Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek TMDL Implementation Plan:

A Plan to Reduce Bacteria in Spring, Briery, Little Sandy & Saylers Creeks & Bush River Watersheds

Prepared for:
Old Dominion Resource Conservation & Development Council
and
The Virginia Department of Conservation & Recreation

Submitted July 7, 2008

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Agricultural BMPs

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.

The length of fencing required on perennial streams in the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds is approximately 19.1, 12.8, 13.6, 4.2, and 7.6 miles respectively, for a total of 57.3 miles. Table E.1 shows the fencing systems required for each impaired watershed to meet the livestock exclusion goal during the first five years (Stage I) of implementation. Both the grazing land (SL-6) and stream protection (WP-2T) practices include a 35-ft 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 bacteria to the stream.

Table E.1 SL-6 and WP-2T fence exclusion systems required for Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek.

Watershed	SL-6 systems	WP-2T systems
Spring Creek*	16	1
Briery Creek**	32	3
Bush River	57	3
Little Sandy Creek	18	1
Saylers Creek	31	2
Totals	**154**	**10**

* Only 20 percent of the required fence exclusion systems are needed in Stage I.
** Only 60 percent of the required fence exclusion systems are needed in Stage I.

Due to the large reductions needed from 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 listed in Table E.2.

Table E.2 Additional agricultural BMPs required for delisting.

Control Measure	Unit	Spring Creek*	Briery Creek**	Bush River	Little Sandy Creek	Saylers Creek	Total
Improved Pasture Management	Acre	220	496	3,691	379	809	5,595
Small Acreage Grazing (SL6-A)	System	1	1	1	1	1	5
Loafing Lot Mnt. (WP-4B)	System	0	0	1	0	0	1
Manure Incorporation	Acre	60	140	390	20	273	883
Riparian Vegetated Buffers – Cropland	Acres	1	1	3	0	1	6

* Only 20 percent of the required BMPs are needed in Stage I.
** Only 60 percent of the required BMPs are needed in Stage I.

Residential BMPs

All failing septic systems and straight pipes must be identified and replaced during implementation since a 99 – 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. Based on updated data from the county health department the number of straight pipes in the watersheds was reduced for the implementation plan and the number of failing septic systems was increased.

Table E.3 Estimated residential waste treatment systems from the TMDL study and updated from VDH information for the IP.

Watershed	Houses with Standard Septic Systems	Potential Failing Septic Systems - TMDL	Potential Straight Pipes - TMDL	Potential Failing Septic Systems – IP[1]	Potential Straight Pipes – IP[1]
Spring Creek[2]	377	86	3	18	1
Briery Creek[3]	823	169	8	105	1
Bush River	1360	276	18	292	2
Little Sandy Creek	67	16	1	16	1
Saylers Creek	455	97	3	99	1
Total	3,082	644	33	530	6

[1] Implementation Plan
[2] Only 20 percent of the estimated failing systems need to be corrected for delisting (Stage I)
[3] Only 60 percent of the estimated failing systems need to be corrected for delisting (Stage I)

The Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek 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 of. An additional approach is also proposed to help eliminate pet waste in homeowners yards and dog kennels instead of focusing only on public places. This focus includes the use of pet waste composters and includes the distribution of pet waste composters to households and kennels in the watersheds with dogs. This could be accomplished through partnerships with local stores selling pet food, the Prince Edward County Animal Shelter and the Society for the Prevention of Cruelty to Animals.

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

Residential Control Measure Description	VA Cost-Share Practice Number	Spring Creek[1]	Briery Creek[2]	Bush River	Little Sandy Creek	Saylers Creek	Total
Failing Septic System Corrections:							
Septic System - Repair	RB-3	5	30	83	5	28	151
Septic System - Replacement	RB-4	12	70	194	10	66	352
Alternative Waste Treatment System Installation	RB-5	1	5	15	1	5	27
Straight Pipe Corrections:							
Septic System Installation	RB-4	1	1	1	1	1	5
Alternative Waste Treatment System Installation	RB-5	0	0	1	0	0	1
Pet Waste Education Program[3]	NA	1	1	1	1	1	1
Residential Pet Waste Composters	NA	30	264	546	26	172	1,038

[1] Only 20 percent of the estimated failing systems need to be corrected for delisting (Stage I)
[2].Only 60 percent of the estimated failing systems need to be corrected for delisting (Stage I)
[3] Only one pet waste education program will be used for all five watersheds.

Tables E.5 and E.6 show the estimated cost of installing the recommended agricultural and residential BMPs in Stages I and II. The total cost for Stage I for all five watersheds is $7.12 million. The total cost for full implementation in all five watersheds comes to $12.81

million (Table E.7). Timelines with pollutant reductions expected are shown in Figures E.1 – E.5.

Table E.5 Costs to implement Stage I (years 1 - 5) for Spring Creek, Briery Creek Bush River, Little Sandy Creek and Saylers Creek.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Spring Creek	337,900	112,800	77,930	529,000
Briery Creek	674,500	607,000	62,740	1,344,000
Bush River	1,490,000	1,700,000	220,900	3,410,000
Little Sandy Creek	388,000	102,600	21,570	512,100
Saylers Creek	683,6000	573,400	66,920	1,324,000
Total	**3,574,000**	**3,095,000**	**450,000**	**7,119,000**

Numbers are rounded to four significant digits.

Table E.6 Costs to implement Stage II (years 6 - 10) for Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Spring Creek	$1,760,900	$385,000	$81,610	$2,228,000
Briery Creek	$770,200	$417,600	$47,560	$1,235,000
Bush River	$1,540,000	$3,750	$128,700	$1,673,000
Little Sandy Creek	$160,400	$3,750	$13,520	$177,700
Saylers Creek	$341,000	$3,750	$28,630	$373,000
Total	**$4,573,000**	**$813,800**	**$300,000**	**$5,686,000**

Numbers are rounded to four significant digits.

Table E.7 Total cost for implementation in the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Spring Creek	$2,099,000	$497,800	$159,500	$2,756,000
Briery Creek	$1,444,700	$1,025,000	$110,300	$2,580,000
Bush River	$3,030,000	$1,703,000	$349,500	$5,083,000
Little Sandy Creek	$548,400	$106,300	$35,090	$689,800
Saylers Creek	$1,024,200	$577,100	$95,550	$1,697,000
Total	**$8,146,000**	**$3,909,000**	**$750,000**	**$12,810,000**

Numbers are rounded to four significant digits.

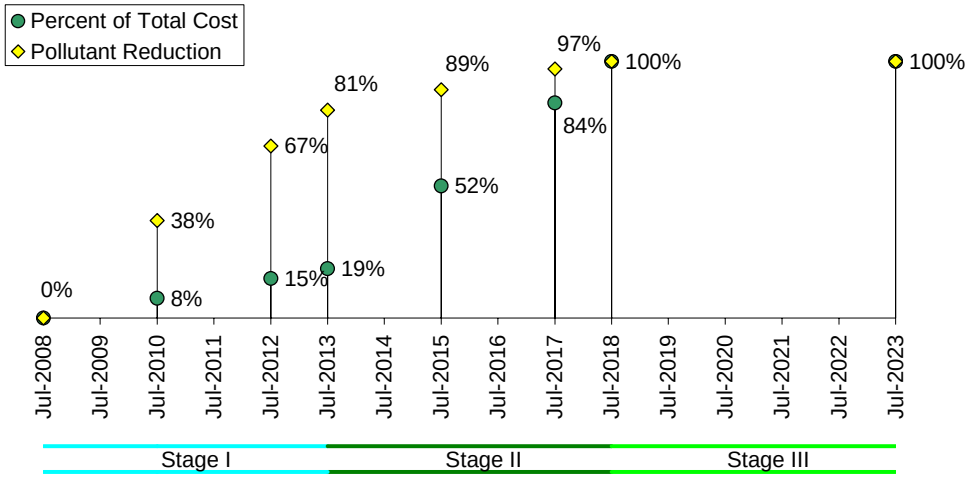

Figure E.1 Timeline for implementation in the Spring Creek watershed.

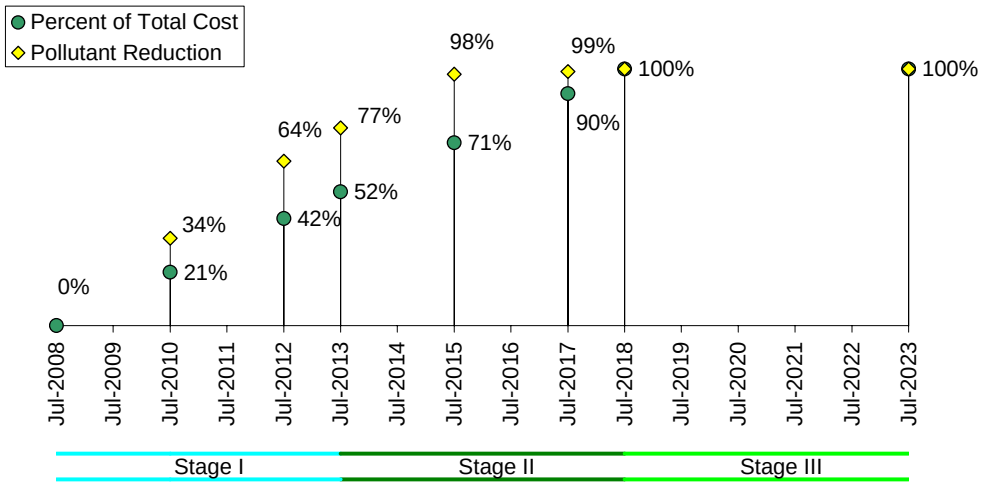

Figure E.2 Timeline for implementation in the Briery Creek watershed.

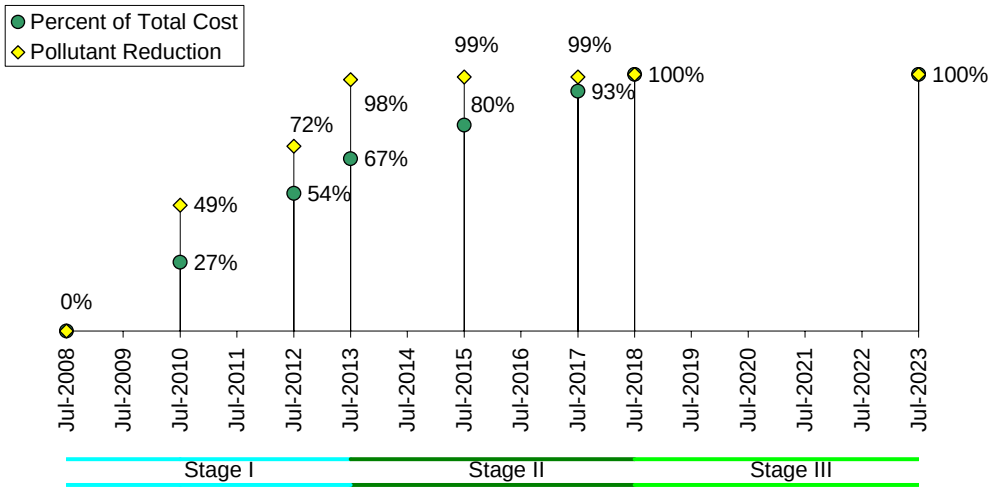

Figure E.3 Timeline for implementation in the Bush River watershed.

