Falling River TMDL Implementation Plan:

A Plan to Reduce Bacteria in the Falling River Watershed

Prepared for:
Virginia's Region 2000 Local Government Council
and
Virginia Department of Conservation and Recreation

Submitted April 3, 2008

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Executive Summary

Agricultural Best Management Practices (BMPs)

The length of livestock fencing required on perennial streams in the Falling River watershed is approximately 115 miles. Streamside fencing is one of the best ways to reduce bacteria levels in the stream. This will remove direct livestock defecation in the stream and prevent the trampling of the stream banks.

Table E.1 shows the fencing systems needed to meet the livestock exclusion goal. Both the grazing land (SL-6) and stream protection (WP-2T) practices include a 35-foot buffer component. Therefore, these practices will provide some of the best water quality benefits in terms of reducing both direct (cows defacating in the stream) and land-based (runoff of manure into the stream during rain events) contributions of fecal bacteria to the stream.

Table E.1 SL-6 and WP-2T fence exclusion systems required for Falling River.

Watershed	SL-6 systems	WP-2T systems
Falling River	289	15

Due to the large reductions needed on land-based loads of *E. coli* bacteria, additional Best Management Practices (BMPs) for pasture and cropland are also needed. Estimates of all agricultural BMPs needed for Stage I, the first five years (delisting from the 303(d) list) in the watershed are provided in Table E.2.

Table E.2 Agricultural land based reduction BMPs required for delisting.

Control Measure	Unit	Falling River
Improved Pasture Management	Acre	17,532
Loafing Lot Management WP-4B	System	2
Manure Incorporation	Acre	7,092
Riparian Vegetated Buffers – Cropland	Acres	25

Residential and Urban Best Management Practices (BMPs)

All failing septic systems and straight pipes must be identified and replaced during implementation since a 98 to 100 percent load reduction from direct and nonpoint source (NPS) human waste is

required to meet the TMDL goals. In addition, straight pipes are illegal in the Commonwealth of Virginia. The estimated numbers of straight pipes and failing septic systems were reported in the TMDL study and are shown in Table E.3.

Table E.3 Estimated number of straight pipes and failing septic systems required to be removed, repaired or replaced. (Source: TMDL Study).

Watershed	Houses with Standard Septic Systems	Potential Failing Septic Systems	Potential Straight Pipes -
Falling River	5,055	152	15

The Falling River TMDL allocations call for large reductions to land-based residential loads. In order to achieve these reductions, the BMPs in Table E.4 must be implemented. The pet waste education program shown in the table includes distributing information on how pet waste should be disposed. In addition, pet waste composters are proposed to help eliminate pet waste in homeowner's yards along with pet waste disposal units in public dog walking areas. This approach includes the distribution of pet waste composters to households in this watershed. This could be accomplished through partnerships with local stores selling pet food, the Campbell and Appomattox County Animal Shelters, the Society for the Prevention and Cruelty to Animals (SPCA) and the County governments. Riparian vegetated buffers should be utilized whenever possible around commercial land. These are simply vegetated areas along the streambank that are allowed to grow. They slow down the runoff water from the surrounding land and allow the solids containing fecal bacteria to be filtered out before reaching a flowing stream.

Table E.4 All residential and urban BMPs recommended to meet the delisting requirements (first 5 years of implementation).

Residential Control Measure Description	VA Cost-Share Practice Number	Falling River
Septic Systems Pump-out	RB-1	2,527
Failing Septic System Corrections:		
Septic System Repair	RB-3	43
Septic System Installation/Replacement	RB-4	101
Alternative Waste Treatment System Installation	RB-5	8
Straight Pipe Corrections:		
Septic System Installation	RB-4	15
Alternative Waste Treatment System Installation	RB-5	0
Pet Waste Education Program	NA	1
Residential Pet Waste Composter	NA	2,163
Riparian Vegetated Buffers – Commercial Land (acres)	NA	1

Tables E.5 and E.6 show the estimated cost of installing the recommended agricultural and residential BMPs in Stages I (implementation years 1 - 5) and II (implementation years 6 – 10). The total cost for Stage I is $10.75 million. The total cost for full implementation comes to $15.67 million (Table E.7). All BMPs are expected to be completed by the end of Stage II. Stage III (implementation years 11 – 15) is considered a time of stabilization for the watershed after all BMPs have been utilized. A timeline with pollutant reductions expected is shown in Figure E.1.

Table E.5 Costs to implement Stage I (years 1 - 5) for Falling River.

Impairment	Agricultural BMPs ($)	Residential and urban BMPs ($)	Technical Assistance ($)	Total ($)
Falling River	$8,843,000	$1,403,000	$500,000	$10,750,000

Numbers are rounded to four significant digits.

Table E.6 Costs to implement Stage II (years 6 - 10) for Falling River.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Falling River	$4,119,000	$556,000	$250,000	$4,925,000

Numbers are rounded to four significant digits.

Table E.7 Total cost for implementation in the Falling River watershed.

Impairment	Agricultural BMPs ($)	Residential and Urban BMPs ($)	Technical Assistance ($)	Total ($)
Falling River	$12,960,000	$1,959,000	$750,000	$15,670,000

Numbers are rounded to four significant digits.

