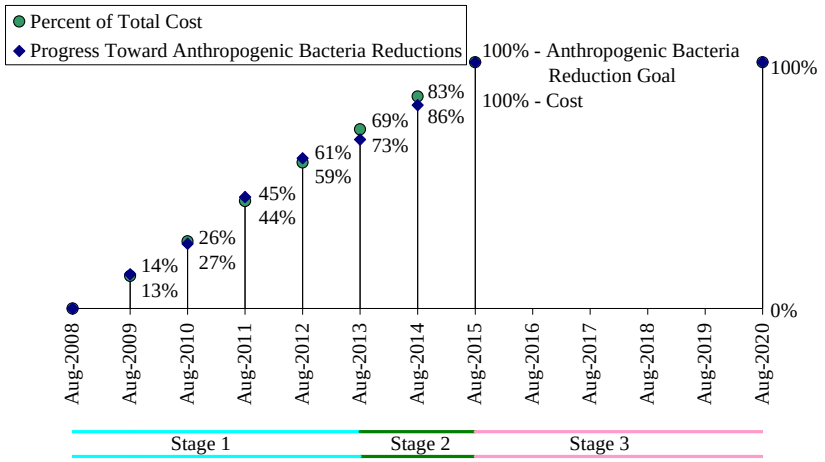

Figure 3. Timeline for implementation in the Looney Creek watershed.

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient BMPs first. The Stage I goals will focus on the more cost-efficient BMPs. Following Stage I implementation, the Steering Committee should evaluate water quality improvements and determine how to proceed to complete implementation during Stage II.

Table 3 shows the types and quantities of BMPs to be installed during each stage. It is anticipated that the BMPs needed for de-listing of the impaired segment from the Dirty Waters List be installed by 2013.

Table 3. Stage I and Stage II implementation goals for Looney Creek.

Control Measure	Unit	Stage I installed 2008– 2013	Stage II installed 2013– 2015
Agricultural			
Grazing Land Protection System (SL–6)	System	40	0
Stream Protection System (WP–2T)	System	4	0
Hardened Crossing	System	20	0
Streamside Fence Maintenance – perennial	Foot	0	6,340
Improved Pasture Management	Acre	5,887	3,580
Waste Storage Facility (WP–4) – Horse	System	1	0
Waste Storage Facility (WP–4) – Dairy	System	1	0
Loafing Lot Management System (WP–4B) – Dairy	System	1	0
Agricultural Sinkhole Protection (WQ–11)	Feet	2,000	2,000
Manure Incorporation	Acre	318	0
Vegetated Stream Buffer	Acre	4	0
Farm Retention Pond(s)	Acres–Treated	0	2,996
Residential			
Septic Systems Pump–out (RB–1)	System	100	0
Septic System Repair (RB–3)	System	16	0
Septic System Installation/Replacement (RB–4)	System	77	0
Alternative Waste Treatment System Installation (RB–5)	System	10	0
Pet Waste Control Program	Program	1	ongoing
Pet Waste Composters	Number	453	0
Vegetated Stream Buffer	Feet	100,810	0
Expected Bacteria Violations of the *E. coli* standard (235 cfu/100mL)		11%	0%

Targeting

The purpose of targeting BMPs is to identify areas where installation would result in the greatest return in water quality improvement. Targeting ensures optimal utilization of resources. Targeting of critical land areas for BMP installation was accomplished through analysis of the slope, hydrologic soil group, and land use with anthropogenic bacteria loads present. Figure 4 shows the areas most prone to bacterial pollution in the Looney Creek watershed.

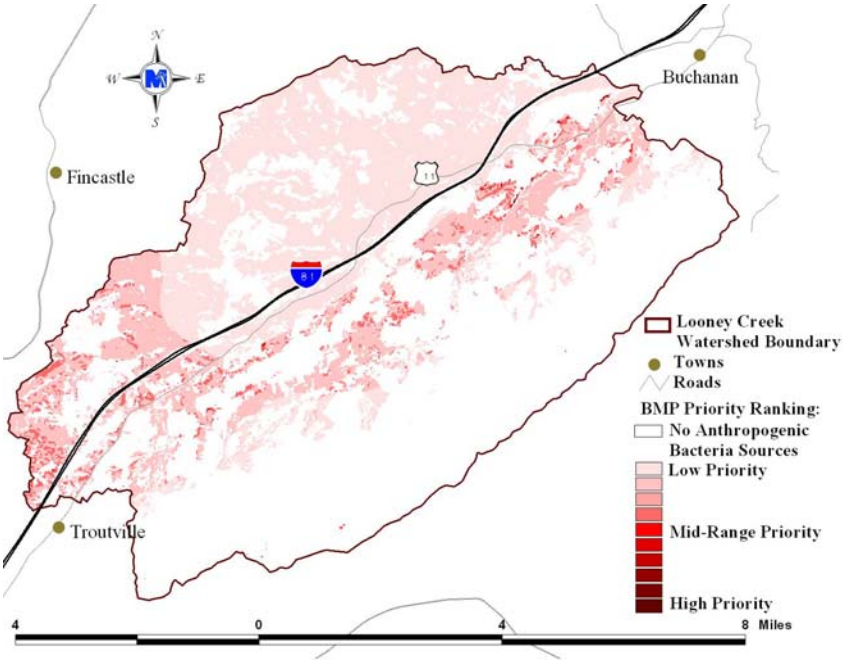

Figure 4. The areas most prone to bacteria pollution in the Looney Creek watershed.

