A Total Maximum Daily Load Implementation Plan for the Chowan Study Area

Prepared for:
Virginia Department of Environmental Quality
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New River-Highlands RC&D

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Virginia Department of Environmental Quality (VADEQ)

Virginia Department of Conservation and Recreation (VADCR)

EXECUTIVE SUMMARY

Streams in the Upper Nottoway River and Upper Blackwater River Basins were listed as impaired on Virginia's *1998 Section 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1998) due to violations of the state's water quality standard for fecal coliform. Cypress Swamp, Mill Swamp, Rattlesnake Swamp, Raccoon Creek, Big Hounds Creek, Nottoway River, Little Nottoway River, and Beaverpond Creek do not support primary contact recreation (*e.g.*, swimming, wading, and fishing) and violated the state's *E. coli* standards. The *E. coli* bacteria standards specify the in-stream *E. coli* levels must not exceed a geometric mean of 126-cfu/100 ml and a single sample maximum of 235-cfu/100 ml. As a result of the listings and court actions taken against the United States Environmental Protection Agency (EPA), a total maximum daily load (TMDL) report was developed (MapTech, 2005), which established the reduction in loads needed to restore these waters. Virginia law requires that a plan be implemented to achieve fully supporting status for impaired waters. In fulfilling the state's requirement for the development of a Total Maximum Daily Load (TMDL) Implementation Plan (IP), a framework was established for reducing fecal bacteria levels to achieve the water quality goals for the impaired stream segments in the Upper Nottoway River and Upper Blackwater River Basins for which TMDL allocations were developed.

Review of TMDL Development

MapTech, Inc., a privately held environmental engineering firm, developed TMDL reports for the Chowan Study Area (MapTech, 2005). Modeling conducted in support of the TMDL report considered fecal bacteria loads in runoff resulting from wildlife (*i.e.*, deer, raccoon, muskrat, beaver, turkey, goose, duck), livestock (*i.e.*, beef, dairy, sheep, goat, horse, and swine), and residential (*i.e.*, failing septic systems, dogs, and cats) sources. Direct loads to the stream included direct deposition from cattle and wildlife, uncontrolled discharges (straight pipes), and permitted sources were also modeled. The *E. coli* geometric mean standard (126 cfu/100 mL) and *E. coli* instantaneous standard (235 cfu/100mL) were used as the water quality endpoints. The TMDL results dictate that all uncontrolled discharges must be identified and corrected, all livestock must be excluded from streams, reductions are required from urban/residential and agricultural land uses, and a majority of the direct

deposition from wildlife must be reduced. Wildlife direct deposition will not be explicitly addressed by this implementation plan. All efforts will be directed at controlling anthropogenic sources.

Public Participation

The actions and commitments described in this document are drawn together through input from citizens of the watershed, county governments, VADEQ, VADCR, VDH, Virginia Cooperative Extension (VCE), Natural Resources Conservation Service (NRCS), Chowan, Peanut, Piedmont, Appomattox River, and Southside Soil and Water Conservation Districts (SWCD), and MapTech, Inc. Every citizen and interested party in the watershed is encouraged to become involved in implementing the IP to help restore the health of the streams.

Public participation was encouraged through two sets of meetings, one set for the Nottoway Study Area (Big Hounds Creek, Beaverpond Creek, Nottoway River, and Little Nottoway River) and one set for the Blackwater/Raccoon Study Area (Raccoon Creek, Cypress Swamp, Mill Swamp, and Rattlesnake Swamp). Public meetings were conducted to distribute information, gain feedback, and solicit participation in the smaller forums. The working groups were comprised of stakeholders with similar concerns (*e.g.*, industrial and non-industrial). Representatives from each working group participated in the Steering Committee, where input from the working groups was reviewed and decisions about the IP were made. 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.

Varied opinions were voiced throughout the public participation meetings regarding the IP process. Most members of the working groups agreed that a cornerstone of the implementation plan is cultivating public involvement and education and encouraging commitment and partnerships among the citizens in the watershed and government agencies in order to reduce fecal bacteria pollution.