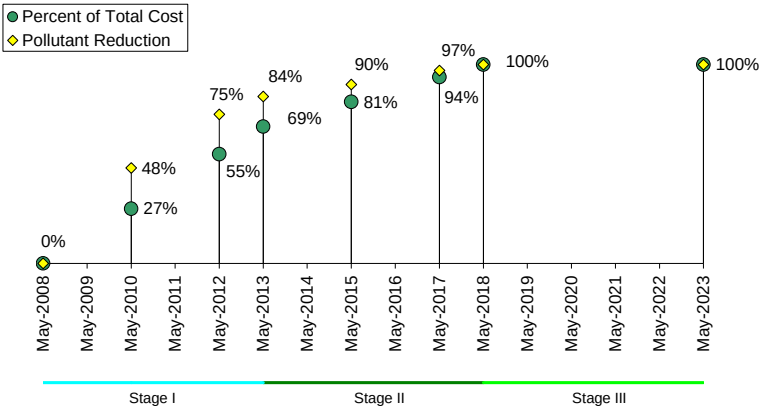

Figure E.1 Timeline for implementation in the Falling River watershed.

Introduction

The Federal Clean Water Act (CWA) became law in 1972 and 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 six beneficial uses: fishing, swimming, shellfish, aquatic life, wildlife and drinking.

When a stream fails to meet the water quality standards, it is listed as impaired, or dirty, on the CWA's Section 303(d) list. When this occurs, the CWA and the U.S. Environmental Protection Agency (EPA) 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. A TMDL accounts for seasonal variations and must include a margin of safety (MOS).

The TMDL process includes three different steps after a stream is listed on the impaired waters or 303(d) list. The first step is to conduct a TMDL study to determine which pollutants are causing the stream to fail at meeting its water quality standards. The second step is development of an implementation plan that contains projects to reduce those pollutants. The third step is implementation of the plan and tracking of the improvements in water quality.

The first step is conducting a TMDL study. This step is complete for the Falling River Watershed and the results are explained below and in the Review of the TMDL Development Study section of this booklet.

Falling River is part of the Roanoke River Basin and is located within USGS hydrologic unit code 03010102 (Roanoke River). The Falling River watershed is approximately 151,000 acres. See Figure 1 for a map of the Falling River impaired segment.

Falling River (DEQ impaired segment ID VAC-L34R-01) was listed as impaired on Virginia's 1998, 2002 and 2004 303(d) Total Maximum Daily Load Priority List and Reports respectively due to violations of the state's water quality standards for fecal coliform. This water quality standard changed from fecal coliform to *E. coli* in 2003 because there is stronger correlation between concentrations of *E. coli* bacteria

and incidence of gastrointestinal illness than there is with fecal coliform. Falling River remained on Virginia's 2006 Integrated 305(b)/303(d) report. The impaired segment on Falling River begins at the confluence with the North and South Forks of Falling River and continues downstream to the confluence with the Roanoke River (17.92 miles).

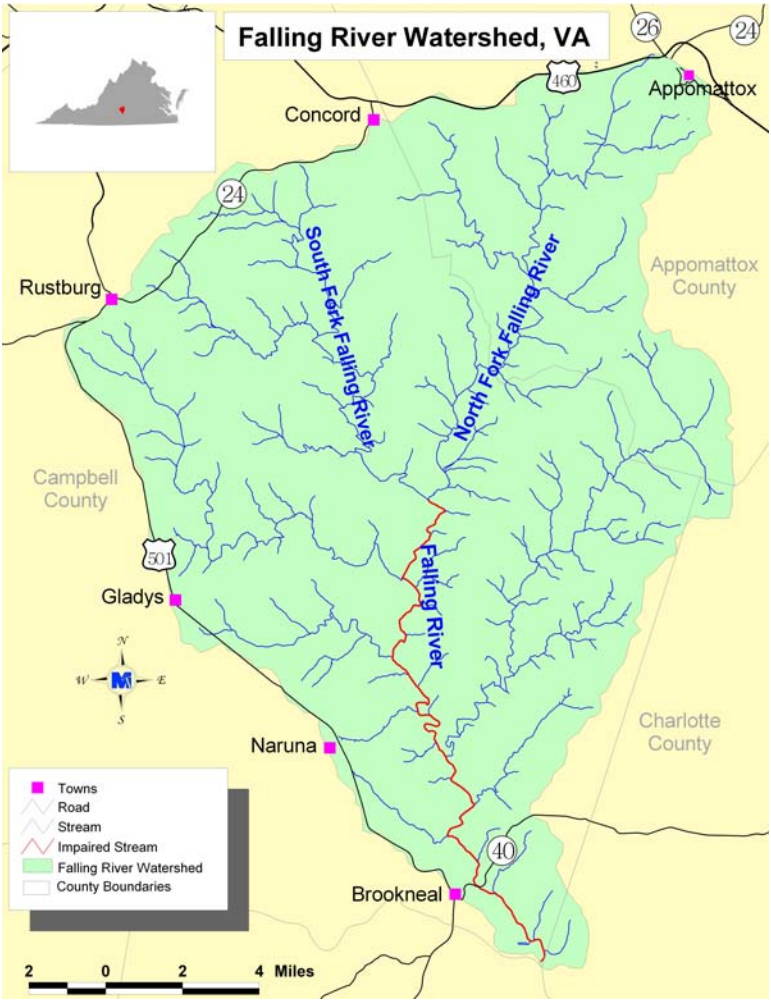

Figure 1 The Falling River impaired segment.

Now that a TMDL study 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. This second step in the TMDL process is the development of an implementation plan (IP).

In fulfilling the state's requirement for the development of an implementation plan, a framework has been established for reducing *E. coli* levels and achieving the water quality goals for the Falling River impaired stream segment. This plan is complete for the *E. coli* impairment in the Falling River watershed and this booklet is a summary of its information. This plan outlines how the TMDL goals can be accomplished in the watershed to improve water quality. The IP describes corrective actions and the installation of BMPs to be implemented in a staged process.