Costs and Benefits

Costs

Associated cost estimates of agricultural and residential BMPs were calculated by multiplying the unit cost by the number of units in each watershed (Table 4). Table 4 shows the estimated cost of installing the recommended agricultural BMPs as $1.98 million. Residential BMP costs sum to $695,135.

It was determined by the MCSWCD and the Steering Committee that it would require $50,000 to support the salary, benefits, travel, training, and incidentals for education of one technical FTE. With quantification analysis yielding a need for 2 technical FTEs per year for the first five years of implementation and 1 FTE per year for the subsequent two years, the maximum

total cost to provide technical assistance during implementation is expected to be $600,000 (Table 4). Factoring in technical assistance costs, the total cost for full implementation in the watershed comes to $3.27 million.

Table 4. Costs to implement BMPs in the Looney Creek watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total Cost ($)
Stage I	1,251,584	695,135	500,000	2,446,719
Stage II	728,038	0	100,000	828,038
Total	**1,979,622**	**695,135**	**600,000**	**3,274,757**

Benefits

The primary benefit of implementation is cleaner waters in Virginia. Specifically, fecal contamination in Looney Creek will be reduced to meet water quality standards and allow for safe swimming. It is difficult to gauge the impact that reducing fecal contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the reductions required, the incidence of infection from fecal sources, through contact with surface waters, should be considerably reduced.

Additionally, because of streambank protection that will be provided through exclusion of livestock from streams, the aquatic habitat will be improved in these waters. The vegetated buffers that are established will also serve to reduce sediment and nutrient transport to the stream from upslope locations. The picture above shows a buffer area planted with tree saplings for the CREP program. In areas where pasture management is improved, soil and nutrient losses should be reduced and infiltration of precipitation should be increased, decreasing peak flows downstream. This will, in turn, benefit the James River and the Chesapeake Bay.

A clean water source has been shown to improve weight gain and milk production in cattle. Fresh clean water is a primary need for livestock. Many livestock illnesses can be spread through contaminated water supplies. A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills. The picture below shows cattle drinking from an alternative water source.

Taking the opportunity to initiate an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 - 40% and, consequently, improve the profitability of the operation. Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits by allowing higher stocking rates and increasing the amount of gain per acre. In general, many of the agricultural BMPs being recommended will provide both environmental benefits and economic benefits to the farmer.

The residential programs will play an important role in improving water quality. Human waste can carry viruses and other non-bacterial pathogens as well as the bacteria that all fecal matter contains. In terms of economic benefits to homeowners, an improved understanding of private sewage systems (including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance) will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. The average septic system will last 20 - 25 years if properly maintained. Proper maintenance includes: knowing the location of the system components and protecting them (not driving or parking on top of them, not planting trees where roots could damage the system), keeping hazardous chemicals out of the system, and pumping out the septic tank every 3 to 5

years. The cost of proper maintenance, as outlined here, is relatively inexpensive in comparison to repairing or replacing the entire system.

An important objective of the implementation plan is to foster continued economic vitality and strength. This objective is based on the recognition that healthy waters improve economic opportunities for Virginians, and a healthy economic base provides the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document are expected to provide economic benefits, as well as environmental benefits, to the landowners.

Stakeholders' Roles and Responsibilities

Monitoring

Progress toward end goals will be assessed during implementation through tracking of BMP installations and continued water quality monitoring.

The success of the implementation measures will be determined by monitoring conducted by VADEQ through the agency's monitoring program. VADEQ will conduct bi–monthly ambient monitoring at three stations in the watershed beginning in January 2008 (Figure 5).

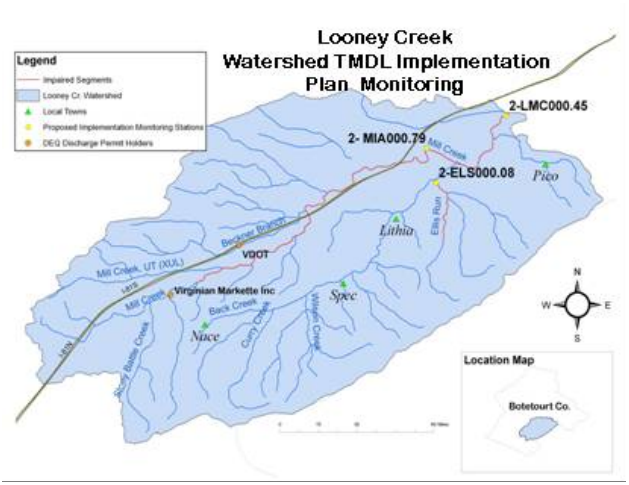

Figure 5. VADEQ monitoring stations in the Looney Creek watershed.