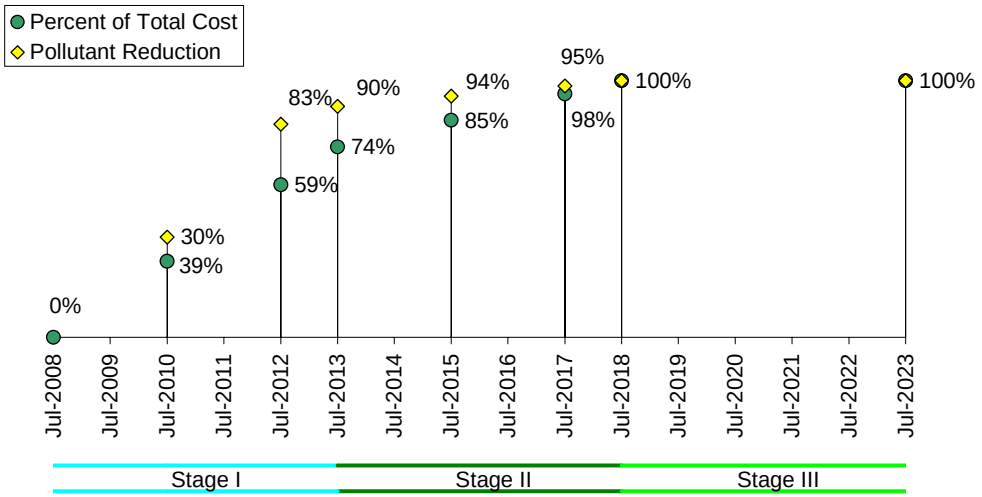

Figure E.4 Timeline for implementation in the Little Sandy Creek watershed.

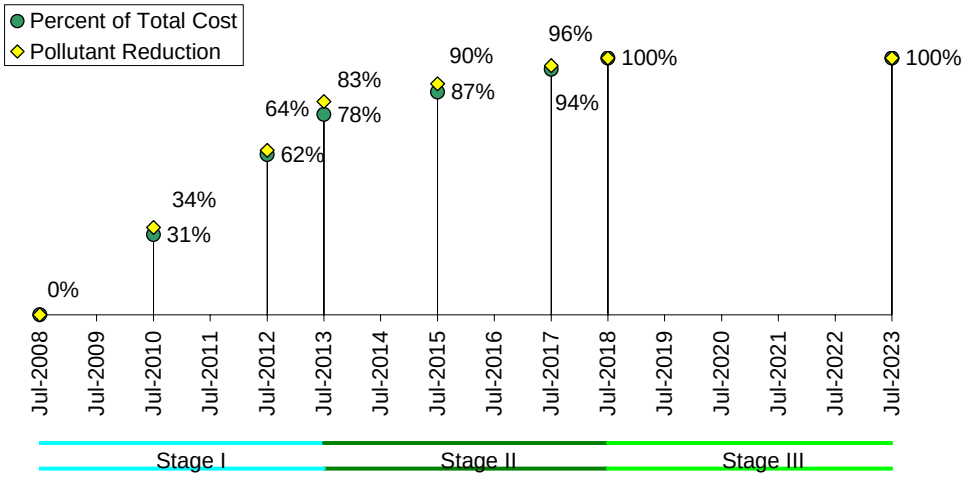

Figure E.5 Timeline for implementation in the Saylers Creek watershed.

Introduction

The Federal 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: fishing, swimming, shellfish, aquatic life (benthic), wildlife and drinking.

When a stream fails to meet the standards, it is listed as impaired on the CWA's Section 303(d) list. Spring Creek (VAC-J02R-01), Briery Creek (VAC-J05R-01), Bush River (VAC-J04R-01), Little Sandy Creek (VAC-J03R-01) and Saylers Creek (VAC-J06R-04) were listed as impaired on Virginia's 1998, 2002 and 2004 303(d) Total Maximum Daily Load Priority List and Reports due to violations of the State's water quality standards for fecal coliform. The bacteria standard was changed 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. All five impairments remained on Virginia's 2006 Integrated 305(b)/303(d) report.

The impaired segment on Spring Creek begins at the confluence with Mud Creek and continues downstream to the confluence with the Bush River (5.5 miles). The Briery Creek impaired segment begins at the Briery Creek Lake outlet and continues downstream to the confluence with Bush River (9.94 miles). The Bush River impaired segment begins at the Millers Creek confluence and continues downstream to the confluence with the Appomattox River (5.0 miles). The Little Sandy Creek impaired segment begins at the headwaters and continues downstream to the Sandy River Reservoir (7.35 miles). The impaired segment on Saylers Creek begins at the Appomattox/Nottoway County line and continues downstream to the confluence with the Appomattox River (9.2 miles). The impaired segments are shown in Figures 1 through 3.

Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek are all part of the James River Basin and are located within USGS hydrologic unit code 02080207 (Appomattox River). The Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds are approximately 22,000, 27,000, 7,600, 65,000 and 15,500 acres, respectively, for a total of 137,100 acres.

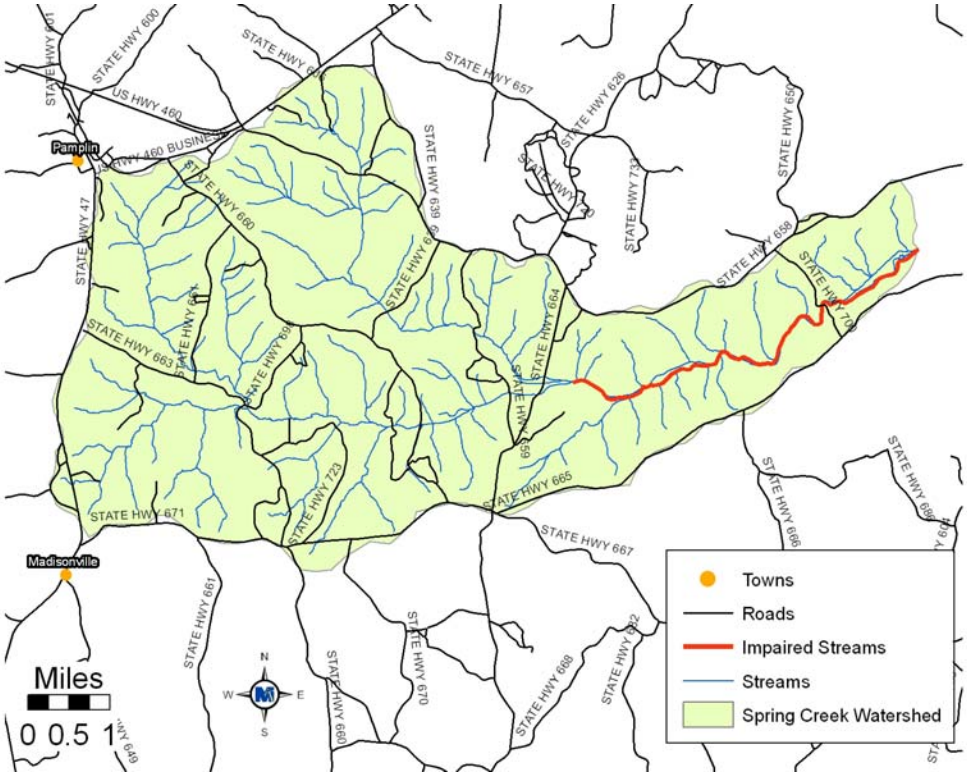

Figure 1. The impaired segment of Spring Creek.

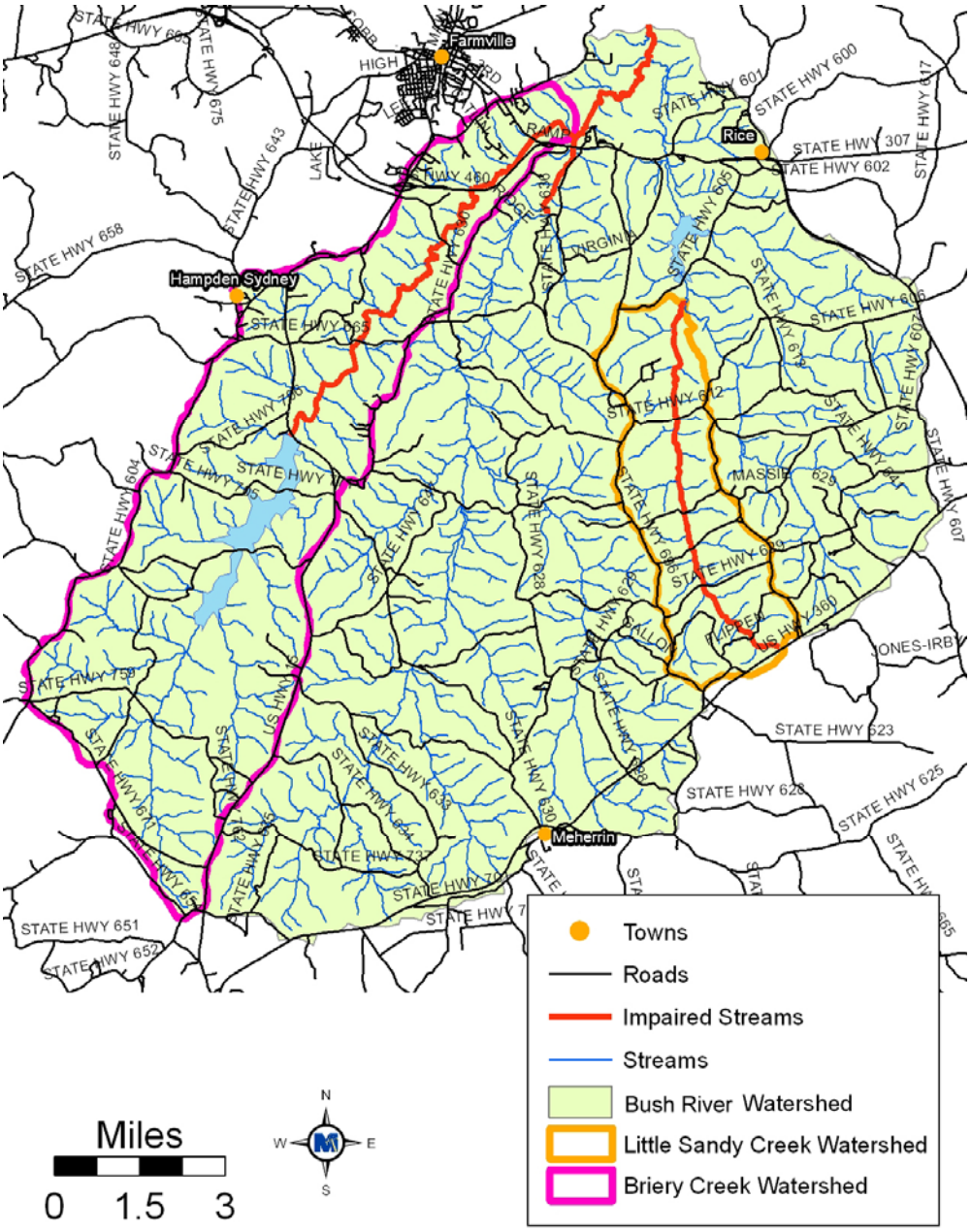

Figure 2. The impaired segments of Briery Creek, Little Sandy Creek, and Bush River.