Assessment of Implementation Action Needs

The quantity of control measures, or BMPs, 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 DCR Agricultural BMP Database and TMDL. Additionally, input from local agency representatives and contractors were used to verify the analyses. Overall, the following needs for the 5-year implementation period were identified:

- 93 Livestock Exclusion Systems
- 92 Hardened Crossings
- 26,806 Acres of Improved Pasture Management
- 18,728 Acre of Manure/biosolids Incorporation/injection
- 121,871 Feet of Vegetated Buffer
- 11 Composting Facilities
- 6 Waste Storage Facilities
- 271 Straight Pipe Corrections
- 903 Failing Septic System Repairs
- 94 Dog Kennel BMPs
- 249 Acres Treated by Infiltration Trenches
- 1,426 Acres Treated by Retention Ponds

Cost/Benefit Analysis

Unit costs for control measures were determined through analysis of control measures previously installed through the Virginia Cost-Share Program in the Chowan River Basin, discussion with local agency representatives, and working groups. The cost of technical assistance was determined through discussion with the local SWCDs. The estimated total cost range to install industrial control measures in the impaired watersheds will range from $6.81 million to $4.64 million, excluding technical assistance. The estimated total cost range of non-industrial control measures is $12.26 million to $8.65 million, excluding technical assistance. The estimated total cost to provide technical assistance during implementation is expected to be $900,000. The total cost estimated for five years of implementation is $20.77 million.

The primary benefit of implementation is the reduction of fecal bacteria concentrations in these waters. The risk of fecal bacteria illness through swimming in or drinking water from

this stream will decrease with the completion of this IP. Streambank protection, provided through exclusion of livestock from streams, will lead to improved aquatic habitat. Soil and nutrient losses should decrease due to vegetated buffers, and infiltration of precipitation should increase through the implementation of agricultural BMPs. The practices recommended in this document will provide economic benefits to the landowner as well as the anticipated environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, and intensive pasture management will improve profitability of farms, while private sewage system installation and maintenance will ultimately save homeowners money by preventing expensive fees and repairs.

Measurable Goals and Milestones for Attaining Water Quality Standards

Potential funding sources available during implementation were identified during plan development. Sources may 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 Revolving Loan Programs (Agricultural BMPs and onsite sewage disposal systems)
- USDA Wildlife Habitat Incentive Program (WHIP)
- Virginia Water Quality Improvement Fund

The funding sources that are expected to play the largest role in implementation are the Federal Clean Water Act 319 Incremental Funds and the Virginia Agricultural BMP Cost-Share and Tax Credit Programs.

The milestones for implementation are 5%, 20%, 55%, 80%, and 100% installation of industrial and non-industrial BMPs by each of the 5 milestones. These milestones are intended to achieve full implementation within 5 years, leaving five years to assess water quality for de-listing. The end goals of implementation are restored water quality in the impaired waters and de-listing of the waters from the Commonwealth of Virginia's Section 305(b)/303(d) list within 10 years. The Steering committees established that implementation

would begin in July 2006 after which five milestones need to be met within the next five years.

Targeting of critical areas for agricultural BMP installation was accomplished through analysis of land use, farm boundaries, stream network GIS layers, and monitoring results. The subwatersheds were ranked by the ratio of animals per length of fence needed and by number of straight pipes in each subwatershed.

Stakeholders and their Role in Implementation

Implementation progress success will be determined by monitoring conducted by VADEQ through the agency's monitoring program and citizen monitoring support for the Blackwater/Raccoon Study Area by the Blackwater Nottoway Riverkeepers Program (BNRP).

The SWCDs will be in charge of initiating contact with farmersin the impaired 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 industrial FTEs should conduct a number of outreach activities in the watershed to promote participation and community support to obtain the agricultural program milestones and to make the agricultural 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 appropriate organizations such as Virginia Cooperative Extension to educate the public.

In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. The agencies regulating activities that impact water quality in Virginia include: VADEQ, VADCR, VDACS, and VDH.

Achieving the goals of this IP (*i.e.*, improving water quality and removing these waters from the Section 305(b)/303(d) list) is dependent on stakeholder participation. Not only the local citizens needing agricultural control measures or residential waste treatment facilities, but also all citizens living in the watershed. It must be acknowledged first that there is a water

quality problem, and changes must be made as needed in operations, programs, and legislation to address these pollutants.