The third step in the TMDL process is to meet these water quality goals through implementation of the plan. This IP will increase the opportunities for funding for implementation, and will provide residents of this watershed with a guide to improve water quality in their community and enhance their natural resources. The implementation of this plan will reduce levels of bacteria in Falling River and its tributaries. The benefits of the implementation of this plan are described in detail in the Cost/Benefit Analysis chapter of this document. In short, the implementation of this plan may provide benefits to homeowners and farmers, as well as those that use the streams for recreation purposes.

State and Federal Requirements for Implementation Plans

State Requirements

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia), or WQMIRA. WQMIRA directs the State Water Control Board to "develop and implement a plan to achieve fully supporting status for impaired waters." In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. WQMIRA requires that IPs include the following:

- Date of expected achievement of water quality objectives,
- Measurable goals,
- Necessary corrective actions, and
- Associated costs, benefits, and environmental impact of addressing the impairment.

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. The EPA outlines the

minimum elements of an approvable IP in its 1999 Guidance for Water Quality-Based Decisions: The TMDL Process.
The listed elements include:

- A description of the implementation actions and management measures,
- A time line for implementing these measures,
- Legal or regulatory controls,
- The time required to attain water quality standards, and
- A monitoring plan and milestones for attaining water quality standards.

This booklet is an abbreviated version of the full IP report which can be obtained by contacting the Virginia Department of Conservation and Recreation (DCR).

Key components of the implementation plan are discussed in the following sections:

- Review of the TMDL Development Study
- Process for Public Participation
- Assessment of Needs
- Implementation, and
- Cost/Benefit Analysis

Review of the TMDL Development Study

The Falling River watershed is located in both Campbell and Appomattox Counties in Virginia. Falling River is part of the Roanoke River Basin and is located within USGS hydrologic unit code 03010102 (Roanoke River). The Falling River watershed is approximately 151,000 acres.

The *E. coli* bacteria TMDL Study for the Falling River watershed was approved in July 2004 by the EPA and is posted at www.deq.virginia.gov.

This TMDL study was conducted because Falling River was not meeting the state water quality standards for the recreation use (swimming). In order to meet the water quality goals established by the TMDL study, any bacteria water sample from the stream must be equal to or less than 235 colony forming units per 100 milliliters (cfu/100mL) at all times. If multiple samples are collected within a 30-day period, a

geometric mean is applied and it must be equal to or less than 126 cfu/100mL.

During the TMDL study, bacteria source tracking (BST), a water quality analysis method, was performed on water samples from the Falling River. BST is intended to aid in identifying the sources of fecal contamination in water bodies (i.e., human, pets, livestock, or wildlife). The BST results provided insight into the likely sources of fecal contamination and the distribution of fecal bacteria in the creeks. The major sources of bacteria are human, livestock, pets and wildlife.

Having this information improves the chances for success in implementing solutions by allowing better targeting of the sources of bacteria in this watershed. Figures 2 and 3 show the load weighted average BST results for Falling River. A summary of the final *E. coli* allocations for the different nonpoint sources in this watershed that resulted from the TMDL study is given in Table 1.

Information from the TMDL study determined the water quality goals and associated pollutant reductions needed in the implementation plan. The TMDL goals for the implementation plan are to address those sources of bacteria that can be attributed to human activities. The correction of straight pipes and failing septic systems are necessary to meet the TMDL goals. In addition, the majority of livestock in the watershed will need to be excluded from the creeks. Runoff carrying *E. coli* into the creeks after rain events must also be addressed. Reductions to wildlife fecal bacteria are not addressed in this implementation plan.

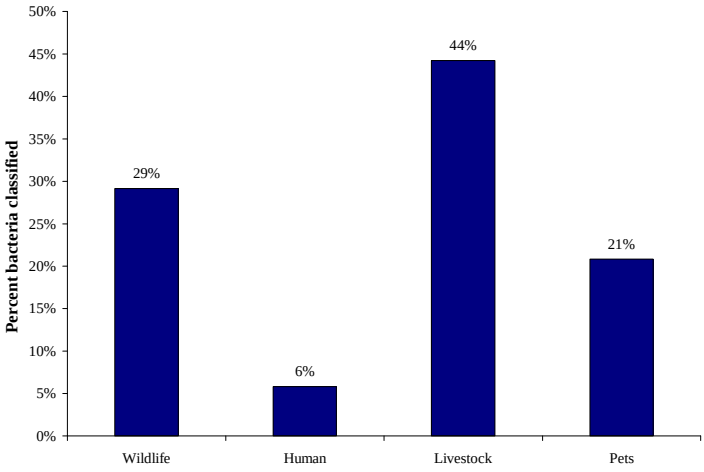

Figure 2 Load weighted averages for *E. coli* concentrations and sources for Falling River at monitoring station, AFRV002.78 (VADEQ TMDL Study).

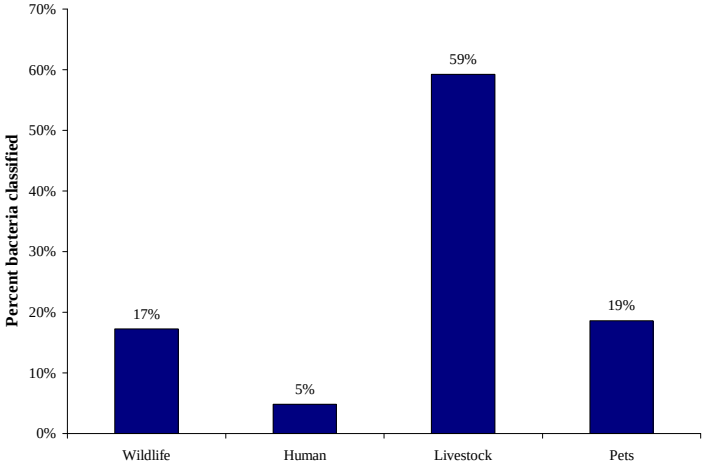

Figure 3 Load weighted averages for *E. coli* concentrations and sources for Falling River at monitoring station, AFRV0025.34 (VADEQ TMDL Study).