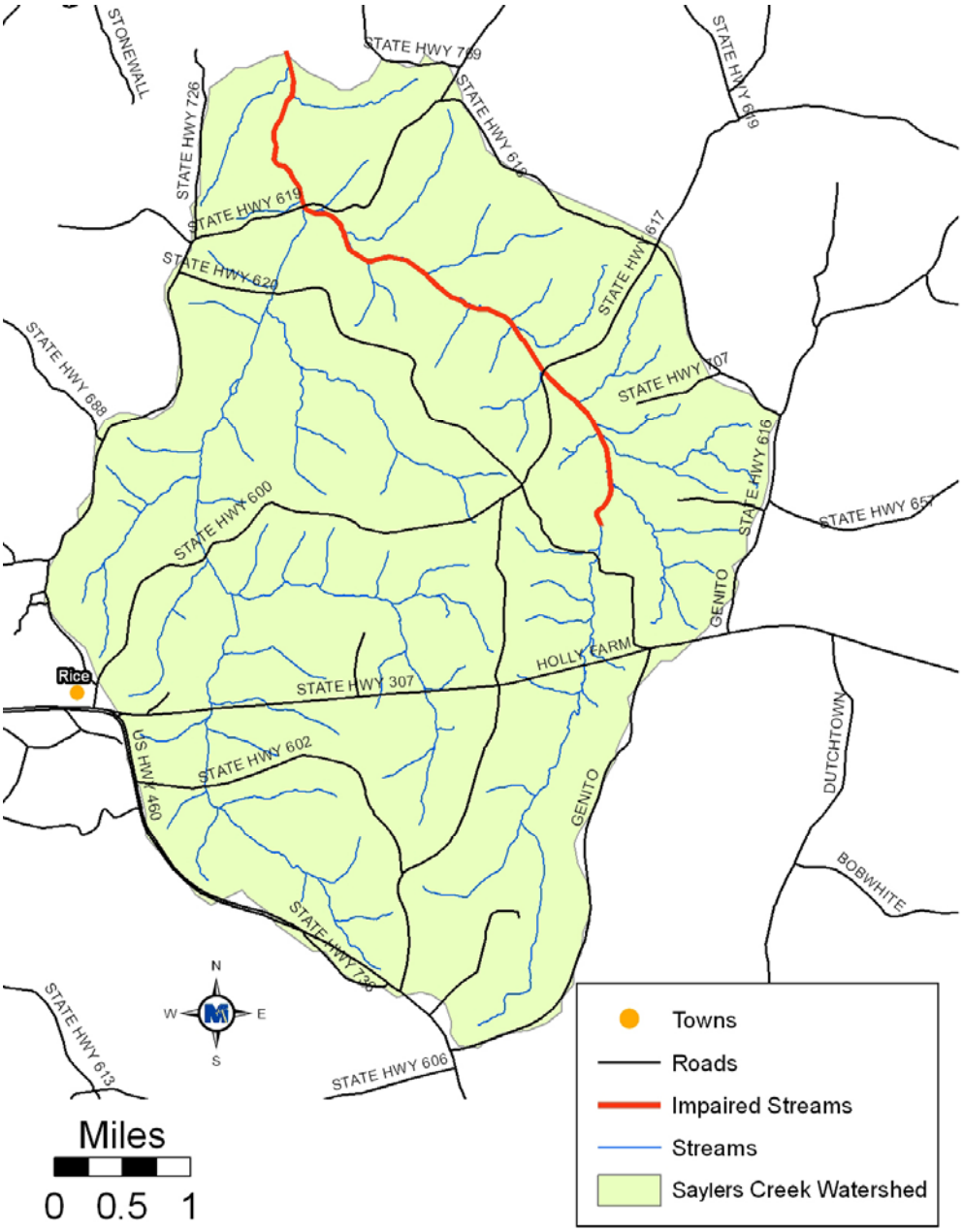

Figure 3. The impaired segment of Saylers Creek.

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. A TMDL accounts for seasonal variations and must include a margin of safety (MOS). The TMDL process includes 3 different steps after a stream is

listed on the impaired waters or 303(d) list. The first step is to conduct a TMDL study. The TMDL study 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 second step in the process is the development of an Implementation Plan (IP), which has now been completed for the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds. This plan outlines how the TMDL goals can be accomplished in the watersheds (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* impairment in Spring Creek, Briery Creek, Bush River, Little Sandy Creek, and Saylers Creek.

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 Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek impaired segments. With successful completion of the IP, we continue on to the third step in the TMDL process to meet these water quality goals, which is implementation of the plan. Approval of the IP will increase the opportunities for implementation funding , and will provide residents of these five watersheds 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 Spring Creek, Briery Creek, Bush River, Little Sandy Creek, Saylers Creek and their 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 wish to swim and recreate in these creeks.

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 SWCB 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 does, however, outline 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.

It is strongly suggested that the EPA recommendations be addressed in the IP, in addition to the required components as described by WQMIRA.

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

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

Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds are located in primarily in Prince Edward County in Virginia. A small portion of the headwaters of the Saylers Creek watershed is located in Amelia and Nottoway Counties.

MapTech, Inc. was contracted to develop the *E. coli* bacteria TMDL for all of the impaired segments in the Appomattox River Basin. This T MDL was approved in August 2004 by the USEPA.

The first step in developing the implementation plan was to review this TMDL study. The result of the TMDL study was used to determine the water quality goals and associated pollutant reductions that would need to be addressed in the implementation plan.

In addition to performing analyses of fecal bacteria and *E. coli* concentrations for the TMDL, a water quality analysis method called Bacteria Source Tracking (BST) was performed on water samples from Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek. 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. Having this information will improve the chances for success in implementing solutions by allowing better targeting of the sources of bacteria in the watersheds. Figures 4 - 14 show the load weighted average BST results for Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek respectively. These averages were calculated from the 12 monthly samples collected during TMDL development. The weighting process favors the values that are associated with highest *E. coli* concentrations because those concentrations often exceed the water quality standard and it is more important to know what the dominant sources of bacteria are when *E. coli* exceeds the water quality standard.

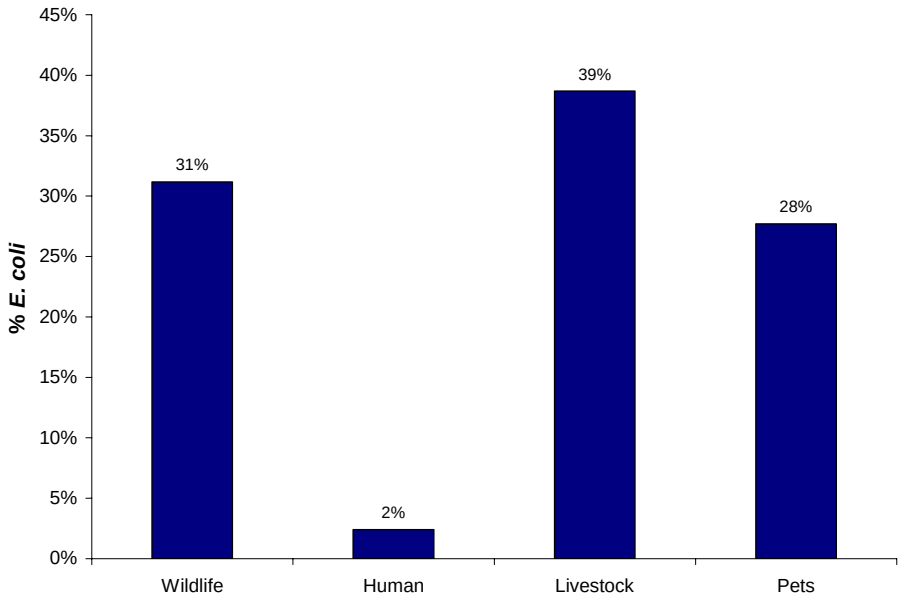

Figure 4. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Spring Creek at station 2-SPA001.46.

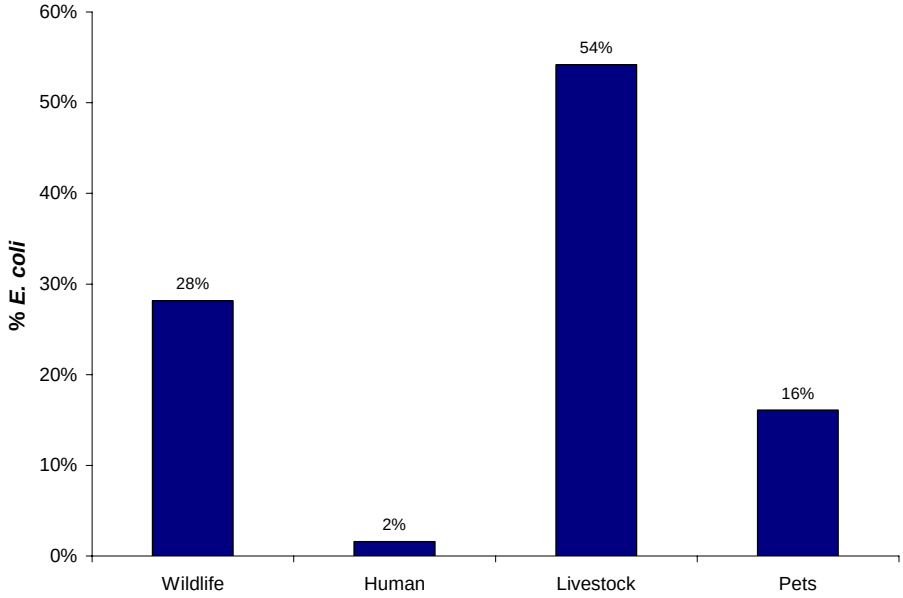

Figure 5. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Spring Creek at station 2-SPA006.48.

