Total Maximum Daily Load Implementation Plan for the Chowan Study Area
(Blackwater/Raccoon Study Area)
Executive Summary

Submitted to:

The Stakeholders of the
Upper Blackwater River and Raccoon Creek
Watersheds
On Behalf of
The Commonwealth of Virginia
Department of Environmental Quality and
Department of Conservation and Recreation
Draft

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Table of Contents

Also available for this project:
A Total Maximum Daily Load Implementation Plan for the Chowan Study Area (Technical Report)

Introduction

Virginia's *2002 Section 303(d) Report on Impaired Waters* listed Cypress Swamp, Mill Swamp, Rattlesnake (Creek) Swamp, and Raccoon Creek due to violations of the State's water quality standard for fecal bacteria. An additional segment of Cypress Swamp was included on the *2004 305(b)/303(d) Water Quality Assessment Integrated Report*. Raccoon Creek is in the Upper Nottoway River Basin; the other segments are in the Upper Blackwater River Basin.

Fecal coliform and *E. coli* are used as indicators of potentially harmful fecal pollution because they are found in the digestive tract of warm-blooded animals and excreted in the feces. *E. coli* is one member of the fecal coliform group of bacteria. In January 2003, the Commonwealth of Virginia adopted *E. coli* as the new fresh-water bacteria standard; therefore, the Total Maximum Daily Loads (TMDLs) and the Implementation Plans (IPs) were developed for *E. coli*.

Inclusion on the 303(d) lists signifies that these streams exceeded the water quality standard in more than 10% of the samples collected during an assessment period. As a result, TMDLs were developed for these streams. The TMDL is the maximum amount of pollutant that a water body can assimilate without exceeding the state water quality standard. After TMDL Plans are written, Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (Section 62.1-44.19:7) states that: "[the] Board shall develop and implement a plan to achieve fully supporting status for impaired waters." In fulfilling the state's requirement for the development of a TMDL IP, a framework was established for reducing fecal bacteria and achieving the water quality goals for each impaired segment. With successful completion of the IP, the Upper Blackwater River and Raccoon Creek impairments will be well on the way to meeting these water quality goals, and natural resources will be enhanced. Additionally, approval of the IP will increase the opportunities for funding during implementation.

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

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

Background

The detrimental effects of bacteria in food and water supplies have been documented time and again. In Franklin County, Virginia, a 1997 outbreak of illnesses involving three children was attributed to *E. coli* (O157:H7) in Smith Mountain Lake. The children were exposed to the bacteria while swimming in the lake and a two-year-old was hospitalized as a result of the exposure (Roanoke Times, 1997). In August 1998, seven children and two adults at a day-care center in rural Floyd County were infected with *E. coli* (O157:H7). Upon investigation, two of the property's wells tested positive for total fecal coliform (Roanoke Times, 1998). On June 6, 2000, Crystal Spring (Roanoke, Virginia's second largest water source) was shut down by the Virginia Department of Health (VDH) for *E. coli* contamination.

Isolated cases? No. Throughout the United States, the Centers for Disease Control estimates that at least 73,000 illnesses and 61 deaths *per year* are caused by coliform pathogens (*e.g., E. coli* O157:H7 bacteria) (CDC, 2001). In addition, other bacterial and viral pathogens are indicated by the presence of *E. coli* and can be responsible for similar illnesses. Whether the source of contamination is human or livestock, the risk of sickness from contact with these pathogens appears more prevalent as both populations increase. As stakeholders, we must assess the risk we are willing to accept and then implement measures to safeguard the public from these risks. Water quality standards are

society's implementation of legislative measures resulting from an assessment of the acceptable risks.

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

Review of TMDL Development

The Upper Blackwater River watershed contains impaired segments of Cypress Swamp, Mill Swamp, and Rattlesnake (Creek) Swamp, which include portions of Virginia's Isle of Wight and Surry counties. Raccoon Creek runs through the counties of Sussex and Southampton. For the purposes of this report, they will be referred to as the Blackwater/Raccoon Study Area.

In 2004, the estimated human population within the Blackwater/Raccoon Study Area was 3,881. The major land use in this area is forest (Figure 1 and Figure 2).

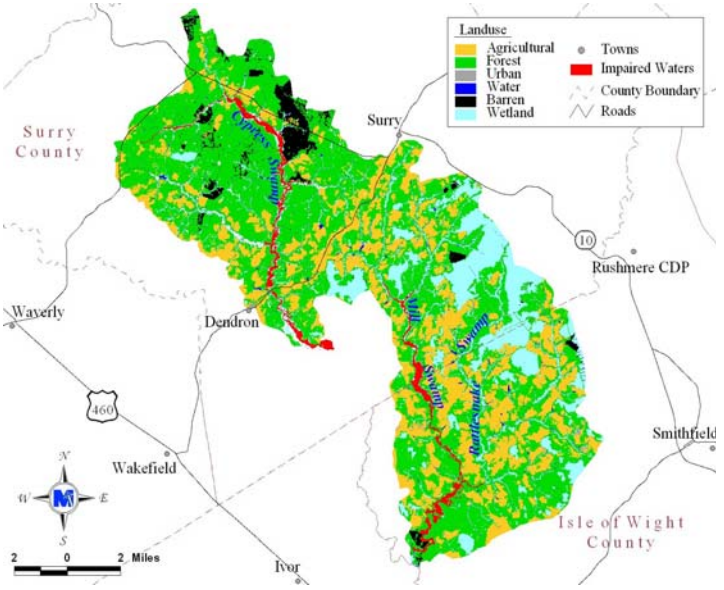


Figure 1. Land uses in the Upper Blackwater River watershed area.