Table 1 Load reduction allocations from the Falling River TMDL.

Impairment	Failed Septic Systems and Straight Pipes	Direct Livestock	Nonpoint Sources	Direct Wildlife*
Falling River	100%	100%	98%	50%

*Direct deposition of waste into the stream from wildlife will not be explicitly addressed by this implementation plan (gray in table 1)

Process for Public Participation

The actions and commitments described in this document are drawn together through input from citizens of the watershed, county government, DEQ, DCR, Virginia Department of Health (VDH), Virginia Cooperative Extension (VCE), Virginia Department of Forestry (DOF), Robert E. Lee Soil and Water Conservation District (RELSWCD), and MapTech, Inc. Every citizen in the watershed and interested party is encouraged to become involved in the implementation process and contribute to restoring the health of the streams. Public participation in development of the plan took place on three levels: public meetings, working groups, and a steering committee.

A public meeting was held on Sept. 25, 2007 to inform the public about the water quality impairments in the Falling River watershed and outline the goals for improving water quality through an implementation plan. A second public meeting took place on April 3, 2008 to request feedback from citizens on the draft implementation plan.

Specialized working groups were assembled to discuss specific implementation strategies for different sources of bacteria in this watershed and recommend actions for the plan. The working groups were divided into three focus areas: residential/urban, agricultural and governmental.

A steering committee was formed with representation from DEQ, DCR, VDH, RELSWCD, Campbell County Government and representatives from the working groups. This committee reviewed recommendations from the working groups and the draft implementation plan before it was made public.

Assessment of Needs: Recommended Actions

Agricultural Best Management Practices

Streamside fencing is one of the best ways to reduce bacteria levels in streams in agricultural watersheds. This will remove direct livestock defecation in the stream and prevent the trampling of the stream banks. The quantity of streamside fencing needed was determined through spatial analyses of land uses, the stream network, and archived data. Additionally, input from local agency representatives and citizens were used to verify the analyses.

Photo of badly eroded streams banks from direct livestock access in Pulliam Branch (Campbell County) 11/2/2000.

The length of fencing required on perennial, flowing year round, streams in the Falling River watershed is approximately 115 miles. In order to assess this goal, the state cost-share program for agricultural best management practices (BMPs) was utilized. The total fencing needed was divided up among the different BMPs offered through the state cost-share program that include a fencing component. The Robert E. Lee Soil and Water Conservation District has been targetting implementation since May 2007, the agricultural specialist began working with landowners to implement agricultural best management practices. As of April 1, 2008, 12 fence exclusion practices were completed and 14 others were under contract. The completed and under contract practices total 10 miles out of an estimated 115 miles of streamside fencing needed in the watershed.

Table 2 shows the fencing systems required for the impaired watershed in order to meet the livestock exclusion goal. Both the grazing land (SL-6) and stream protection (WP-2T) practices include a 35-foot

buffer along both sides of the stream where livestock exclusion fencing is installed. These riparian vegetated or forested buffers will provide an additional water quality benefit by trapping bacteria moving toward the streams through runoff. Therefore, these practices will provide some of the best water quality benefits in terms of reducing both direct (cows defacating in the stream) and land-based (runoff of manure into the stream during rain events) contributions of bacteria to the stream.

Table 2 SL-6 (Grazing Land Protection) and WP-2T (Stream Protection) fence exclusion systems required for Falling River.

Watershed	SL-6 systems	WP-2T systems
Falling River	289	15

The average system project length was 2,000 feet.

Due to the large reductions needed on land-based loads of *E. coli* bacteria, additional BMPs for pasture and cropland are also needed. Estimates of all agricultural BMPs needed for Stage I, the first five years (delisting from the 303(d) list), are listed in Table 3.

Table 3 Agricultural land based reduction BMPs required for delisting.

Control Measure	Unit	Falling River
Improved Pasture Management	Acre	17,532
Loafing Lot Management. WP-4B	System	2
Manure Incorporation - Cropland*	Acre	7,092
Riparian Vegetated Buffers – Cropland	Acres	25

* Manure incorporation on cropland involves mechanically incorporating manure into the soil so it does not wash off the land during a precipitation event.

Residential and Urban Best Management Practices

The Falling River TMDL allocations call for 100 percent reduction in bacteria sources in the watershed from straight pipes and failing septic systems (see Table 4). Also, large bacteria reductions in runoff from residential and urban areas are required. In order to achieve the human source reductions from on-site sewage disposal and runoff, the BMPs in Table 5 are targeted. The BMPs include removing straight pipes and

replacing failing septic systems, proper disposal of pet waste by homeowners, kennel owners, hunt clubs, etc.

Table 4 Estimated houses with septic systems or straight pipes and number of failing septic systems (Source: TMDL study).

Falling River Watershed	#
Houses with Standard Septic Systems	5,055
Potential Failing Septic Systems	152
Potential Straight Pipes	15

Septic Systems
All failing septic systems and straight pipes must be identified and replaced during implementation since a 100 percent load reduction from direct and nonpoint source (NPS) human waste is required to meet the TMDL goals. In addition, straight pipes are illegal in the Commonwealth of Virginia. The estimated numbers of straight pipes and failing septic systems were reported in the TMDL study.

Financial assistance could be provided through grants to provide cost-share for homeowners to pump out their septic tanks. While it is not likely that sufficient grant funds will be available to assist every homeowner in this watershed with a septic system pump-out, it is expected that this type of outreach will raise local awareness and lead homeowners to assume responsibility for maintaining their systems. In turn, this will help to prevent septic system failures in the future.