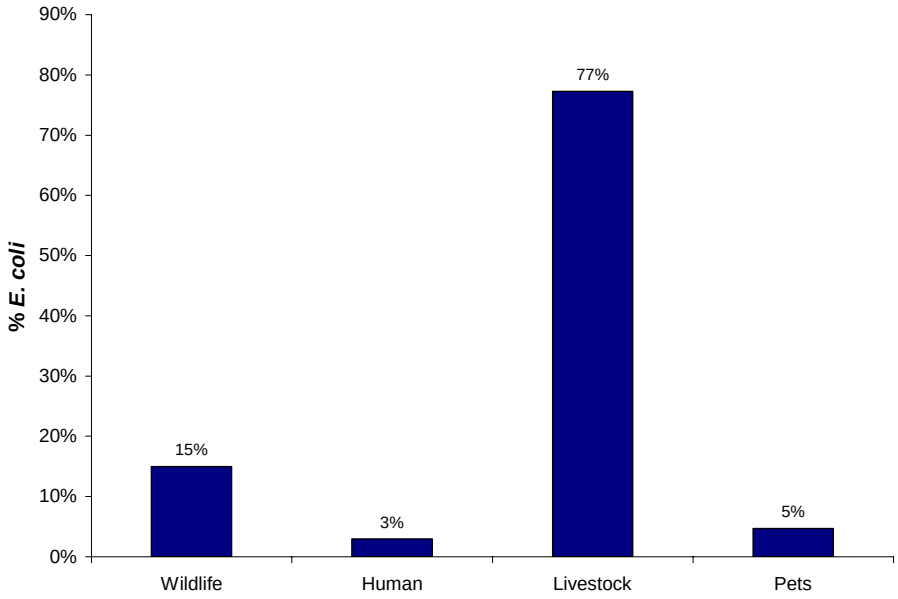

Figure 6. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Briery Creek at station 2-BRI001.00.

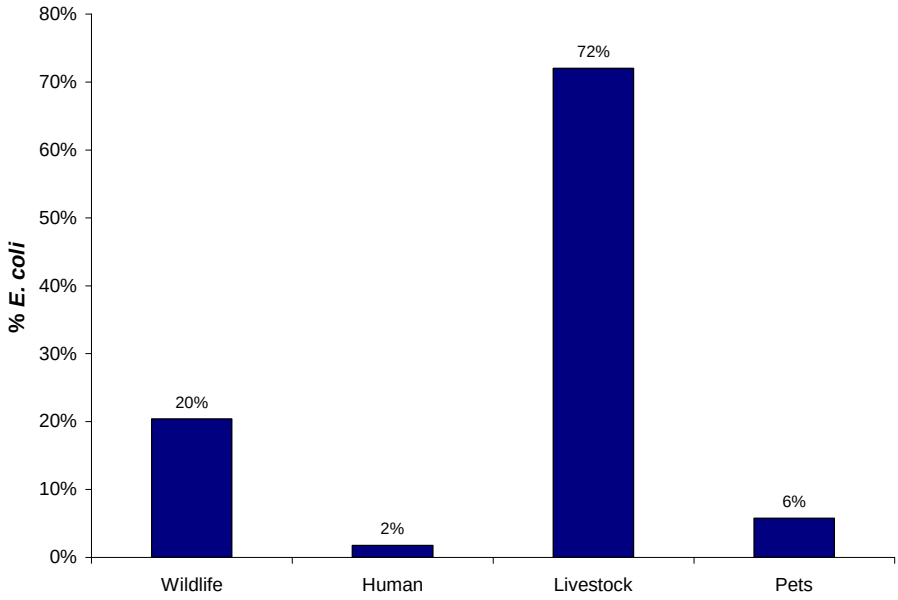

Figure 7. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Briery Creek at station 2-BRI004.01.

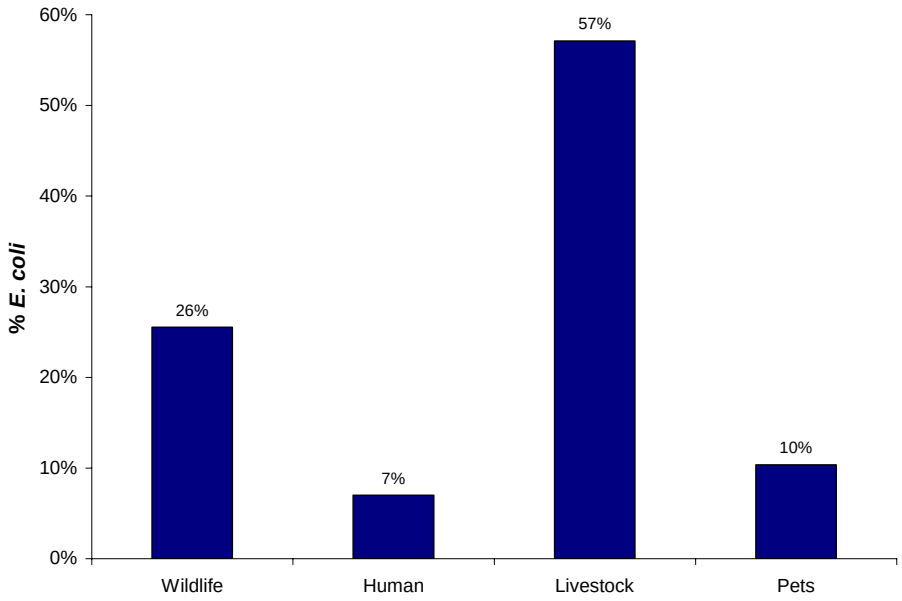

Figure 8. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Bush River at station 2-BSR002.82.

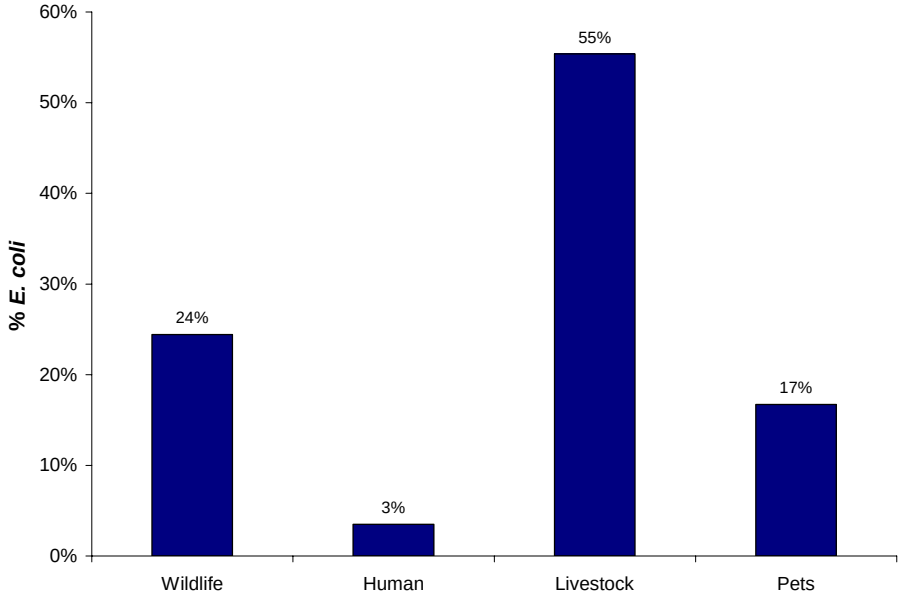

Figure 9. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Bush River at station 2-BSR008.08.

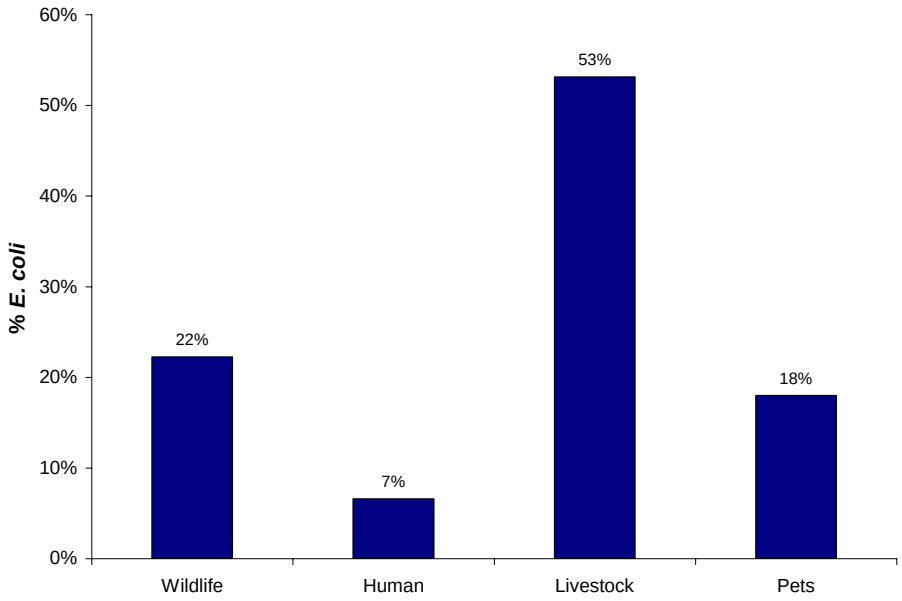

Figure 10. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Bush River at station 2-BSR014.67.

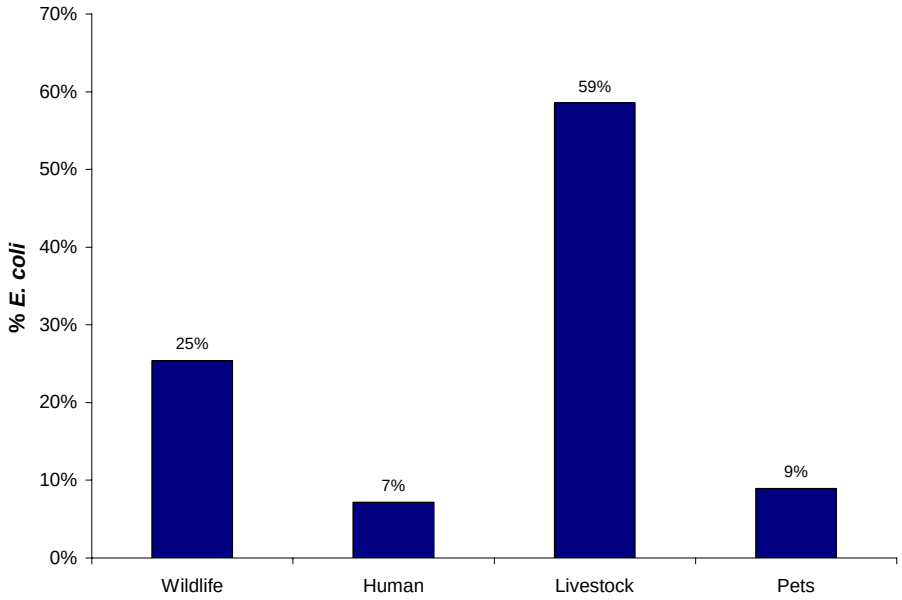

Figure 11. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Little Sandy Creek at station 2-LIT002.40.