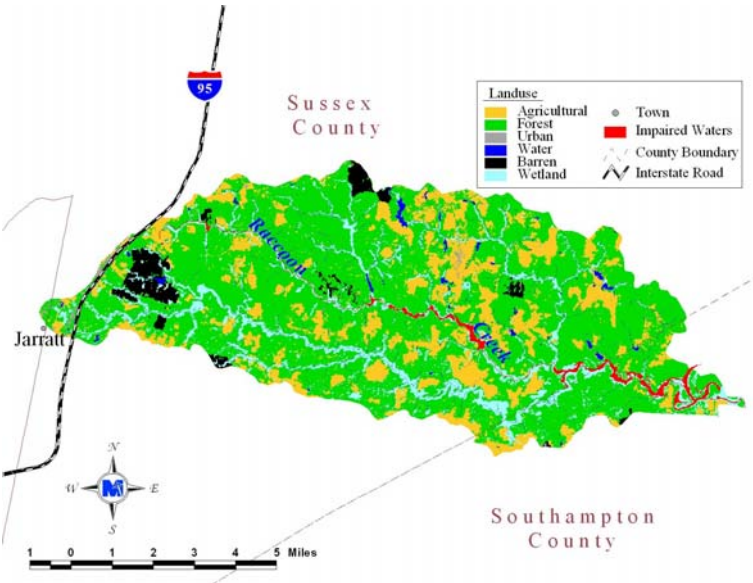


Figure 2. Land uses in the Raccoon Creek watershed area.

In addition to performing analyses of fecal bacteria and *E. coli* concentrations, MapTech, Inc. also conducted Bacterial Source Tracking (BST) in the Blackwater/Raccoon Study Area. BST is intended to aid in identifying sources (*i.e.,* human, pets, livestock, or wildlife) of fecal contamination in water bodies. The BST results provided insight into the likely sources of fecal contamination, aided in distributing fecal loads from different sources during model calibration, and will improve the chances for success in implementing solutions.

Table 1 summarizes the results for each station with load-weighted average proportions of bacteria originating from the four source categories. The load-weighted average considers the level of flow in the stream at the time of sampling, the concentration of *E. coli* measured, and the number of bacterial isolates analyzed in the BST analysis.

A summary of the final allocations that resulted from the TMDL study is given in Table 2. The allocations presented are required in order to have a 0% violation rate of the 235 cfu/100mL instantaneous standard for *E. coli.*

Table 1. Load-weighted average proportions of *E. coli* originating from wildlife, human, livestock, and pet sources.

Station Name	Station ID	Weighted Averages				
		Human	Livestock	Pet	Anthropogenic (Human + Livestock + Pet)	Wildlife
Cypress Swamp	5ACPP003.20	3%	48%	11%	62%	38%
Mill Swamp	5AMSW006.77	2%	57%	18%	77%	23%
Rattlesnake Cr. Swamp	5ARKN006.40	3%	43%	17%	63%	37%
Raccoon Creek	5ARCN003.36	9%	20%	50%	79%	21%

Table 2. Load reductions allocated during TMDL development for the Upper Blackwater River impairments and Raccoon Creek.

Impairment	Percent Reduction in Loading from Existing Conditions					
	Direct Wildlife	NPS Forest / Wetland	Direct Livestock	NPS Agricultural Land	Direct Human	NPS Urban Land
Raccoon Creek	0	95	100	99	100	99
Cypress Swamp	80	90	0*	99	100	99
Mill Swamp	28	86	0*	99	100	99
Rattlesnake Creek Swamp	65	84	0*	99	100	99

* There is no direct livestock deposition, so BMPs for this load do not need to be implemented.

Process for Public Participation

The actions and commitments described in this document were drawn together through input from citizens of the watershed, county governments, VADEQ, VADCR, VDH, Virginia Cooperative Extension (VCE), Natural Resources Conservation Service (NRCS), Peanut Soil and Water Conservation District (PSWCD), Chowan Soil and Water Conservation District (CSWCD), and MapTech, Inc. Every citizen and interested party in the watershed area is encouraged to become involved in implementing the IP and contribute to the process that will restore the health of the streams.

Public participation took place on three levels. First, public meetings were held to inform the public of the end goals and status of the project, as well as provide a forum for soliciting participation in the smaller, more targeted meetings (*e.g.,* working groups and steering committee). Second, working groups were assembled from communities of people with common concerns regarding the implementation process. These meetings were the primary arena for public input. The working groups were: Industrial (stakeholders involved in agriculture and industry) and Non-Industrial (residents, environmental group representatives, and government representatives). Representatives from VADEQ and MapTech attended each working group meeting in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from all of the working groups, VADEQ, VADCR, VDH, and MapTech, and had the express purpose of guiding the development of the IP. Hundreds of work-hours were devoted to attending these meetings by individuals representing agricultural, residential, commercial, environmental, and government interests on local, state, and federal levels.

Throughout the public participation process, major emphasis was placed on discussing best management practices (BMPs), BMP specifications, locations of control measures, education, technical assistance, and funding.

Working Groups and Steering Committee

The Industrial Working Group (IWG) consisted of local residents and representatives from VADEQ, VADCR, VCE, CSWCD, PSWCD, MapTech, and the Blackwater Nottoway Riverkeeper Association (an environmental group).

The Non-Industrial Working Group (NIWG) was made up of area residents as well as representatives from VADEQ, VADCR, Sussex County VDH, Crater VDH District, and MapTech.

The Steering Committee consisted of representatives from the local community, the Industrial and Non-Industrial Working Groups, VADEQ, VADCR, the Blackwater Nottoway Riverkeeper Program (BNRP), CSWCD, Isle of Wight Planning Dept., Isle of Wight County Rural Economic Development, and MapTech. The Steering Committee discussed implementation needs, potential funding resources, and how to encourage participation from producers.

Assessment of Needs

Industrial BMPs

The quantity of streamside fencing required during implementation was determined through spatial analyses of land use, stream network, and the USDA Common Land Unit Layer (CLU) along with regionally appropriate data archived in the VADCR Agricultural BMP Database and TMDL development documents. The map layers and archived data were combined to establish high and low estimates of the cattle exclusion required overall, in the watershed, and in each subwatershed. Additionally, input from local agency representatives was used to verify the analyses. There are approximately 456 miles of perennial and intermittent streams in the Blackwater /Raccoon Study Area. The length of fencing

required on perennial and intermittent streams in the Blackwater/Raccoon Study Area is approximately 18,960 feet. There are 19 Grazing Land Protection Systems (SL-6) and four Stream Protection Systems (WP-2) required to be installed to ensure full exclusion of livestock from the streams. Estimates of all industrial BMPs needed for full implementation in the watershed are listed in Tables 3 - 6.