Pet Waste
There are a significant number of dogs in the watershed. For example, in 2006 Campbell County issued 175 licenses for kennels that held between five to 20 dogs. An additional 25 kennel licenses were issued for facilities that held between 21 to 50 dogs.

The pet waste education program referred to in Table 5 includes bacteria-reducing practices including distribution of information on proper disposal of pet waste, to pet owners, kennel operators and hunt clubs; signage regarding proper disposal of pet waste in public areas, along with pet waste disposal stations in public dog walking areas. There are two public areas within the Town of Appomattox where this information could be placed -- Abbit Park (7,332 square feet) and Courtland Field (87,912 square feet). Consideration should also be given to distributing pet waste information at campgrounds and picnic areas. Pet waste composters are also proposed to help eliminate pet

waste in homeowners' yards in addition to pet waste disposal stations in public dog walking areas. This approach includes the distribution of pet waste composters to households in this watershed with pets. This could be accomplished through partnerships with local stores selling pet food, the Campbell and Appomattox County Animal Shelters and the Society for the Prevention of Cruelty to Animals (SPCA).

Table 5 All residential and urban BMPs recommended in order to meet the delisting requirements (first 5 years of implementation).

Residential and Urban Control Measure Descriptions	VA Cost-Share Practice Number	Falling River
Septic Systems Pump-out	RB-1	2,527
Failing Septic System Corrections:		
Septic System Repair	RB-3	43
Septic System Installation/Replacement	RB-4	101
Alternative Waste Treatment System Installation	RB-5	8
Straight Pipe Corrections:		
Septic System Installation	RB-4	15
Alternative Waste Treatment System Installation	RB-5	0
Pet Waste Education Program	NA	1
Residential Pet Waste Composter	NA	2,163
Riparian Vegetated Buffers – Commercial Land (acres)	NA	1

Technical Assistance

Technical assistance needed for implementing the identified BMPs was measured in full-time equivalents (FTEs), with one FTE being equal to one full-time position. Two FTEs are needed per year during the first five years of the implementation period. It is estimated that only one FTE will be needed in the second five years primarily for the agricultural BMPs. The RELSWCD currently has a part-time position funded through the state to provide technical assistance for farmers to implement the agricultural BMPs identified in the implementation plan.

Implementation

Costs

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

- Virginia Agricultural Best Management Practices Cost-Share Program
- Virginia Agricultural Best Management Practices Tax Credit Program
- Virginia Agricultural Best Management Practices Loan Program
- Virginia Small Business Environmental Assistance Fund Loan Program
- Virginia Water Quality Improvement Fund
- Community Development Block Grant Program
- 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 intended implementation goal is to restore Falling River's water quality to attain the bacteria standards and the removal of this stream from Virginia's Section 303(d) impaired waters list. Progress toward end goals will be assessed during implementation through 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 the TMDL within 10 years. Stage I, Stage II and Stage III timelines extend out to 2023 with expected pollutant reductions shown in Figure 4. Stage III is a post-implementation period with water quality monitoring and plan evaluation continuing as there will be a lag time between

BMP implementation and the actual maximum efficiency of the BMPs being effective. This period extends to 2023. A timeline of implementation milestones is shown in Figure 4.

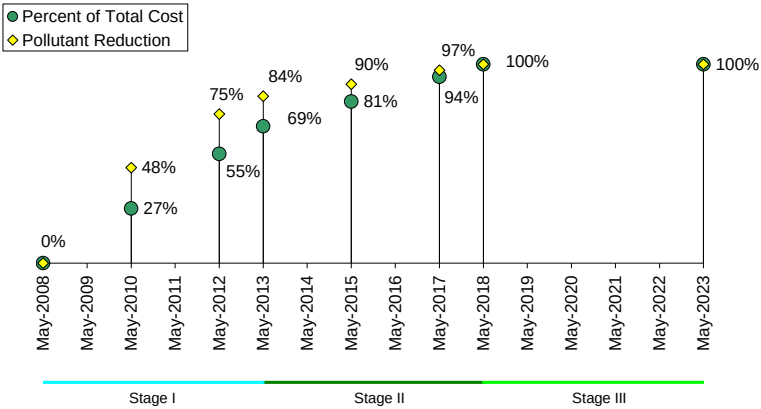

Figure 4 **Timeline for implementation in the Falling River watershed.**

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures first. These measures will be the focus of Stage I. Following Stage I implementation and if a de-listing is not yet attained, the steering committee should evaluate water quality improvements and determine how to proceed to implement additional BMPs during Stage II. Stage II focuses on BMPs that are necessary for the stream to fully comply with the TMDL allocation requirements. The Department of Environmental Quality's *E. coli* bacterial standard states that there can be no exceedances of either the geometric mean (126 cfu/100 ml) or the instantaneous (235 cfu/100 ml) values. Complying with the two-part standard requires BMPs that are more difficult and costly to implement. Table 6 shows the types and quantities of BMPs to be installed during each stage.

Table 6 Stage I and Stage II BMP implementation goals for Falling River.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (SL-6)	System	289	
Stream Protection (WP-2T)	System	15	
Improved Pasture Management	Acres	17,532	
Streamside Fence Maintenance	Feet	24,772	24,771
Loafing Lot Management (WP-4B)	System	2	
Manure Incorporation	Acres	7,092	
Riparian Vegetated Buffers – Cropland	Acres	25	
Retention Ponds – Pasture	Acres		29,220
Residential			
Septic Systems Pump-out	System	2,527	2,528
Septic System Repair (RB-3)	System	43	
Septic System Installation/Replacement (RB-4)	System	116	
Alternative Waste Treatment System Installation (RB-5)	System	8	
Pet Waste Education Program	Program	1	ongoing
Residential Pet Waste Composters	Composter	2,163	
Riparian Vegetated Buffers – Commercial Land	Acres	1	

Targeting

The impaired watershed was divided into subwatersheds for TMDL modeling purposes and this also helps with the targeting of BMP practices (Figure 5). Targeting of critical areas for livestock fencing was accomplished through analysis of livestock population and the fencing requirements for each subwatershed. The subwatersheds were ranked in descending order based on the ratio of animals per fence length along perennial streams. Failing septic systems were ranked based on the sum of the bacteria loads in each subwatershed. If feasible, effort should be made to prioritize financial and technical resources in the order of subwatersheds (Table 7).