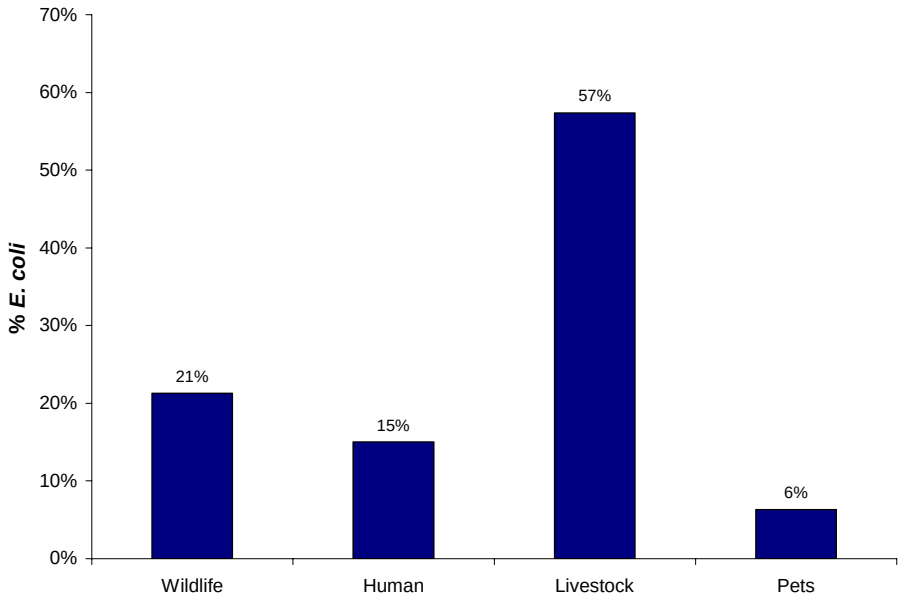

Figure 12. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Little Sandy Creek at station 2-LIT005.43.

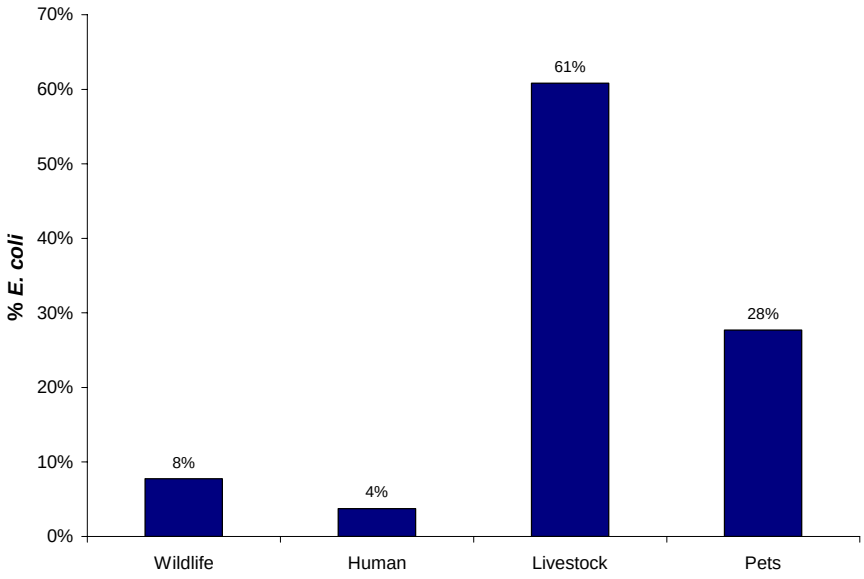

Figure 13. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Saylers Creek at station 2-SLY001.26.

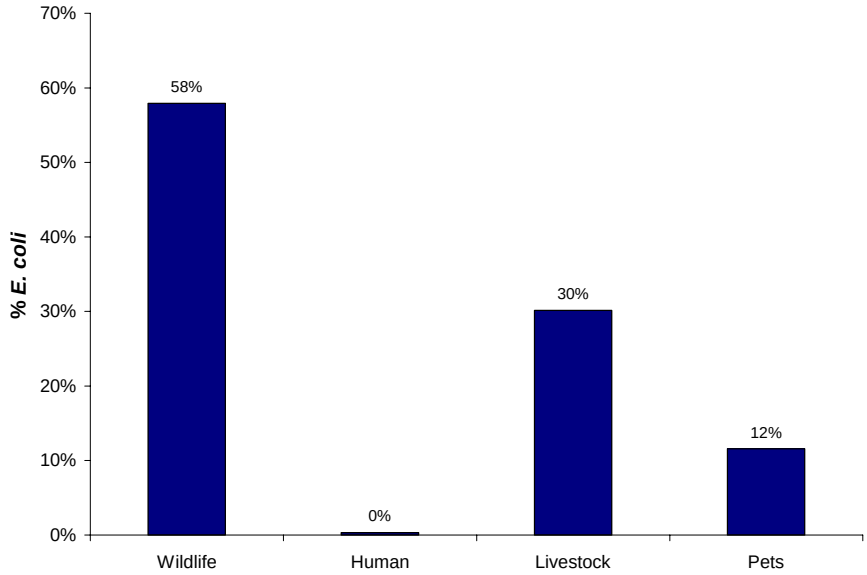

Figure 14. Load weighted averages for E. coli concentrations and fecal bacteria sources conducted by DEQ during development of the TMDL for Saylers Creek at station 2-SLY003.91.

A summary of the final *E. coli* allocations that resulted from the TMDL study is given in Table 1. The correction of straight pipes and failing septic systems are a requirement of the *E. coli* TMDL. In addition, the majority of livestock in all five watersheds 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 will not be addressed in this implementation plan. Rather, the objective of this plan is to address those sources of bacteria that can be attributed to human activities including land use and natural resource management.

These TMDL studies were conducted because Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek were not meeting state water quality standards for the recreation use (swimming). In order to meet the water quality goals established by the TMDL studies, any water sample from the stream must be equal to or less than 235 colony forming units per 100 milliliters (cfu/100mL) at all times. Over all the samples collected within a 30 day period the geometric mean of this data must be equal or less than 126 cfu/100mL.

Table 1. Load reductions allocated for Spring Creek, Briery Creek, Bush River, Little Sandy Creek, and Saylers Creek TMDLs.

Impairment	Failed Septic Systems and Straight Pipes	Direct Livestock	Nonpoint Sources	Direct Wildlife*
Spring Creek	100%	100%	99%	0%
Briery Creek	100%	100%	99%	38%
Bush River	100%	100%	99%	35%
Little Sandy Creek	100%	100%	99.8%	48%
Saylers Creek	100%	100%	99%	55%

*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, Prince Edward and Amelia County governments, DEQ, DCR, Virginia Department of Health (VDH), Virginia Cooperative Extension (VCE), Virginia Department of Forestry (DOF), Natural Resources Conservation Service (NRCS), Piedmont Soil and Water Conservation District (PSWCD), and MapTech, Inc. Every citizen and interested party in the watershed area is encouraged to become involved in the implementation process and contribute in in ways to restore the health of the streams.

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. Second, specialized working groups were assembled to discuss specific implementation strategies for different sources of bacteria in the watersheds. The working groups included: residential/urban, agricultural and government. Third, a Steering Committee was formed with representation from DEQ, DCR, VDH, PSWCD, Prince Edward County Government and representatives from the working groups.

Assessment of Needs: Recommended Actions

Agricultural BMPs

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. 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.

Severly eroded streambanks in Rockingham County, Viginia

The length of fencing required on perennial streams in the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds is approximately 19.1, 12.8, 13.6, 4.2 and 7.6 miles respectively for a total of 57.3 miles. In order to accomplish these goals, the state cost-share program for agricultural best management practices (BMPs) was utilized in the implementation plan. The total fencing needed was divided up among the different BMPs offered through the state cost-share program that included a fencing component. Table 2 shows the fencing systems required for each impaired watershed needed to meet the livestock exclusion goal. Both the grazing land and stream protection practices include a 35-ft buffer component. These vegetated or forested buffers will provide an additional water quality benefit by trapping bacteria moving towards 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 and WP-2T fence exclusion systems required for Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek.

Watershed	SL-6 systems	WP-2T systems
Spring Creek*	16	1
Briery Creek **	32	3
Bush River	57	3
Little Sandy Creek	18	1
Saylers Creek	31	2
Totals	**154**	**10**

* Only 20 percent of the required fence exclusion systems are needed in Stage I.
** Only 60 percent of the required fence exclusion systems are needed in Stage I.

Due to the large reductions needed from land-based loads of *E. coli* bacteria, additional BMPs for pasture and cropland are also necessary. 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. Additional agricultural BMPs required for delisting.

Control Measure	Unit	Spring Creek*	Briery Creek**	Bush River	Little Sandy Creek	Saylers Creek	Total
Improved Pasture Management	Acre	220	496	3,691	379	809	5,595
Small Acreage Grazing (SL6-A)	System	1	1	1	1	1	5
Loafing Lot Mnt. (WP-4B)	System	0	0	1	0	0	1
Manure Incorporation	Acre	60	140	390	20	273	883
Riparian Vegetated Buffers – Cropland	Acres	1	1	3	0	1	6

* Only 20 percent of the required BMPs are needed in Stage I.
** Only 60 percent of the required BMPs are needed in Stage I.

Residential BMPs

Straight Pipes and Septic Systems

All failing septic systems and straight pipes must be identified and replaced during implementation since a 99 – 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 studies and are shown in Table 4. Based on updated data from the county health department the number of straight pipes in the watersheds was reduced for the implementation plan and the number of failing septic systems was increased. This was due to the type of soils found in the county, the distance most homes are from a flowing stream and the fact there very few straight pipes have ever been found or reported to the health department.

Table 4. Estimated residential waste treatment systems in the TMDL study and updated data from VDH data for the IP.

Watershed	Houses with Standard Septic Systems	Potential Failing Septic Systems - TMDL	Potential Straight Pipes - TMDL	Potential Failing Septic Systems – IP[1]	Potential Straight Pipes – IP[1]
Spring Creek[2]	377	86	3	18	1
Briery Creek[3]	823	169	8	105	1
Bush River	1360	276	18	292	2
Little Sandy Creek	67	16	1	16	1
Saylers Creek	455	97	3	99	1
Total	3,082	644	33	530	6

[1] Implementation Plan
[2] Only 20 percent of the estimated failing systems need to be corrected for delisting (Stage I)
[3] Only 60 percent of the estimated failing systems need to be corrected for delisting (Stage I)

Example of septic tank being installed.

Pet Waste

The Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek TMDL allocations call for large reductions to land-based residential loads. In order to achieve these reductions, the BMPs in Table 5 must be implemented. The Pet Waste Education Program referred to in the table includes distributing information on the 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 receptables at public dog walking areas. An additional approach is also proposed to help eliminate pet waste in homeowners yards and dog kennels instead of focusing only on public places. This focus includes the use of pet waste composters and includes the distribution of pet waste composters to households and kennels in the watersheds with dogs. This could be accomplished through partnerships with local stores selling pet food, the Prince Edward County Animal Shelters and the Society for the Prevention of Cruelty to Animals.

Example of a pet waste disposal system

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

Residential Control Measure Description	VA Cost-Share Practice Number	Spring Creek[1]	Briery Creek[2]	Bush River	Little Sandy Creek	Saylers Creek	Total
Failing Septic System Corrections:							
Septic System - Repair	RB-3	5	30	83	5	28	151
Septic System - Replacement	RB-4	12	70	194	10	66	352
Alternative Waste Treatment System Installation	RB-5	1	5	15	1	5	27
Straight Pipe Corrections:							
Septic System Installation	RB-4	1	1	1	1	1	5
Alternative Waste Treatment System Installation	RB-5	0	0	1	0	0	1
Pet Waste Education Program[3]	NA	1	1	1	1	1	1
Residential Pet Waste Composters	NA	30	264	546	26	172	1,038

[1] Only 20 percent of the estimated failing systems need to be corrected for delisting (Stage I)
[2].Only 60 percent of the estimated failing systems need to be corrected for delisting (Stage I)
[3] Only one pet waste education program will be used for all five watersheds.