1. INTRODUCTION

1.1 Background

Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) states in section 62.1-44.19:7 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 Total Maximum Daily Load (TMDL) Implementation Plan (IP), a framework was established for reducing fecal bacteria levels and achieving the water quality goals for impairments in the Upper Blackwater River Basin and the Upper Nottoway River Basin. The Upper Blackwater River watershed includes portions of Virginia's Isle of Wight and Surry counties. The Upper Nottoway River watershed includes portions of Virginia's Dinwiddie, Lunenburg, Nottoway, Prince Edward, Southampton, and Sussex counties.

The Upper Blackwater River watershed contains impaired segments of Rattlesnake (Creek) Swamp, Mill Swamp, and Cypress Swamp (Figure 1.1). The Upper Nottoway River watershed contains impaired segments of Raccoon Creek (Figure 1.2), the Nottoway River, Little Nottoway River, Big Hounds Creek, and Beaverpond Creek (Figure 1.3). For the purposes of this report, the impaired watersheds of Cypress Swamp, Mill Swamp, Rattlesnake Swamp, and Raccoon Creek will be referred to as the Blackwater/Raccoon Study Area. The impaired watersheds of Nottoway River, Little Nottoway River, Big Hounds Creek, and Beaverpond Creek will be referred to as the Nottoway Study Area. All watersheds together shall be referred to as the Chowan Study Area.

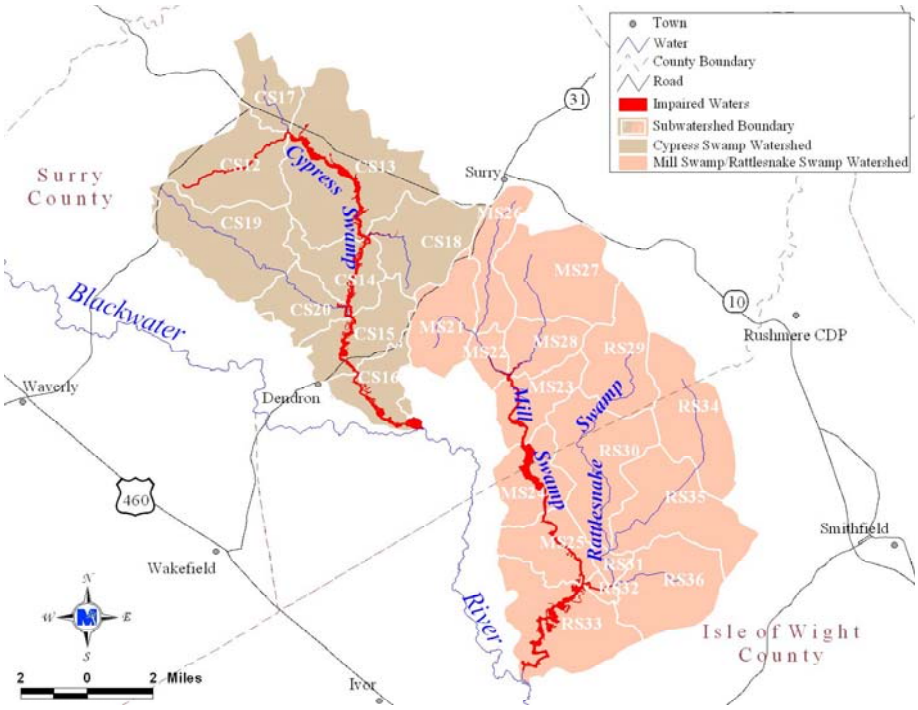

Figure 1.1 Location of Upper Blackwater River impaired stream segments and subwatersheds.

Figure 1.2 Location of Raccoon Creek impaired stream segments and subwatersheds.