Non-Industrial BMPs

All failing septic systems and straight pipes must be identified and replaced during implementation since a 100% load reduction from direct and nonpoint source (NPS) human waste is required to meet the TMDL goal. The estimated numbers of straight pipes and failing septic systems were reported in the TMDL and are shown in Tables 3 - 6.

To deal with the NPS loads from dog waste in the Blackwater/Raccoon Study Area, the NIWG and the Steering Committee decided that the number of dog kennels should be estimated as these operations will require BMPs to reduce fecal bacteria from dog waste from entering surface waters. The recommended dog kennel BMPs are septic systems with filters (if waste is washed from dog pens) and composting bins (if dog waste is solid). Estimates of all non-industrial BMPs needed for full implementation are listed in Tables 3 - 6.

Table 3. Control measures (BMPs) required in the Cypress Swamp watershed.

Control Measure	Unit	Estimated Unit Needs (#)	Average Cost/Unit ($)
Industrial			
Full Exclusion System (SL-6)	system	0	N/A
Stream Protection (WP-2)	system	0	N/A
Hardened Crossing	system	0	N/A
Woodland Buffer Filter Area (FR-3)	acre	25.8	700
Manure/biosolids Incorporation/injection[1]	acre	2353	18
Improved Pasture Management	acre	1705	170
Animal Waste Control Facility[2]	system	0	N/A
Composting Facility[3]	system	0	N/A
Technical and Administrative Assistance (Peanut SWCD)	person/yr	0.33	30,000
Non-Industrial			
Septic/Alternative System Installation	system	41	9,000[7]
Septic System Repair	system	92	3,000
Dog Kennel BMP[4]	system	21	1,200
Retention Pond[5]	acre	0	N/A
Infiltration Trench[6]	acre	0	N/A
Technical and Administrative Assistance	person/yr	0.25	30,000

[1]The injection of liquid manure below the soil surface or disking land after dry manure is spread. It is recommended to incorporate/inject manure 3 to 6 inches.

[2]A facility to store animal manure before use on the land.

[3]A facility to compost animal manure before use on the land.

[4]A septic system with filter if dog waste is wet, or composting bins if waste is dry.

[5]A basin that includes a permanent pool of water in which runoff is temporarily stored during storms.

[6]Runoff is diverted into a shallow trench filled with gravel, covered with soil and grass.

[7]Average cost of standard septic system and alternative waste treatment system.

Table 4. Control measures (BMPs) required in the Mill Swamp watershed.

Control Measure	Unit	Estimated Unit Needs (#)	Average Cost/Unit ($)
Industrial			
Full Exclusion System (SL-6)	system	0	N/A
Stream Protection (WP-2)	system	0	N/A
Hardened Crossing	system	0	N/A
Woodland Buffer Filter Area (FR-3)	acre	30.5	700
Manure/biosolids Incorporation/injection[1]	acre	1710	18
Improved Pasture Management	acre	2248	170
Animal Waste Control Facility[2]	system	0	N/A
Composting Facility[3]	system	1	4,100
Technical and Administrative Assistance (Peanut SWCD)	person/yr	0.33	30,000
Non-Industrial			
Septic/Alternative System Installation	system	33	9,000[7]
Septic System Repair	system	77	3,000
Dog Kennel BMP[4]	system	14	1,200
Retention Pond[5]	acre	31	2,000
Infiltration Trench[6]	acre	0	N/A
Technical and Administrative Assistance	person/yr	0.25	30,000

[1]The injection of liquid manure below the soil surface or disking land after dry manure is spread. It is recommended to incorporate/inject manure 3 to 6 inches.

[2]A facility to store animal manure before use on the land.

[3]A facility to compost animal manure before use on the land.

[4]A septic system with filter if dog waste is wet, or composting bins if waste is dry.

[5]A basin that includes a permanent pool of water in which runoff is temporarily stored during storms.

[6]Runoff is diverted into a shallow trench filled with gravel, covered with soil and grass.

[7]Average cost of standard septic system and alternative waste treatment system.

Table 5. Control measures (BMPs) required in the Rattlesnake (Creek) Swamp watershed.

Control Measure	Unit	Estimated Unit Needs (#)	Average Cost/Unit ($)
Industrial			
Full Exclusion System (SL-6)	system	0	N/A
Stream Protection (WP-2)	system	0	N/A
Hardened Crossing	system	0	N/A
Woodland Buffer Filter Area (FR-3)	acre	16.3	700
Manure/biosolids Incorporation/injection[1]	acre	507	18
Improved Pasture Management	acre	2,054	170
Animal Waste Control Facility[2]	system	0	N/A
Composting Facility[3]	system	0	N/A
Technical and Administrative Assistance (Peanut SWCD)	person/yr	0.33	30,000
Non-Industrial			
Septic/Alternative System Installation	system	33	9,000[7]
Septic System Repair	system	87	3,000
Dog Kennel BMP[4]	system	8	1,200
Retention Pond[5]	acre	3	2,000
Infiltration Trench[6]	acre	53.2	9,000
Technical and Administrative Assistance	person/yr	0.25	30,000

[1]The injection of liquid manure below the soil surface or disking land after dry manure is spread. It is recommended to incorporate/inject manure 3 to 6 inches.

[2]A facility to store animal manure before use on the land.

[3]A facility to compost animal manure before use on the land.

[4]A septic system with filter if dog waste is wet or composting bins if waste is dry.

[5]A basin that includes a permanent pool of water in which runoff is temporarily stored during storms.

[6]Runoff is diverted into a shallow trench filled with gravel, covered with soil and grass.

[7]Average cost of standard septic system and alternative waste treatment system.

Table 6. Control measures (BMPs) required in the Raccoon Creek watershed.

Control Measure	Unit	Estimated Unit Needs (#)	Average Cost/Unit ($)
Industrial			
Full Exclusion System (SL-6)	system	19	10,000
Stream Protection (WP-2)	system	4	3,000
Hardened Crossing	system	21	2,000
Woodland Buffer Filter Area (FR-3)	acre	21.9	700
Manure/biosolids Incorporation/injection[1]	acre	4363	18
Improved Pasture Management	acre	2,654	170
Animal Waste Control Facility[2]	system	1	20,000
Composting Facility[3]	system	3	4,100
Technical and Administrative Assistance (Chowan SWCD)	person/yr	1.0	30,000
Non-Industrial			
Septic/Alternative System Installation	system	34	9,000[7]
Septic System Repair	system	78	3,000
Dog Kennel BMP[4]	system	14	1,200
Retention Pond[5]	acre	0	N/A
Infiltration Trench[6]	acre	51.4	9,000
Technical and Administrative Assistance	person/yr	0.25	30,000

[1]The injection of liquid manure below the soil surface or disking land after dry manure is spread. It is recommended to incorporate/inject manure 3 to 6 inches.