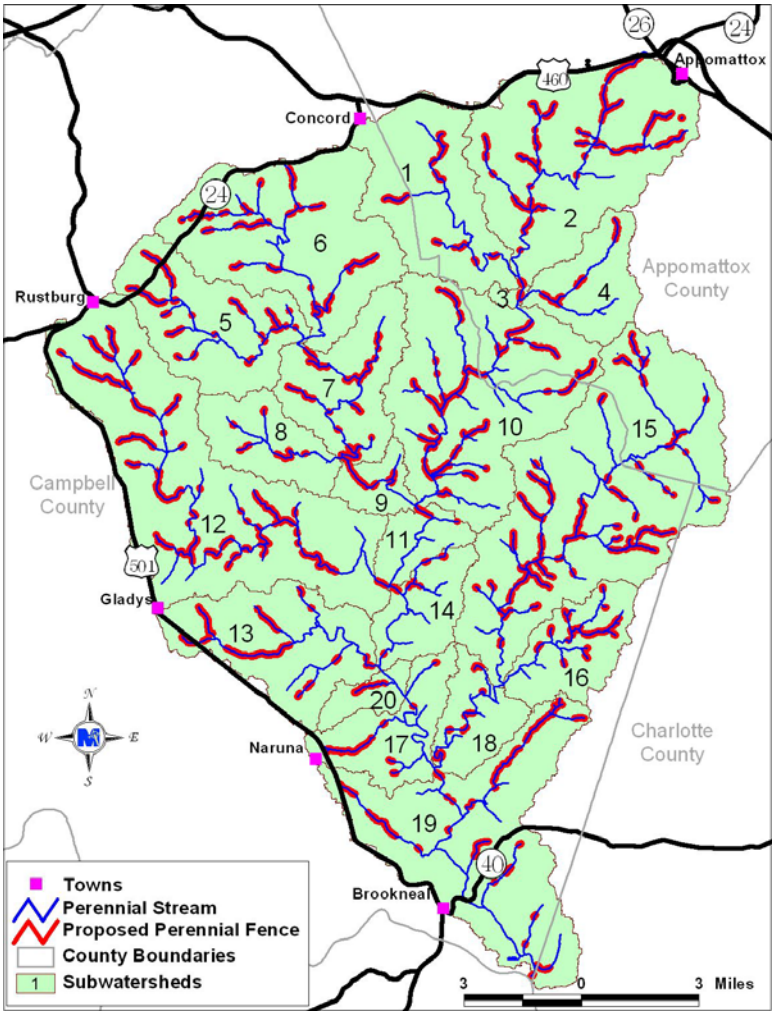

Figure 5 **Area available for streamside fencing in the Falling River watershed.**

Table 7 **Targeting subwatershed order for residential waste BMPs and streamside fencing.**

Stream	Failing Septic Systems	Streamside Fencing
Falling River	12, 2, 6, 19, 15, 5, 10, 13, 7, 1, 17, 8, 16, 18, 4, 14, 11, 9, 20, 3	12, 15, 10, 2, 19, 13, 6, 5, 7, 16, 1, 17, 18, 11, 4, 9, 14, 8, 20, 3

Cost / Benefit Analysis

In general, many of the agricultural BMPs being recommended will provide both environmental benefits and economic benefits to the farmer. Associated cost estimates of agricultural and residential BMPs were calculated by multiplying the unit cost of each practice by the number of units in each watershed.

Tables 8 and 9 show the estimated cost of installing the recommended agricultural, residential and urban BMPs in Stages I and II. The total cost for Stage I for this watershed is $10.75 million.

It was determined by the RELSWCD that it would require $50,000 to support the salary, benefits, travel, training, and incidentals for education for one technical FTE. With quantification analysis yielding a need for two FTEs per year for the first five years of implementation and one FTE per year for the subsequent five years, the maximum total cost to provide technical assistance during implementation is expected to be $750,000 (Tables 8 and 9). Factoring in technical assistance costs, the total cost for full implementation in this watershed comes to $15.67 million (Table 10).

The primary benefit of this implementation is cleaner waters in Campbell and Appomattox Counties. Specifically, fecal bacteria contamination in Falling River will be reduced to meet water quality standards and allow for safe recreational use. 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 stream 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 bacteria runoff to the stream from upslope locations. In addition, as trees and shrubs in vegetated buffers grow, they serve as excellent shade sources for streams. This in turn reduces water temperature in the stream and increases dissolved oxygen, thereby improving aquatic habitat for numerous aquatic organisms. In areas where pasture management is improved, less bacteria will be washed into streams following precipitation events. Bacteria concentrations in the stream should be at or below the state standards.

Livestock stream exclusion example.

Table 8 Costs to implement Stage I (years 1 - 5) for Falling River.

Impairment	Agricultural BMPs ($)	Residential and urban BMPs ($)	Technical Assistance ($)	Total ($)
Falling River	$8,843,000	$1,403,000	$500,000	10,750,000

Numbers are rounded to four significant digits.

Table 9 Costs to implement Stage II (years 6 - 10) for Falling River.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Falling River	$4,119,000	$556,000	$250,000	4,925,000

Numbers are rounded to four significant digits.