Education

Education and outreach is a significant component of any TMDL implementation project. The MCSWCD has expressed an interest in taking the lead to contact residents and farmers to encourage the installation of BMPs.

This one–on–one contact will facilitate communication of the water quality problems and the corrective actions needed. A number of outreach activities could be conducted in the watershed to promote participation and community support to attain the IP milestones and to make the community aware of the TMDL requirements. Such activities could include: information exchange through newsletters, mailings, field days, demonstrations, organizational meetings, etc. The District could work with appropriate organizations such as VCE and the Upper James River Roundtable to educate the public.

Achieving the goals of this effort (improving water quality and removing Looney Creek from the Dirty Waters List) is dependent on stakeholder participation. Both the local stakeholders who are charged with the implementation of control measures and the stakeholders who are responsible for overseeing our nation's human health and environmental programs must first acknowledge there *is* a water quality problem, and then make the needed changes in our operations, programs, and legislations to address these pollutants. Below is a picture of a hardened crossing with streamside fencing.

Governmental Responsibilities

The EPA has the responsibility for overseeing the various programs necessary for the success of the Clean Water Act. However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. The state agencies responsible for regulating activities that impact water quality include: VADEQ, VADCR, VDH, VCE, Virginia Department of Forestry (VDOF), and Virginia Department of Agriculture and Consumer Services (VDACS).

VADEQ has responsibility for monitoring streams to determine compliance with state standards, and for requiring permitted point dischargers to maintain

loads within permit limits. They have the regulatory authority to levy fines and take legal action against those in violation of permits. Beginning in 1994, animal waste from confined animal facilities in excess of 300 animal units (cattle and hogs) has been managed through a Virginia general pollution abatement permit. These operations are required to implement a number of practices to prevent groundwater contamination. In response to increasing demand from the public to develop new regulations dealing with animal waste, in 1999 the Virginia General Assembly passed legislation requiring VADEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999).

VADCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. Historically, most VADCR programs have dealt with agricultural NPS pollution through education and voluntary incentive programs. To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentive programs must be reevaluated to account for 100% participation. It should be noted that VADCR does not have regulatory authority over the majority of NPS issues addressed here.

Through Virginia's Agricultural Stewardship Act, the VDACS Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. The enforcement of the Agricultural Stewardship Act is entirely complaint-driven.

VDH is responsible for maintaining safe drinking water measured by standards set by EPA. Their duties also include septic system regulation and regulation of biosolids land application. Like VDACS, VDH's program is complaint-driven. In the scheme of this TMDL IP, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes, respectively.

State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments, in conjunction with the state, can develop ordinances involving pollution prevention measures. In addition, citizens have the right to bring litigation against persons or groups of people who can be shown to be causing some harm to the claimant. In hearing the claims of citizens in civil court, and the claims of government representatives

in criminal court, the judicial branch of government also plays a significant role in the regulation of activities that impact water quality.

Successful implementation depends on stakeholders taking responsibility for their role in the process. While the primary role falls on the landowner, local, state and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. An important first step in correcting the existing water quality problem is recognizing that there *is* a problem and that the health of citizens is at stake. While it is unreasonable to expect that the natural environment (streams and rivers) can be made 100% free of risk to human health, it is possible and desirable to minimize man-made problems. Virginia's approach to correcting NPS pollution problems has been, and continues to be, encouragement of participation through education and financial incentives. However, if progress is not made toward restoring water quality using this voluntary approach, regulatory controls may be established and enforced.

List of Acronyms

BMP	Best Management Practice
BST	Bacterial Source Tracking
cfu/100mL	Colony forming units per 100 millileters
CREP	Conservation Reserve and Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FTE	Full Time Equivalent
IP	Implementation Plan
NPS	Non Point Source
NRCS	Natural Resources Conservation Service
Section 303(d)/305(b) List	Dirty Waters List
SE/R-CAP	Southeast Rural Community Assistance Project
SL-6	Grazing Land Protection System
SWCB	Soil and Water Conservation Board
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
VADCR	Virginia Department of Conservation and Recreation
VADEQ	Virginia Department of Environmental Quality
VCE	Virginia Cooperative Extension
VDACS	Virginia Department of Agriculture and Consumer Services
VDH	Virginia Department of Health
VDOF	Virginia Department of Forestry
WHIP	Wildlife Habitat Incentive Program
WP-2T	Streambank Protection
WP-4	Waste Storage Facility
WQIA	Water Quality Improvement Fund
WRP	Wetland Reserve Program