Technical Assistance

Technical assistance needed for the project was measured in full time equivalents (FTEs), with 1 FTE being equal to one full time position. Two (2) FTEs are needed per year during the first 5 years of the

implementation period for this project. It is estimated that only 1 FTE will be needed in the second 5 years of the project primarily for the agricultural BMPs. The PSWCD currently has a full 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 PSWCD, 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 end goals of implementation are restored water quality of Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek; and the removal of these streams from Virginia's Section 303(d) 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 within 10 years. Timelines with pollutant reductions expected are shown in Figures 15 - 19.

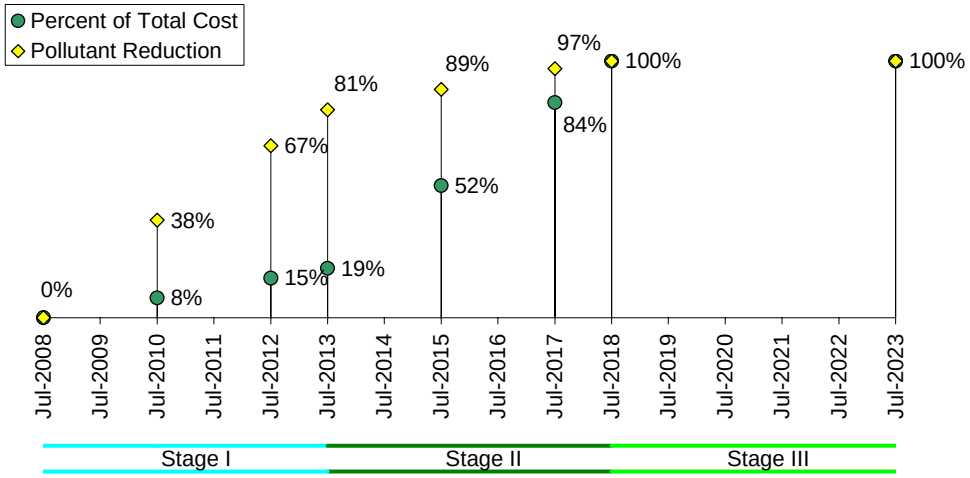

Figure 15. Timeline for implementation in the Spring Creek watershed.

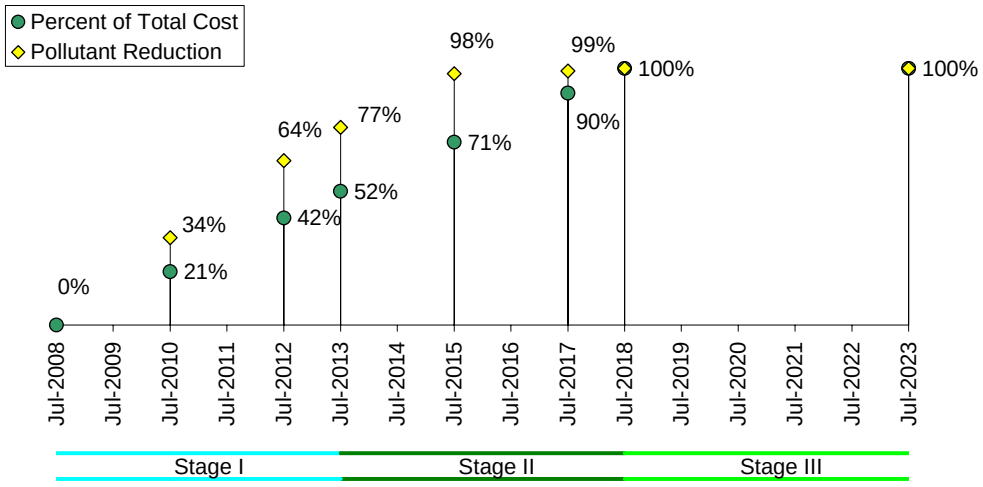

Figure 16. Timeline for implementation in the Briery Creek watershed.

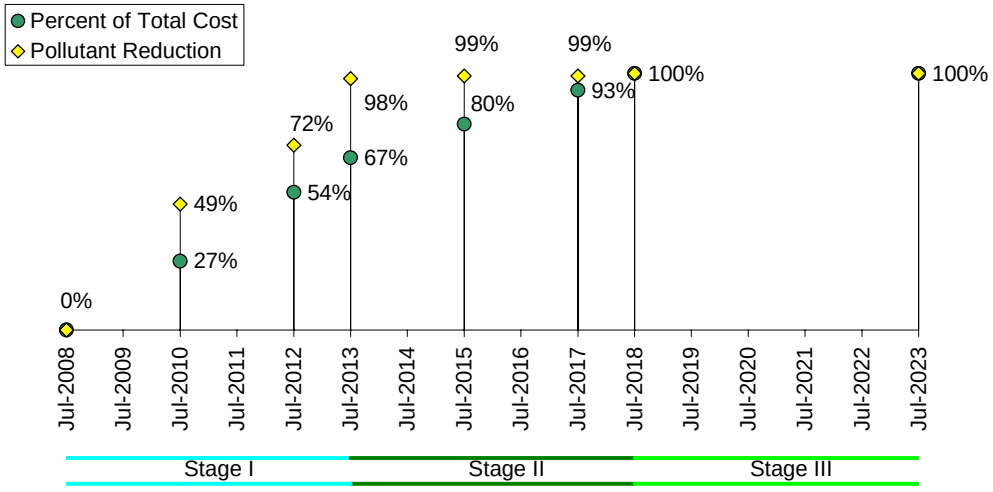

Figure 17. Timeline for implementation in the Bush River watershed.

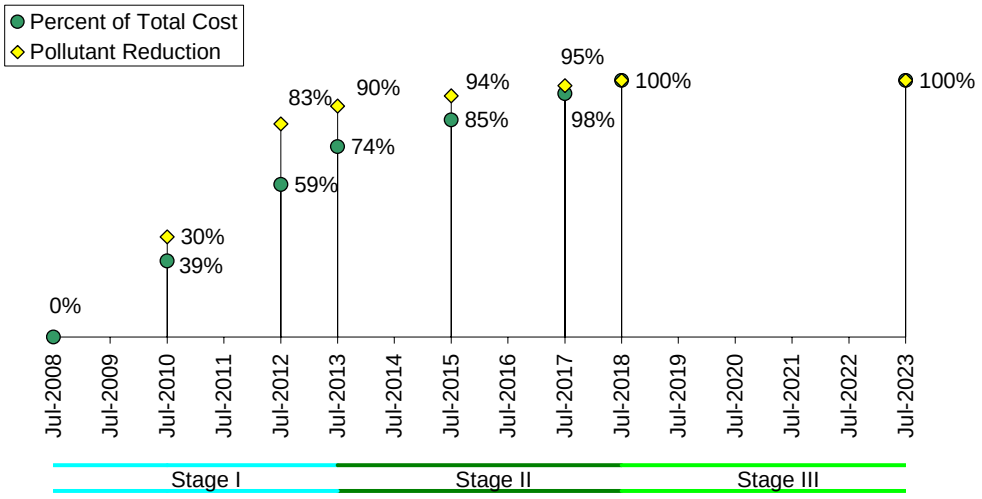

Figure 18. Timeline for implementation in the Little Sandy Creek watershed.

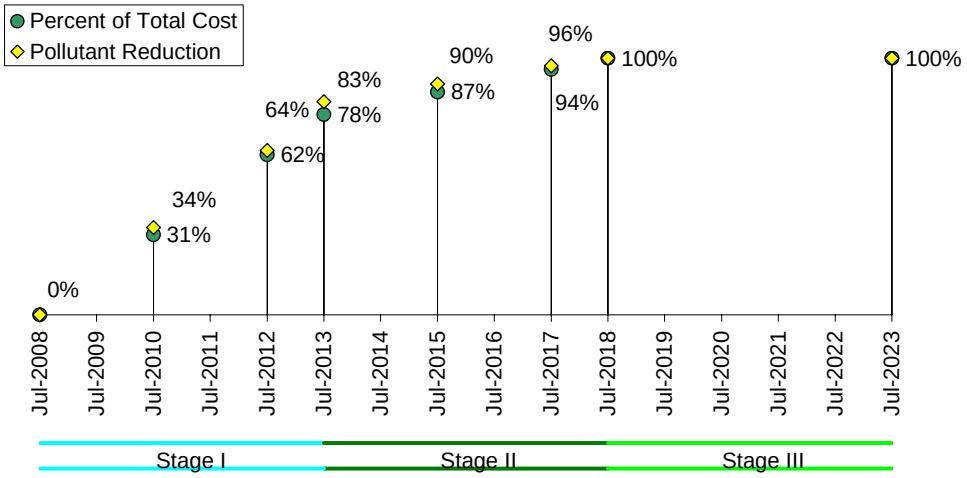

Figure 19. Timeline for implementation in the Saylers Creek watershed.

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 which is based on the exceedances of no more than 10% of the instantaneous 235 cfu/100 ml) value. Following Stage I implementation, the Steering Committee should evaluate water quality improvements and determine how to proceed to complete implementation during Stage II, if the

impaired stream has not been delisted. Stage II includes BMPs that are necessary for the streams to fully comply with the TMDL allocation requirements. The TMDL is based on that there can be no exceedances of either the geometric mean (126 cfu/100 ml) or the instantaneous values. Complying with the TMDL requires BMPs that are more difficult to implement.

Tables 6 - 9 show the types and quantities of BMPs to be installed for each impairment during each stage. It is anticipated that the de-listing of the impaired segments from the Section 303(d) list will occur by 2018.