Table 10 Total cost for implementation in the Falling River watershed.

Impairment	Agricultural BMPs ($)	Residential and urban BMPs ($)	Technical Assistance ($)	Total ($)
Falling River	$12,960,000	$1,959,000	$750,000	$15,670,000

Numbers are rounded to four significant digits.

Off stream watering source for cattle.

A clean water source has been shown to improve herd health. Fresh clean water is the primary nutrient 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. Beef producers in several Virginia Counties have reported weight gains in cattle after providing alternative water sources. Studies also show increased milk and butterfat production from dairy cattle ingesting water from a clean 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 to 40 percent 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.

The residential programs will play an important role in improving water quality, since human waste can carry human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry with it. 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. Proper maintenance includes: knowing the location of the system components and protecting them (e.g., 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 three to five years. The cost of proper maintenance, as outlined here, is relatively inexpensive in comparison to repairing or replacing the entire system.

Implementation of this plan will help to foster continued local economic vitality and strength. This is based on the recognition that clean water improves 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 and environmental benefits to the landowner. Specifically, alternative (clean) water sources, exclusion of livestock from streams, intensive pasture management, and private sewage system maintenance will each provide economic benefits.

Monitoring

Improvements in water quality will be determined in the Falling River watershed through monitoring conducted by the DEQ's ambient monitoring program. The monitoring data include bacteria, physical parameters (dissolved oxygen, temperature, pH, and conductivity), nutrients and suspended and dissolved solids. The VADEQ uses the data to determine overall water quality status. The water quality status will help gauge the success of implementation aimed at reducing the amount of bacteria in the streams of the Falling River watershed.

The DEQ monitoring stations in the Falling River watershed are described in Table 11 and shown in Figure 6. Stations are monitored every other month within the monitoring period listed in Table 11. The station labeled 'trend' in sample frequency is the only station monitored continuously.

Up-to-date monitoring results are available to residents online at the department's Web site:
http://gisweb.deq.virginia.gov/monapp/mon_query_form.cfm.
Query information by selecting the watershed from the drop-down menu.

Currently, no volunteer monitoring is occurring in the Falling River Watershed.

Table 11 DEQ's existing and proposed monitoring stations in the Falling River watershed.

Station ID	Station Location	Monitoring Period
4ADOG000.80	Dog Creek at Route 600	2007-2008
4AHCK000.51	Hickory Creek at Route 641	2007-2008
4AFSF000.66	South Fork Falling River at Route 648 bridge	2009-2010
4ALRV005.17	Little Falling River at Route 618 bridge	2009-2010
4AMEY010.46	Mollys Creek at Route 654 bridge	2009-2010
4ASUC001.31	Suck Creek at Route 648	2009-2010
4AFRV025.34	Falling River at Route 650	2011-2012
4AFRV017.71	Falling River at Route 615	2011-2012
4AFRV003.07	Falling River at Route 40	2011-2012
4AFRV010.99	Falling River at Route 643	Trend – continual

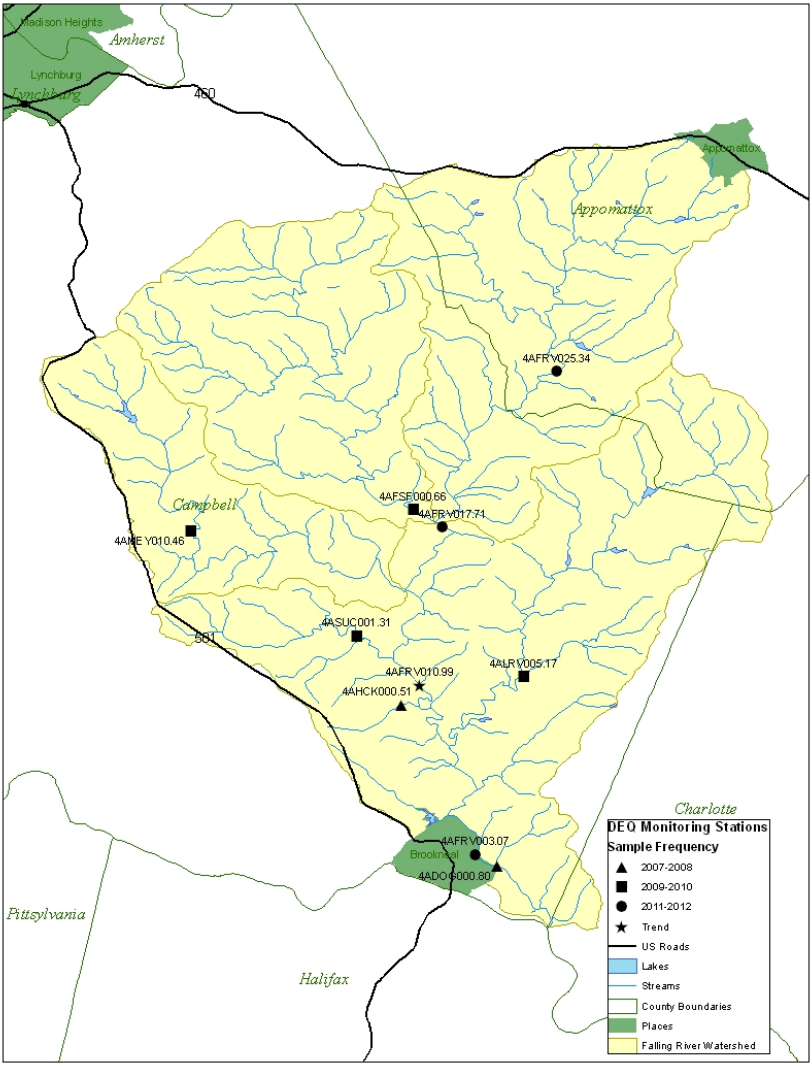

Figure 6 **DEQ's proposed monitoring stations in the Falling River watershed.**

Education

Personnel from the Robert E. Lee SWCD will initiate contact with farmers in this watershed to encourage the installation of agricultural BMPs. This one-on-one contact will facilitate communication of the water quality problems and the corrective actions needed. The technical staff for the IP will conduct a number of outreach activities in the watershed to raise local awareness, encourage community support and participation in reaching the implementation plan milestones. Such activities will include information exchange through newsletters, postcard mailings, field days and, presentations at local Ruritan and Rotary Clubs. The technical staff will work with organizations such as Virginia Cooperative Extension to sponsor farm tours and field days.