[2]A facility to store animal manure before use on the land.

[3]A facility to compost animal manure before use on the land.

[4]A septic system with filter if dog waste is wet or composting bins if waste is dry.

[5]A basin that includes a permanent pool of water in which runoff is temporarily stored during storms.

[6]Runoff is diverted into a shallow trench filled with gravel, covered with soil and grass.

[7]Average cost of standard septic system and alternative waste treatment system.

Full-Time Equivalents (FTE)

To determine the number of FTEs considered necessary for industrial technical assistance during implementation, the number of BMPs required per year was divided by the number of BMPs that one FTE can process in a year. The number of FTEs required was calculated from historical work records. As a result, 2.0 industrial technical FTEs are needed to provide technical assistance throughout implementation of BMPS in the Blackwater/Raccoon Study Area. The implementation process is expected to last five years, with an additional five years for assessing water quality improvements. If the *E. coli* water quality criteria are not attained after all reasonable and cost-effective BMPs have been installed, the Commonwealth of Virginia has the option of pursuing a Use Attainability Analysis to designate a stream as secondary contact recreation, *i.e.,* non-swimmable.

The Steering Committee decided that one technical FTE will be required to carry out the non-industrial IP aspects.

Implementation

Potential funding sources available during implementation were identified during plan development. A detailed description of each source can be obtained from the SWCDs, VADCR, NRCS, VCE, and VADEQ. Sources include:

- Federal Clean Water Act Section 319 Increment Funds
- Virginia Agricultural Best Management Practices Cost-Share Program
- Virginia Agricultural Best Management Practices Tax Credit Program
- USDA Environmental Quality Incentives Program (EQIP)
- Virginia Department of Housing and Community Development (VDHCD) - Indoor Plumbing Rehabilitation

- Virginia Revolving Loan Programs (Agricultural BMPs and onsite sewage disposal systems)
- Virginia Water Quality Improvement Fund
- USDA Conservation Reserve Enhancement Program (CREP)

One possible scenario for funding in the first year is presented in Table 7. This scenario represents installation of 5% of the industrial and non-industrial BMPs, and 3.0 technical FTEs. The negative number in the incentive row refers to a per acre rental payment from the CREP program given to the landowner.

Table 7. One possible scenario for funding costs for 5% of implementation.

	Landowner	**Cost-Share**	**Total**
Industrial BMPs	$84,869	$13,912	$98,781
FR-3 Incentive	-$945	$945	$0
Non-Industrial BMPs	$167,440	$0	$167,440
FTEs	$0	$90,000	$90,000
Total	**251,364**	**104,857**	**356,221**

Implementation is scheduled to begin in Auguat 2006 after which five milestones need to be met over the next five years. The first milestone will be one year after implementation begins, whereby 5% of the industrial BMPs and 5% of the non-industrial BMPs will be installed with expected reductions in violations of the *E. coli* water quality standards. The five year milestone will be 100% of all required BMPs installed. Compliance with the *E. coli* bacteria standard will be anticipated five years after full implementation, to allow for lag time in BMP effectiveness and stabilization of bacteria populations in the streams. If, prior to the 5-year milestone, water quality improves to the point that Cypress Swamp, Mill Swamp, Rattlesnake (Creek) Swamp, and/or Raccoon Creek can be de-listed (10.5% or less violation rate of the instantaneous standard), the Steering Committee will evaluate the cost-share requests and monitoring data and determine whether to revise the project timeline.

The milestones are 5%, 15%, 35%, 25%, and 20% per year. These numbers are shown cumulatively in Table 8. Based on meeting the milestones, a five-year implementation plan outline was formulated as depicted in the table.

Although Table 8 shows the expected water quality results of implementing 5% of all required BMPs in the first year, it is recommended to concentrate resources and finances on streamside fencing, straight pipe corrections, and dog kennel BMP installations in the first year. With the installation of streamside fencing, direct livestock fecal loads are 100% reduced and buffers are established between fencing and the stream. Correcting straight pipes is an important component of this IP due to the health risks associated with contacting pathogens from human wastes. The BST results indicated that dog wastes are a large source of fecal pollution in these streams. Concentrating on implementing streamside fencing, straight pipe corrections, and dog kennel BMPs within the first year may provide the highest return on water quality improvement.

Table 8. Implementation and water quality milestones in the Blackwater/Raccoon impairments.

Milestone	Date	Industrial Implementation Milestones		Non-Industrial Implementation Milestones		Water Quality Milestone: *E. coli* instantaneous water quality exceedances in			
		Livestock Exclusion Systems	NPS	Straight Pipes Corrected	NPS	Cypress Swamp (%)	Mill Swamp (%)	Rattlesnake Cr. Swamp (%)	Raccoon Creek (%)
Existing	8/1/2006	Implementation Begins				18.8	14.7	5.1	14.5
1	8/1/2007	5%	5%	5%	5%	18.6	14.15	5.1	11.18
2	8/1/2008	20%	20%	20%	20%	18.27	13.17	4.83	10.14
3	8/1/2009	55%	55%	55%	55%	17.33	9.54	4.11	8.39
4	8/1/2010	80%	80%	80%	80%	16.57	6.25	3.46	7.13
5	8/1/2011	100%	100%	100%	100%	15.69	3.29	3.02	6.47
6	8/1/2016	De-listing from 303(d) List				0	0	0	0

Implicit in the process of a staged implementation is the targeting of control measures. The purpose of targeting is to identify subwatersheds where initial implementation resources would result in the greatest return in water quality improvement; it ensures optimum utilization of resources. Targeting of critical areas for BMP installation was accomplished through analysis of land use, farm boundaries, stream network GIS layers, and monitoring results. Tables 9 and 10 show the subwatershed order for targeting straight pipe corrections and streamside fencing in the impairments in the Blackwater/Raccoon Study Area. The subwatersheds of the Upper Blackwater impaired watersheds are shown in Figure 3 and the Raccoon Creek subwatersheds are shown in Figure 4.