Table 6. Stage I and Stage II implementation goals for Spring Creek.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (SL-6)	System	16	64
Stream Protection System (WP-2T)	System	1	
Improved Pasture Management	Acres	220	882
Small Acreage Grazing System (SL-6A)	System	1	
Streamside Fence Maintenance	Feet	1,638	6,552
Manure Incorporation	Acres	60	250
Retention Ponds – Pasture	Acres		3,306
Vegetated Buffers - Cropland	Acres	1	4
Residential			
Septic System Repair (RB-3)	System	5	20
Septic System Installation/Replacement (RB-4)	System	12	47
Alternative Waste Treatment System Installation (RB-5)	System	1	3
Pet Waste Education Program	Program	1	ongoing
Pet Waste Composters	Composter	30	116

Table 7. Stage I and Stage II implementation goals for Briery Creek.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (SL-6)	System	32	21
Stream Protection System (WP-2T)	System	3	0
Improved Pasture Management	Acres	496	330
Small Acreage Grazing System (SL-6A)	System	1	0
Streamside Fence Maintenance	Feet	3,037	2,025
Manure Incorporation	Acres	140	94
Retention Ponds - Pasture	Acres		2,478
Vegetated Buffers - Cropland	Acres	1	0
Residential			
Septic System Repair (RB-3)	System	30	20
Septic System Installation/Replacement (RB-4)	System	70	47
Alternative Waste Treatment System Installation (RB-5)	System	5	4
Pet Waste Education Program	Program	1	ongoing
Pet Waste Composters	Composter	264	176

Table 8. Stage I and Stage II implementation goals for Bush River

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (SL-6)	System	57	
Stream Protection System (WP-2T)	System	3	
Improved Pasture Management	Acres	3,691	
Small Acreage Grazing System (SL-6A)	System	1	
Streamside Fence Maintenance	Feet	3,445	3,445
Loafing Lot Management System	System	1	
Manure Incorporation	Acres	390	
Retention Ponds - Pasture	Acres		11,075
Vegetated Buffers - Cropland	Acres	3	
Residential			
Septic System Repair (RB-3)	System	83	
Septic System Installation/Replacement (RB-4)	System	195	
Alternative Waste Treatment System Installation (RB-5)	System	16	
Pet Waste Education Program	Program	1	ongoing
Pet Waste Composters	Composter	546	

Table 9. Stage I and Stage II implementation goals for Little Sandy Creek.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (SL-6)	System	18	
Stream Protection System (WP-2T)	System	1	
Improved Pasture Management	Acres	379	
Small Acreage Grazing System (SL-6A)	System	1	
Streamside Fence Maintenance	Feet	1,046	1,046
Manure Incorporation	Acres	20	
Retention Ponds - Pasture	Acres		1,136
Vegetated Buffers - Cropland	Acres	0	
Residential			
Septic System Repair (RB-3)	System	5	
Septic System Installation/Replacement (RB-4)	System	11	
Alternative Waste Treatment System Installation (RB-5)	System	1	
Pet Waste Education Program	Program	1	ongoing
Pet Waste Composters	Composter	26	

Table 10. Stage I and Stage II implementation goals for Saylers Creek.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (SL-6)	System	31	
Stream Protection System (WP-2T)	System	2	
Improved Pasture Management	Acres	809	
Small Acreage Grazing System (SL-6A)	System	1	
Streamside Fence Maintenance	Feet	1,582	1,582
Manure Incorporation	Acres	273	
Retention Ponds - Pasture	Acres		2,428
Vegetated Buffers - Cropland	Acres	1	
Residential			
Septic System Repair (RB-3)	System	28	
Septic System Installation/Replacement (RB-4)	System	67	
Alternative Waste Treatment System Installation (RB-5)	System	5	
Pet Waste Education Program	Program	1	ongoing
Pet Waste Composters	Composter	172	

Targeting

The five impaired watersheds were divided into subwatersheds for TMDL modeling purposes and this also helps with the targeting of BMP practices. The location of the estimated streamside fencing is shown in Figures 20 through 22. The subwatersheds were ranked in descending order based on the ratio of animals per fence length. Failing septic systems were ranked based on the sum of the bacteria loads in each watershed. If feasible, efforts should be made to prioritize resources by subwatersheds in the order shown in Table 11.

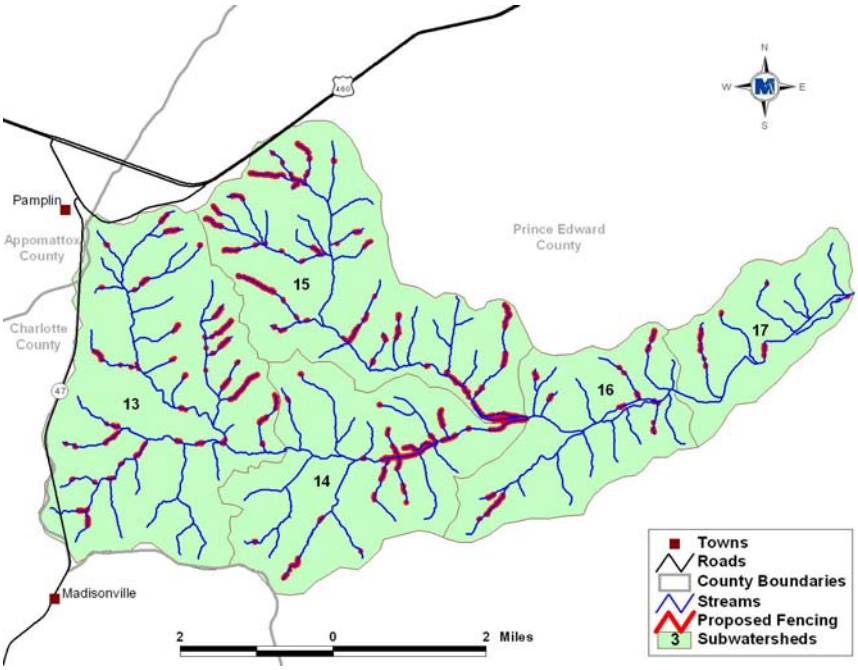

Figure 20. Area available for streamside fencing within the Spring Creek watershed.

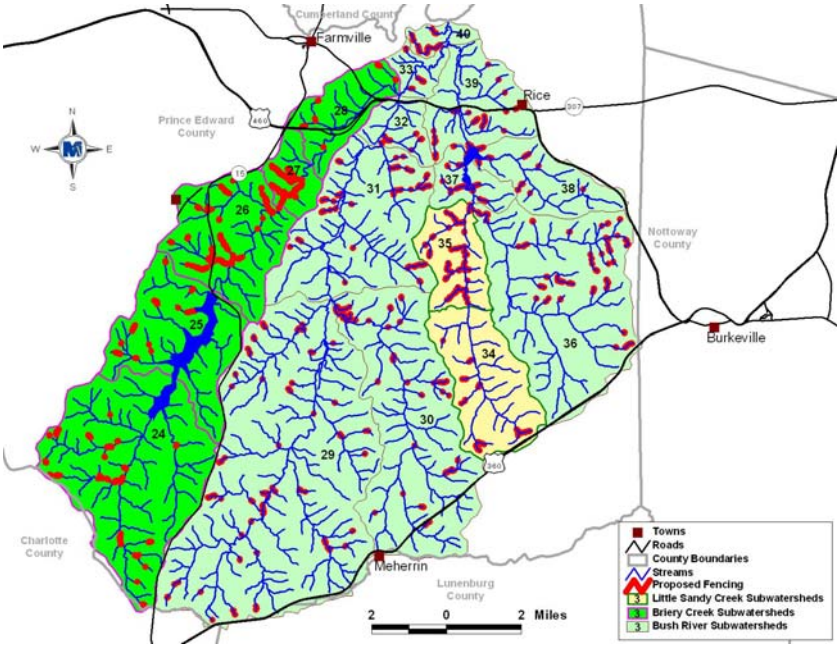

Figure 21. Area available for streamside fencing within the Briery Creek, Bush River and Little Sandy Creek watersheds.

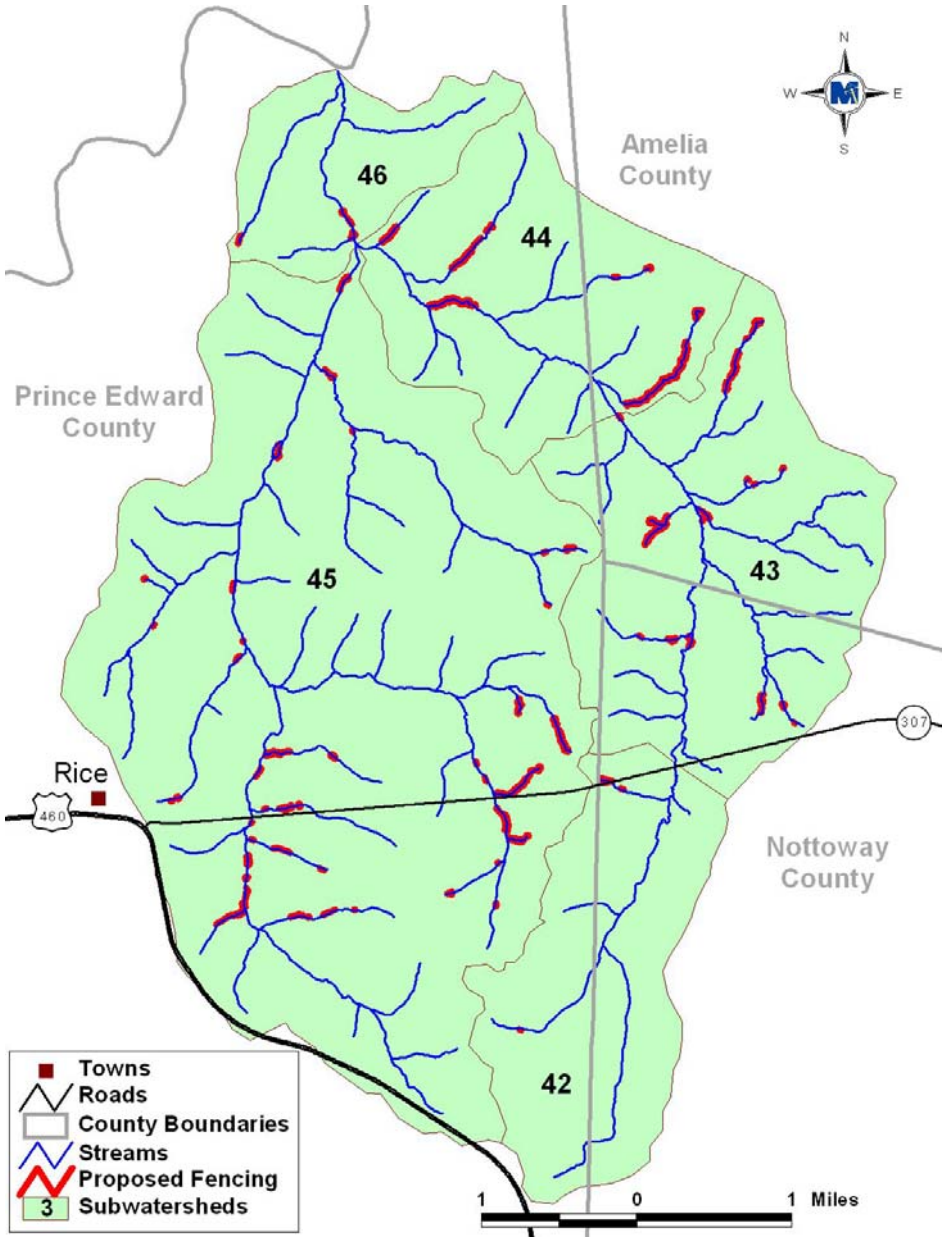

Figure 22. Area available for streamside fencing within the Saylers Creek watershed.

Table 11. Targeting subwatershed order for residential waste BMPs and streamside fencing.