Stakeholders' Roles and Responsibilities

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals and special interest groups. Stakeholder participation and support is essential for achieving the goals of this TMDL implementation plan effort.

Environmental Protection Agency

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. Currently, there are six state agencies responsible for regulating activities that impact water quality with regard to this implementation plan. These agencies include: DEQ, DCR, VDH, VCE, DOF, and Virginia Department of Agriculture and Consumer Services (VDACS).

Department of Environmental Quality

DEQ has responsibility for monitoring the waters 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 DEQ 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). On January 1, 2008 the Virginia Department of Environmental Quality (DEQ) assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids. DEQ's Office of Land Application Programs within the Water Quality Division to manages the biosolids program. The biosolids program includes having and following nutrient management plans for all fields receiving biosolids, unannounced inspections of the land application sites, certification of persons land applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied.

Department of Conservation and Recreation

DCR is a major participant in the TMDL process. DCR has a lead role in the development of IPs to address non-point source pollutants such as bacteria from failing septic systems, pet waste, and livestock operations that contribute to water quality impairments. DCR provides available funding and technical support for the implementation of NPS components of IPs.

Robert E. Lee Soil and Water Conservation District

The Robert E. Lee SWCD will provide outreach, technical and financial assistance to farmers and property owners in the Falling River watershed through the Virginia Agricultural BMP Cost-Share and Tax Credit programs. Their responsibilities will include promoting implementation goals, available funding and the benefits of BMPs and providing assistance in the survey, design, layout, and approval of agricultural BMPs. Education and outreach activities are a significant portion of their responsibilities. The Robert E. Lee SWCD is currently receiving technical assistance funding to support their duties.

Virginia Department of Agriculture and Consumer Services

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. This Act is considered as a state regulatory tool that can support implementing conservation practices to addresses pollutant sources in TMDL impaired watersheds even though the Act does not specifically reference pathogens as a pollutant.

Virginia Department of Health

VDH is responsible for maintaining safe drinking water measured by standards set by EPA. Their duties also include septic system regulation and, in the past, regulation of biosolids land application. Like VDACS, VDH's program is complaint-driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. 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. VDH staff also issue permits for the repair and installation of septic systems and the installation of alternative waste treatment systems.

Local Governments

Local governments can develop ordinances involving pollution prevention measures and play a very active role in the TMDL implementation process.

The local governments can play a very active role in the implementation process. For example, they could promote a septic system maintenance program. This could be done by handing out literature when individuals apply for a building permit. It is recommended (if they have not done so already) that Campbell and Appomattox Counties adopt a reserve area for land parcels using on-site wastewater treatment of equal size to the approved on-site disposal system for use in the event the on-site disposal system fails. Further, the reserve area shown must be of equal capacity to the primary drainfield using the same technology as the primary system. Nothing shall be constructed within the reserve area.

Local governments could also play an active role in the proper disposal of pet waste. There are approximately 217 twenty-dog kennels and 44 fifty-dog kennels in Campbell and Appomattox Counties combined. When licenses for dog kennels are issued, the owners should be

required to produce a plan for the proper disposal of waste from the facility.

Regarding future subdivisions, local governments should ensure that they be developed with sustainable growth practices that minimize or eliminate storm water runoff.

Citizens

Successful implementation depends on stakeholders taking responsibility for their role in the process. This could include using pet waste composters if they have dogs, getting septic tanks pumped on a regular basis and talking with friends and neighbors about things they can do to protect water quality. 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. While it is unreasonable to expect that the natural environment (e.g., streams and rivers) can be made one hundred percent free of risk to human health, it is possible and desirable to minimize anthropogenic 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.

Water Quality Programs and Activities

Each watershed in the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographic boundaries and goals. These include but are not limited to TMDLs, roundtables, water quality management plans, erosion and sediment control regulations, stormwater management, a source water protection program, and local comprehensive plans. Coordination of the implementation project with these existing programs could result in additional resources and increased participation.

Notes

List of Acronyms

BMP	Best Management Practice
BST	Bacteria Source Tracking
CREP	Conservation Reserve and Enhancement Program
CWA	Clean Water Act
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
DOF	Virginia Department of Forestry
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FTE	Full Time Equivalent
GWG	Government Working Group
IP	Implementation Plan
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Service
RWG	Residential Working Group
SL-6	Grazing Land Protection System
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
VCE	Virginia Cooperative Extension
VDACS	Virginia Department of Agriculture and Consumer Services
VDH	Virginia Department of Health
WP-2T	Stream Protection

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List of Contacts

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Virginia Department of Health Central Virginia Health District 1900 Thomson Drive Lynchburg, VA 24501	(434) 947-6785
Virginia Cooperative Extension Service 163 Kabler Lane Agricultural Building Rustburg, VA 24588	(434) 332-9538
Virginia Cooperative Extension Service 177 Morton Lane County Office Building Appomattox, VA 24522	(434) 352-8244
Natural Resources Conservation Service Farmville Service Center 100 Dominion Drive Farmville, VA 23901	(434) 392-4906
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