Table 9. Subwatershed order for targeting straight pipe corrections.

Impairment	Straight Pipe Correction Targeting Subwatershed Order
Cypress Swamp	19, 12, 13, 15, 18, 20, 14, 17, 16
Mill Swamp	27, 26, 24, 21, 25, 23, 28, 22
Rattlesnake (Creek) Swamp	35, 30, 36, 33, 34, 29, 31, 32
Raccoon Creek	23, 19, 25, 18, 22, 26, 24, 20, 21

Impairment	Streamside Fencing Targeting Subwatershed Order
Raccoon Creek	21, 25, 18, 19, 23, 20, 24, 22, 26

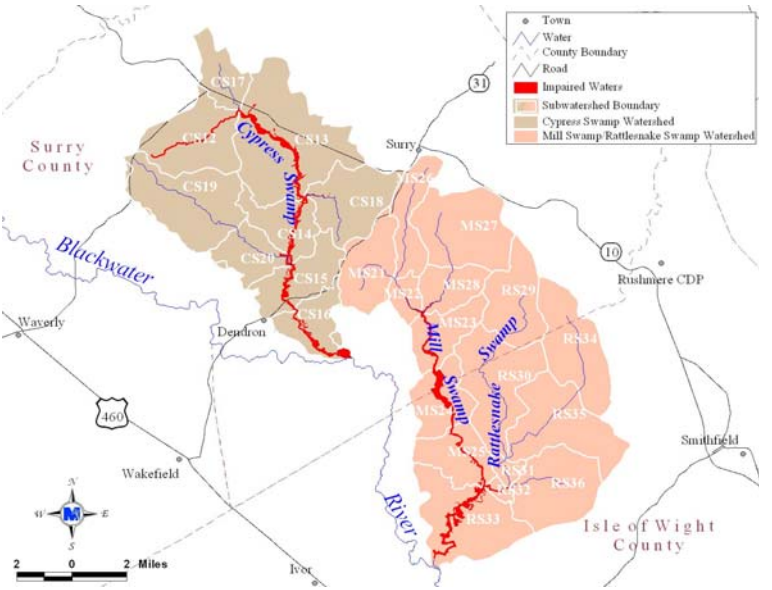


Figure 3. Upper Blackwater River impaired segments and subwatersheds

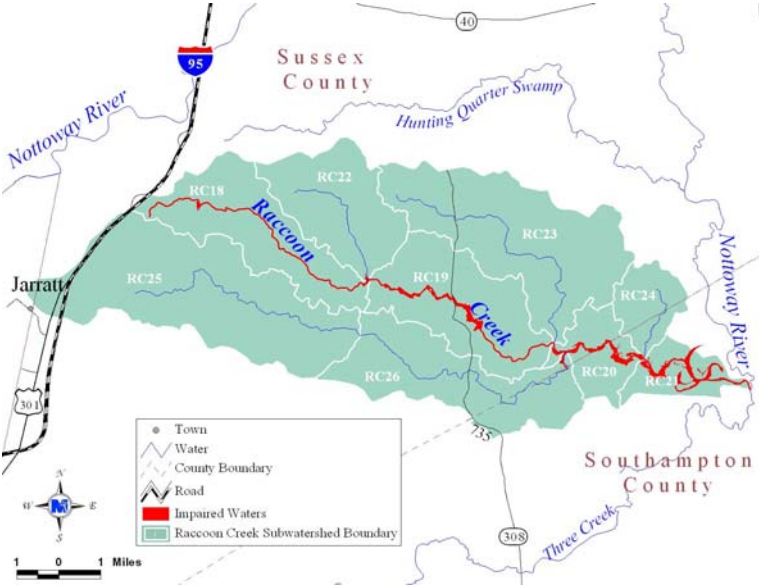


Figure 4. Raccoon Creek impaired segment and subwatersheds.

Cost / Benefit Analysis

Associated cost estimates of industrial BMPs were calculated by multiplying the unit cost by the number of units in each subwatershed (Tables 3 - 6). As depicted in Table 11, the amount needed to install all industrial control measures is $1.98 million.

Cost estimations to replace straight pipes were based on the combination of new septic systems or alternative waste treatment systems. The costs of the non-industrial BMPs were calculated using values from Tables 3 - 6. The total cost estimated for all required non-industrial BMPs is $4.06 million.

It was determined by the SWCDs and the Steering Committee that it would require $30,000 to support the salary, benefits, travel, and training for one technical FTE. With quantification analysis yielding a need for two technical industrial FTEs per year and one non-industrial FTE per year, the maximum total cost to provide technical assistance during implementation is expected to be $450,000 over five years (Table 11).

Table 11. Estimated total costs for full implementation in the Blackwater/Raccoon Study Area.

Year	Industrial BMPs ($)	Non-Industrial BMPs ($)	Technical Assistance ($)	Estimated Total Cost Per Year ($)
1	99,000	203,000	90,000	392,000
2	297,000	609,000	90,000	996,000
3	693,000	1,421,000	90,000	2,204,000
4	495,000	1,015,000	90,000	1,600,000
5	396,000	812,000	90,000	1,298,000
Total	**$1,980,000**	**$4,060,000**	**$450,000**	**$6,490,000**

The primary benefit of implementation is cleaner waters in Virginia. Specifically, fecal contamination in Cypress Swamp, Mill Swamp, Rattlesnake (Creek) Swamp, and Raccoon Creek will be reduced to meet water quality standards. It is difficult to gauge the impact that reducing fecal contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the reductions required, the incidence of infection from fecal sources, through contact with surface waters, should be considerably reduced. Additionally, because of streambank protection that will be provided through exclusion of livestock from streams, the aquatic habitat will be improved in these waters. The vegetated buffers that are established will also serve to reduce sediment and nutrient transport to the stream from upslope locations. In areas where pasture management is improved, soil and nutrient losses should be reduced and infiltration of precipitation should be increased, decreasing peak flows downstream.

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 will provide economic benefits, as well as the expected 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.