Stream	Failing Septic Systems	Streamside Fencing
Spring Creek	15, 14, 16, 13, 17	13, 15, 14, 16, 17
Briery Creek	27, 26, 28, 24, 25	26, 28, 24, 25, 27
Bush River	40, 30, 32, 39, 37, 33, 29, 31, 38, 36	29, 36, 31, 30, 39, 38, 32, 37, 33, 40
Little Sandy Creek	34, 35	35, 34
Saylers Creek	44, 43, 45, 46, 42	45, 42, 43, 44, 46

Cost / Benefit Analysis

Associated cost estimates of agricultural and residential BMPs were calculated by multiplying the unit cost by the number of units in each watershed.

Tables 12 and 13 show the estimated cost of installing the recommended agricultural and residential BMPs in Stages I and II. The total cost for Stage I for all five watersheds is $7.12 million.

It was determined by the PSWCD 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 two technical FTEs per year for the first five years of implementation and one FTE per year for the subsequent ten years, the maximum total cost to provide technical assistance during implementation is expected to be $750,000 (Tables 10 and 11). Factoring in technical assistance and the additional implementation costs for Stage II, the total cost for full implementation in all five watersheds comes to $12.81 million (Table 14).

Human Health

The primary benefit of this implementation is cleaner waters in Prince Edward County. Specifically, fecal bacteria contamination in Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek 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. 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. Because of the reductions required, the incidence of infection from fecal sources, through contact with surface waters, should be considerably reduced.

Aquatic Life

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 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 12. Costs to implement Stage I (years 1 - 5) for Spring Creek, Briery Creek Bush River, Little Sandy Creek and Saylers Creek.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Spring Creek	337,900	112,800	77,930	529,000
Briery Creek	674,500	607,000	62,740	1,344,000
Bush River	1,490,000	1,700,000	220,900	3,410,000
Little Sandy Creek	388,000	102,600	21,570	512,100
Saylers Creek	683,6000	573,400	66,920	1,324,000
Total	**3,574,000**	**3,095,000**	**450,000**	**7,119,000**

Numbers are rounded to four significant digits.

Table 13. Costs to implement Stage II (years 6 - 10) for Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Spring Creek	$1,760,900	$385,000	$81,610	$2,228,000
Briery Creek	$770,200	$417,600	$47,560	$1,235,000
Bush River	$1,540,000	$3,750	$128,700	$1,673,000
Little Sandy Creek	$160,400	$3,750	$13,520	$177,700
Saylers Creek	$341,000	$3,750	$28,630	$373,000
Total	**$4,573,000**	**$813,800**	**$300,000**	**$5,686,000**

Numbers are rounded to four significant digits.

Table 14. Total cost for implementation in the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total ($)
Spring Creek	$2,099,000	$497,800	$159,500	$2,756,000
Briery Creek	$1,444,700	$1,025,000	$110,300	$2,580,000
Bush River	$3,030,000	$1,703,000	$349,500	$5,083,000
Little Sandy Creek	$548,400	$106,300	$35,090	$689,800
Saylers Creek	$1,024,200	$577,100	$95,550	$1,697,000
Total	**$8,146,000**	**$3,909,000**	**$750,000**	**$12,810,000**

Numbers are rounded to four significant digits.

Off stream watering source for cattle.

Livestock Health

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.

Farm Income

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 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. In general, many of the agricultural BMPs being recommended will provide both environmental benefits and economic benefits to the farmer.

Economic Benefits to Home Owners

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.

Local Economy

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 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 five watersheds 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 all five watersheds.

The DEQ monitoring stations in the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds are described

in Table 15 and shown in Figures 23, 24 and 25. Stations are monitored every other month within the monitoring period listed in Table 15. It is recommended that monitoring continue in Briery Creek in the 2009-2010 schedule since this station is close to the de-listing goal and implementation is currently on-going.

Up-to-date monitoring results are available to residents online at the department's Web site.
Query information by selecting the watershed from the drop-down menu.

There is citizen monitoring being performed in some of the impaired watersheds. The Clean VA Waterways program is run by Longwood University.

Table 15. DEQ's proposed monitoring in the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds.

Watershed	Station ID	Station Location	Sampling Schedule
Saylers Creek	2-SYL001.26	Rt 619 Bridge	2011-2012
Spring Creek	2-SPA001.46	Spring Creek,Rt 700 Bridge	2009-2010
Bush River	2-SDY003.00	Rt 460 Bridge (North Lane)	2011-2012
Bush River	2-BSR002.82	Bush River, Rt 460 Bridge	2007-2008
Briery Creek	2-BRI001.00	Briery Creek, Bus Rt 460 Bridge	2007-2008
Little Sandy Creek	2-LIT002.40	Little Sandy River at Rt 612	2009-2010

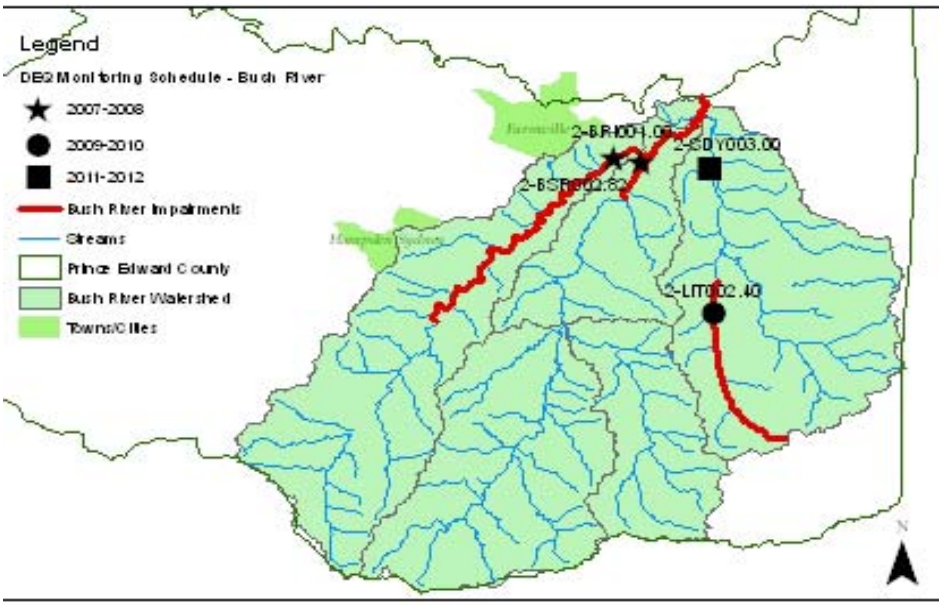

Figure 23. DEQ's Proposed Monitoring Stations in the Briery Creek, Little Sandy Creek and Bush River Watersheds.

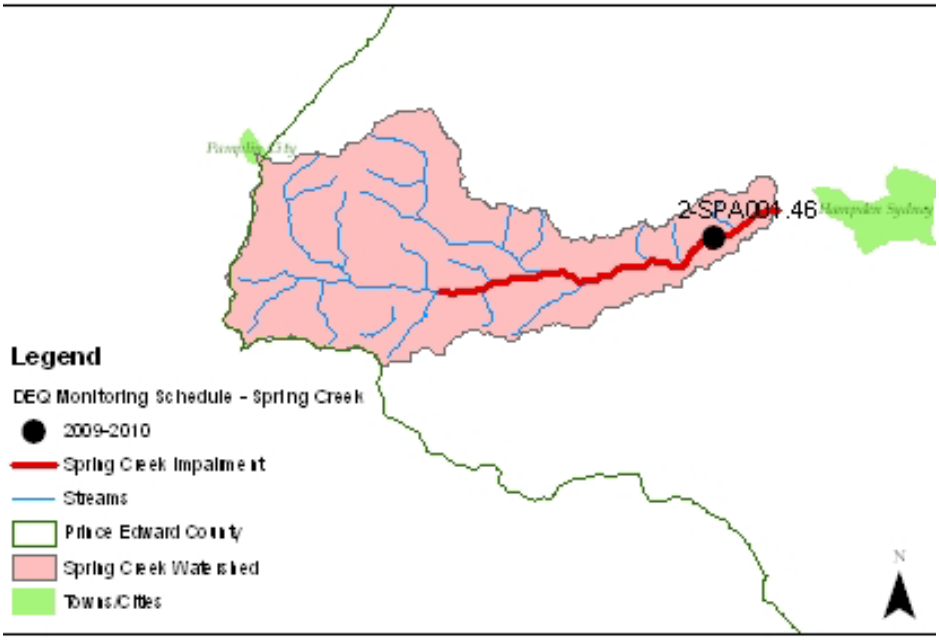

Figure 24. DEQ's Proposed Monitoring Station in the Spring Creek Watershed.

Figure 25. DEQ's Proposed Monitoring Station in the Saylers Creek Watershed.

Education

Personnel from the Piedmont SWCD will initiate contact with farmers in all five watersheds 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

Achieving the goals of this effort (*i.e.*, improving water quality and removing these waters from the impaired 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.

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).

DEQ has responsibility for monitoring state 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 DEQ assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids as a directed by the Virginia General Assembly in 2007. DEQ's Office of Land Application Programs within the Water Quality Division 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 issuing permits for land appliers.

DCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. Historically, most DCR programs have dealt with agricultural NPS pollution through education and voluntary incentive programs. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the TMDL which required 100 percent participation of stakeholders. 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 percent participation. It should be noted that DCR does not have regulatory authority over the majority of NPS issues addressed here.

The Piedmont SWCD will provide outreach, technical and financial assistance to farmers and homeowners in the Spring Creek, Briery Creek, Bush River, Little Sandy Creek and Saylers Creek watersheds through the Water Quality Improvement Fund targeted cost-share funds for impaired stream segments 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 Piedmont SWCD is currently receiving technical assistance funding to support their duties in these five watersheds.

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, historically, 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.

State government has the authority to establish state laws that control delivery of pollutants to local waters. 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.

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. Some county governments require that additional land on a homeowner's property be set aside for a new drainfield in case of a septic system failure. County governments could also play an active role in the proper disposal of pet waste. There are approximately 100 kennels with 20 dogs or less and four kennels with at least 50 dogs in Prince Edward County. 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. Future subdivisions should be developed with sustainable growth practices that minimize or eliminate storm water runoff. Local governments can also, in conjunction with the state, develop ordinances involving pollution prevention measures.

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. While it is unreasonable to expect that the natural environment (*e.g.*, streams and rivers) can be made 100 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.

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, Source Water Protection Program, and local comprehensive plans. Coordination in carrying out the implementation plan with these existing programs could result in additional resources and increased participation.

References

ELI. 1999. Locating Livestock: How Water Pollution Control Efforts Can Use Information From State Regulatory Programs. Environmental Law Institute. Research Report 1999. ELI Project #941718.

Pugh, S. 2001. Letter regarding: The Agricultural Stewardship Act and TMDLs. February 13, 2001.

List of Acronyms

BMP	Best Management Practice
CREP	Conservation Reserve and Enhancement Program
CWA	Clean Water Act
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FTE	Full Time Equivalent
GWG	Government Working Group
IP	Implementation Plan
NPS	Non Point 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
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
VCE	Virginia Cooperative Extension
VDACS	Virginia Department of Agriculture and Consumer Services
VDH	Virginia Department of Health
DOF	Virginia Department of Forestry
WP-2T	Stream Protection

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