A clean water source has been shown to improve weight gain and milk production in cattle. Healthy cattle consume, on a daily basis, close to 10% of their body

weight during winter and 15% of their body weight in summer. Many livestock illnesses can be spread through contaminated water supplies. For instance, coccidia can be delivered through feed, water and haircoat that has been contaminated with manure (VCE, 2000). In addition, horses drinking from marshy areas, or areas accessible to wildlife or cattle that are carrying leptospirosis, tend to have an increased incidence of moonblindness associated with leptospirosis infections (VCE, 1998b). A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills. In addition to reducing the likelihood of animals contracting waterborne illnesses by providing a clean water supply, streamside fencing excludes livestock from wet, swampy environments as are often found next to streams where cattle have regular access. Keeping cattle in clean, dry areas has been shown to reduce the occurrence of mastitis and foot rot. The Virginia Cooperative Extension (1998a) reports that mastitis currently costs producers $100 per cow in reduced quantity and quality of milk produced. On a larger scale, mastitis costs the U.S. dairy industry about $1.7 - $2 billion annually, or 11% of total U.S. milk production. While the spread of mastitis through a dairy herd can be reduced through proper sanitation of milking equipment, mastitis-causing bacteria can be harbored and spread in the environment where cattle have access to wet and dirty areas. Implementation of streamside fencing and well-managed loafing areas will reduce the amount of time that cattle have access to these areas.

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% and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80 percent of the cost of growing or

maintaining an animal, and pastures providing feed at a cost of $0.01-$0.02/lb of total digestible nutrients (TDN) (compared to $0.04-$0.06/lb TDN for hay), increasing the amount of time that cattle are fed on pasture is clearly a financial benefit to producers (VCE, 1996). 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. A side benefit is that cattle are more closely confined, allowing for quicker checking and handling. In general, many of the agricultural BMPs being recommended will provide both environmental benefits and economic benefits to the farmer.

The non-industrial 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. The average septic system will last 20-25 years if properly maintained. Proper maintenance includes: knowing the location of the system components and protecting them (*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.

Monitoring

During implementation, progress toward end goals will be assessed through tracking of control measure installations by the SWCDs, VDH, VADEQ, and continued water quality monitoring.

The success of the implementation measures will be determined by monitoring conducted by VADEQ through the agency's monitoring program, and by volunteer monitoring by the BNRP. VADEQ will monitor at four locations in the Blackwater/Raccoon Study Area on a monthly basis from 2006 through 2016. BNRP will monitor at eight stations monthly from 2005 through 2011 (Figures 5 and 6).

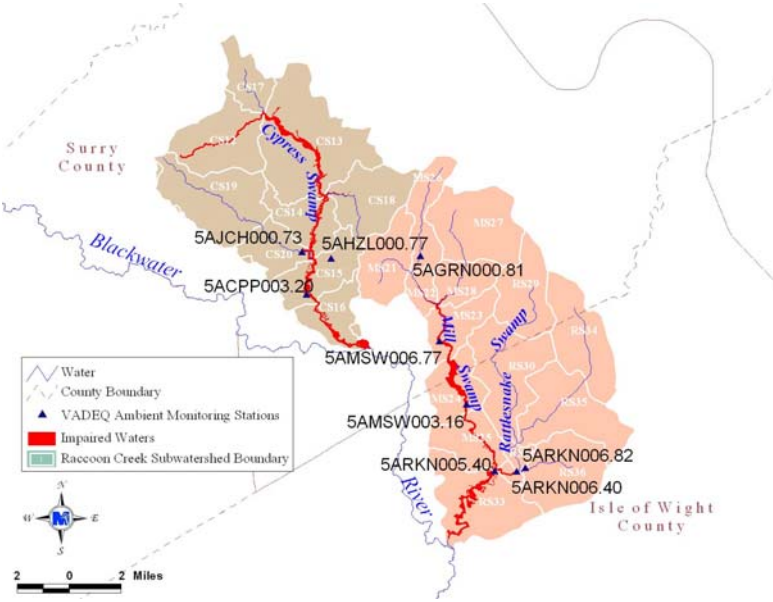


Figure 5. Location of VADEQ and BNRP monitoring stations in the Upper Blackwater River impaired watersheds.

Figure 6. Location of VADEQ and BNRP monitoring stations in the Raccoon Creek watershed.

Education

The Peanut and Chowan SWCDs, along with the FTEs, will initiate contact with farmers in the Blackwater/Raccoon Study Area to encourage the installation of cattle exclusion systems. This one-on-one contact will facilitate communication of the water quality problems and the corrective actions needed. The FTEs will conduct a number of outreach activities in the watershed in order to encourage community support and participation in attaining the program milestones, and to make the community aware of the TMDL requirements. Such activities will include information exchange through newsletters, mailings, field days, organizational meetings, etc. The FTEs will work with organizations (such as Virginia Cooperative Extension) to educate the public.

Stakeholders' Roles and Responsibilities

Achieving the goals of this effort (*i.e.,* improving water quality and removing these waters from the impaired waters lists) is dependent on stakeholder participation. Both the local stakeholders charged with implementation of control measures and the stakeholders charged with overseeing our nation's human health and environmental programs must first acknowledge that 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 four state agencies responsible for regulating activities that impact water quality with regard to this implementation plan. The agencies are: VADEQ, VADCR, Virginia Department of Agriculture and Consumer Services (VDACS), and VDH.

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

VADCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. Historically, most VADCR programs have dealt with agricultural NPS pollution through education and voluntary incentive programs. Cost programs were originally developed to meet the needs of voluntary partial participation and not the TMDL-required 100% participation of stakeholders. To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentive programs are constantly under evaluation to result in higher levels of participation.

Through Virginia's Agricultural Stewardship Act, 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 of 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), septic system regulation, regulation of biosolids land application, and issuing permits not regulated by VPDES. 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, and should refer citizens to the IP project.

State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments, in conjunction with the state, can develop ordinances involving pollution prevention measures. In addition, citizens have the right to bring litigation against persons or groups of people who can be shown to be causing some harm to the claimant. Through hearing the claims of citizens in civil court, and the claims of government representatives in criminal court, the judicial branch of government also plays a significant role in the regulation of activities that impact water quality.

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

List of Acronyms

BMP	Best Management Practice
BNRP	Blackwater Nottoway Riverkeeper Program
CLU	Common Land Unit
CREP	Conservation Reserve and Enhancement Program
CWA	Clean Water Act
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FTE	Full Time Equivalent
IP	Implementation Plan
IWG	Industrial Working Group
NIWG	Non-Industrial Working Group
NPS	Non Point Source Pollution
NRCS	Natural Resources Conservation Service
SL-6	Grazing Land Protection System
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
VADCR	Virginia Department of Conservation and Recreation
VADEQ	Virginia Department of Environmental Quality
VCE	Virginia Cooperative Extension
VDACS	Virginia Department of Agriculture and Consumer Services
VDH	Virginia Department of Health
VDPES	Virginia Pollutant Discharge Elimination System
WP-2	Streambank Protection

Chowan Study Area TMDL Implementation Plan Development

Upper Blackwater River and Raccoon Creek Impairments

Acknowledgements

Steering Committee Members
Working Group Members
&
Chowan and Peanut Soil & Water Conservation Districts
VADEQ and VADCR
County Government

Total Maximum Daily Load

Maximum amount of pollutant that a water body can assimilate without surpassing state water quality standard.

Presentation Outline

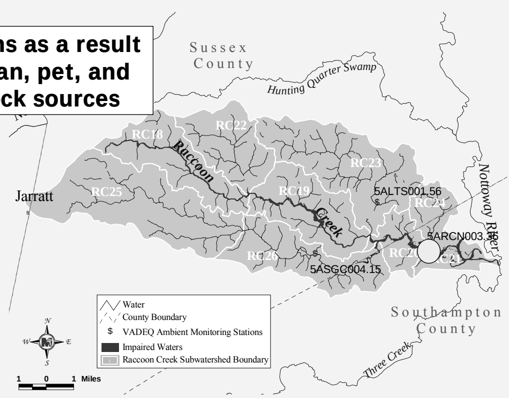
1. Chowan Study Area TMDL Summary
2. Public Participation
3. Assessment of Needs
4. Cost/Benefit Analysis
5. Implementation

Chowan Study Area TMDL Summary

- 100% of cattle must be fenced out of streams
- 100% of straight pipes must be corrected
- Failing septic systems must be repaired
- Dog waste must be disposed of properly
- Bacteria in runoff from agricultural lands must be prevented

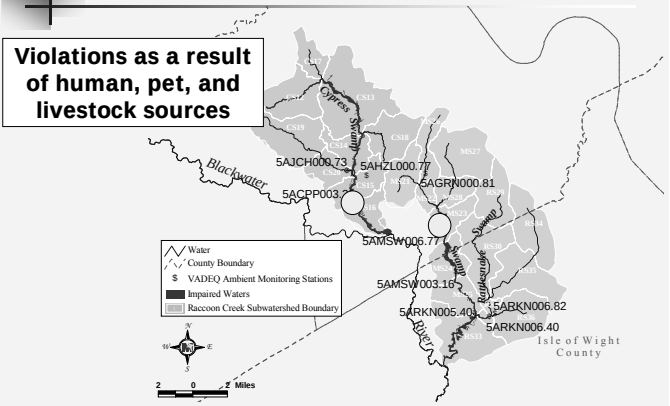
Chowan Study Area TMDL Summary
Bacterial Source Tracking (BST) Results

Violations as a result of human, pet, and livestock sources



Chowan Study Area TMDL Summary
Bacterial Source Tracking (BST) Results

Violations as a result of human, pet, and livestock sources



Public Participation

- **Public Meetings (2)**
  - March 3, 2005
  - June 27, 2005
- **Steering Committee Meetings (2)**
- **Working Groups**
  - Industrial (2)
  - Non-industrial (2)

- **Summary**
  - Increasing Participation
  - Types of BMPs
  - Education and Technical Assistance
  - Funding
  - Timeline and Milestones

Assessment of Needs

- Identification of BMPs
- Quantification of BMPs
  - Spatial Analysis
  - BMP Database Analysis
  - Input from Working Groups
- Technical Assistance and Education
  - BMP Database Analysis
  - Input from Steering Committees

Assessment of Needs

Industrial (Agricultural) BMPs

- Livestock Exclusion
  - 3.59 miles of Streamside Fencing
  - 23 Livestock Exclusion Systems
  - 21 Hardened Water Crossings
- Nonpoint Source (NPS) BMPs
  - 8,661 acres of Improved Pasture Management
  - 8,933 acres of Manure/biosolids Incorporation/injection
  - 94.5 acres (117,645 feet) of Vegetated Buffers
  - 4 Composting Facilities
  - 1 Waste Storage Facility

Assessment of Needs

Non-industrial (residential) BMPs

- 141 Straight Pipe Corrections
- 334 Failing Septic System Repairs
- 57 Dog Kennel BMPs
- 105 acres treated by Infiltration Trenches
- 34 acres treated by Retention Ponds
- 1 Residential Education Program

Assessment of Needs

Technical Assistance

- Industrial (agricultural) Program
  - Soil & Water Conservation Districts
  - 2 Full-Time Employees (FTE)
    - Distributed to each SWCD
- Non-Industrial (residential) Program
  - 1 Full-Time Employee (FTE)

Industrial (Agricultural) BMP Costs

Alternative Water Source	$1,000 – $10,000
1,000 ft Streamside Fencing	$1,500 – $4,000
Hardened Water Crossing	2,000 – $12,000
Composting Facility (Manure)	$4,100
Waste Storage Facility	$20,000
Manure/biosolids Incorporation/injection	$18 /acre
Improved Pasture Management	$170 /acre
Vegetated Buffer	$700 /acre

Non-Industrial (Residential) BMP Costs

Standard Septic System	$3,000 – $6,000
Alternative System	$10,000 – $20,000
Failing Septic System Repair	$3,000
Compost Bins	$250
Septic System with Filter	$4,000
Infiltration Trench	$9,000 /acre treated
Retention Pond	$2,000 /acre treated
Residential Education Program	$8,750 total

Potential Funding Sources

- Many funding sources available
  - EPA - 319 Incremental Funding
  - USDA - EQIP
  - USDA - CREP
  - Virginia Ag. BMP Cost-Share Program
  - Virginia Ag. BMP Tax Credit Program
  - Virginia Water Quality Improvement Fund
  - Virginia Revolving Loan Programs
  - Virginia Department of Housing and Community Development

Funding Example 1

319 & VA State Cost-Share Programs:

System Cost	$10,000
Design Cost (SWCD/FTE assistance)	$1,600
100% Assistance Funded (319 Incremental Funds)	-$1,600
75% Cost-Share	-$7,500
25% Tax Credit	-$625
Cost to Landowner	**$1,875**

Funding Example 2

If regulatory authority or court action forces participation:

System Cost	$10,000
Design Cost	$1,600
0% Assistance Funded	-$0
0% Cost-Share	-$0
0% Tax Credit	-$0
Cost to Landowner	**$ 11,600**

Estimated Total Cost

Industrial Practices	**$1,980,000**
Non-Industrial Practices	**$4,060,000**
Technical Assistance	**$450,000**
TOTAL	**$6,940,000**

5-Year Timeline

Costs

Year	Industrial BMPs ($)	Non-Industrial BMPs ($)	Technical Assistance ($)	Estimated Total Cost Per Year ($)
1	99,000	203,000	90,000	392,000
2	297,000	609,000	90,000	996,000
3	693,000	1,421,000	90,000	2,204,000
4	495,000	1,015,000	90,000	1,600,000
5	396,000	812,000	90,000	1,298,000
Total	**$1,980,000**	**$4,060,000**	**$450,000**	**$6,490,000**

5-Year Timeline

Implementation and Technical Assistance

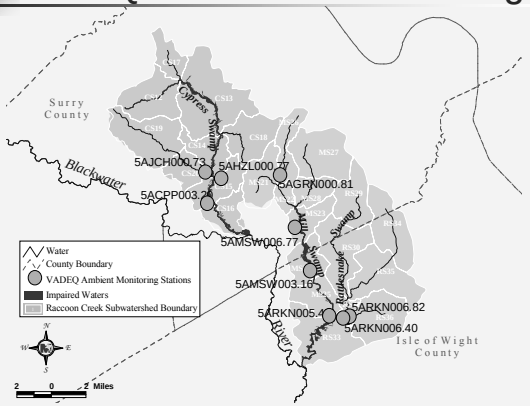
Year	Industrial BMPs (%)	Non-Industrial BMPs (%)	Industrial Technical FTEs (#)	Non-Industrial Technical FTEs (#)
1	5%	5%	2	1
2	15%	15%	2	1
3	35%	35%	2	1
4	25%	25%	2	1
5	20%	20%	2	1
Total	**100%**	**100%**	**10**	**5**

10-Year Timeline

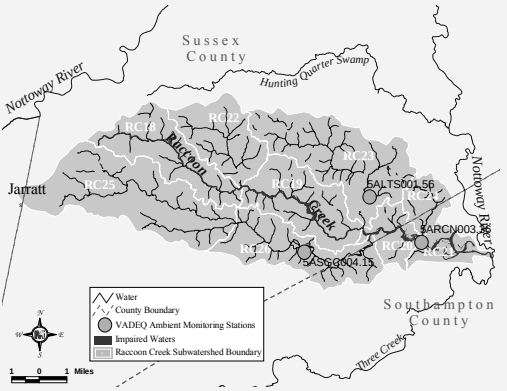
Water Quality Milestones

		Industrial Implementation Milestones		Non-Industrial Implementation Milestones		Water Quality Milestone: *E. coli* instantaneous water quality exceedances in			
Milestone	**Date**	**Livestock Exculsion Systems**	**NPS**	**Straight Pipes Corrected**	**NPS**	**Cypress Swamp (%)**	**Mill Swamp (%)**	**Rattlesnake Cr. Swamp (%)**	**Raccoon Creek (%)**
Existing	8/1/2006	Implementation Begins				18.8	14.7	5.1	14.5
1	8/1/2007	5%	5%	5%	5%	18.6	14.15	5.1	11.18
2	8/1/2008	20%	20%	20%	20%	18.27	13.17	4.83	10.14
3	8/1/2009	55%	55%	55%	55%	17.33	9.54	4.11	8.39
4	8/1/2010	80%	80%	80%	80%	16.57	6.25	3.46	7.13
5	8/1/2011	100%	100%	100%	100%	15.69	3.29	3.02	6.47
6	8/1/2016	De-listing from 303(d) List				0	0	0	0

VADEQ and Citizen Monitoring



VADEQ and Citizen Monitoring



Benefits

- Economic Benefit
  - Local Economy & Community
  - Agricultural Producers
  - Homeowners

- Water Quality Benefits
  - Human Health
  - Environmental Benefit

Education & Outreach

- Soil and Water Conservation Districts and FTEs
  - One-on-one communication
  - Field Days/Demonstrations
- Virginia Department of Health
  - Operation and maintenance of septic systems
  - Permit writing
  - Refer citizens to TMDL IP program
- Virginia Cooperative Extension
  - Responds to specific needs of Virginia citizens
  - Refer citizens to TMDL IP program

Stakeholder's Role in Implementation

- Participation
  - Surry, Isle of Wight, Sussex, and Southampton County Residents
  - Chowan and Peanut Soil and Water Conservation Districts
  - Surry, Isle of Wight, Sussex, and Southampton County Governments
  - VA Department of Environmental Quality
  - VA Department of Conservation and Recreation
  - VA Department of Health
  - VA Cooperative Extension
  - VA Department of Agricultural & Consumer Services
  - United States Environmental Protection Agency
  - USDA – Natural Resources Conservation Service

Summary

- Industrial BMPs required
  - Livestock Exclusion Systems
  - Hardened Water Crossings
  - Improved Pasture Management
  - Manure/biosolids Incorporation/injection
  - Vegetated Buffers
  - Composting Facilities
  - Waste Storage Facilities

- Non-industrial BMPs required
  - Straight Pipe Corrections
  - Failing Septic System Repairs
  - Dog Kennel BMPs
  - Retention Ponds
  - Infiltration Trenches

Contacts

30-day Public Comment Period
June 27, 2005 through July 27, 2005

- VADEQ **R. Chris French**, VADEQ
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Chuck Griffin
Peanut SWCD
(Cypress Swamp, Mill Swamp, and Rattlesnake Swamp)
(757) 357-7004

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VCE Southampton County Office
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Courtland, VA 23837
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Sussex, VA 23884
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