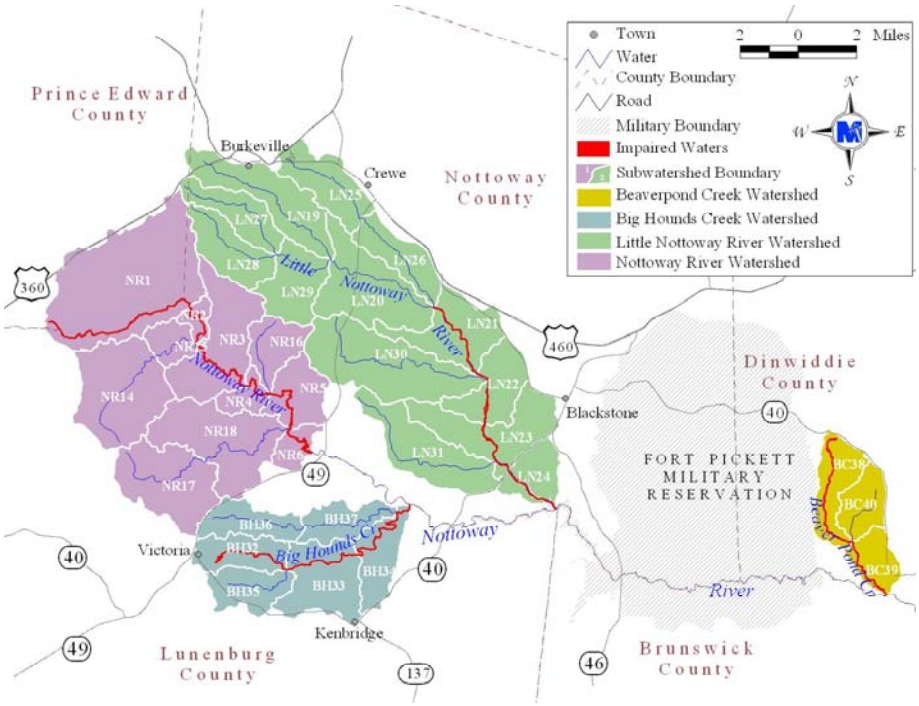

Figure 1.3 Location of Upper Nottoway River impaired stream segments and subwatersheds.

The Beaverpond Creek and Nottoway River segments were placed on the *Virginia 1998 Section 303(d) Total Maximum Daily Load Priority List and Report* and additional stream segments were subsequently placed on the *2002 Section 303(d) Report on Impaired Waters* (Table 1.1). All segments remained on the *2004 Section 305(b)/303(d) Water Quality Assessment Integrated Report*. Elevated levels of fecal bacteria recorded at VADEQ ambient water quality monitoring stations showed that these Chowan Study Area stream segments do not support the primary contact recreation designated use.

Table 1.1 Chowan Study Area fecal bacteria impairments listed in *2004 305(b)/303(d) Water Quality Assessment Integrated Report* for which IPs will be developed.

Stream Name, HUP	Listing Station ID	Initial Listing	Miles Affected	2002 303(d) List FC Violation Rate	2004 303(d) List FC Violation Rate	Location
Upper Blackwater River Basin						
Cypress Swamp, K32	5ACPP003.20	2002	17.1	4/25	N/A	Headwaters to Blackwater River
Cypress Swamp, K32	5A-PL-SCP1B	2004	N/A	1/9	N/A	Headwaters to Blackwater River
Mill Swamp, K34	5AMSW006.77	2002	16.78	3/24	1/10	From confluence with Moores Swamp to confluence with Rattlesnake Swamp
Rattlesnake (Creek) Swamp, K34	5ARKN006.40	2002	8.16	7/59	2/18	From the confluence with Pouches Swamp to the Blackwater River
Upper Nottoway River Basin						
Beaverpond Creek, K16	5ABPC000.12	1998	7.17	9/16	9/19	Headwaters to Nottoway River
Big Hounds Creek, K14	5ABHC003.73	2002	10.35	5/27	5/28	Headwaters to Nottoway River
Little Nottoway River, K15	5ALNT004.68	2002	9.85	6/27	12/28	From Lazaretto Creek downstream to its mouth at the Nottoway River
Nottoway River, K14	5ANTW155.06	1998	17.76	1/6	N/A	From the headwaters to the backwaters of Nottoway Falls Lake
Raccoon Creek, K25	5ARCN003.36	2002	19.3	4/21	6/29	The entire mainstem of Raccoon Creek

The Upper Blackwater River (Figure 1.4), Raccoon Creek (Figure 1.5), and the Upper Nottoway River (Figure 1.6) watershed areas have forest as the major land use (Table 1.2).

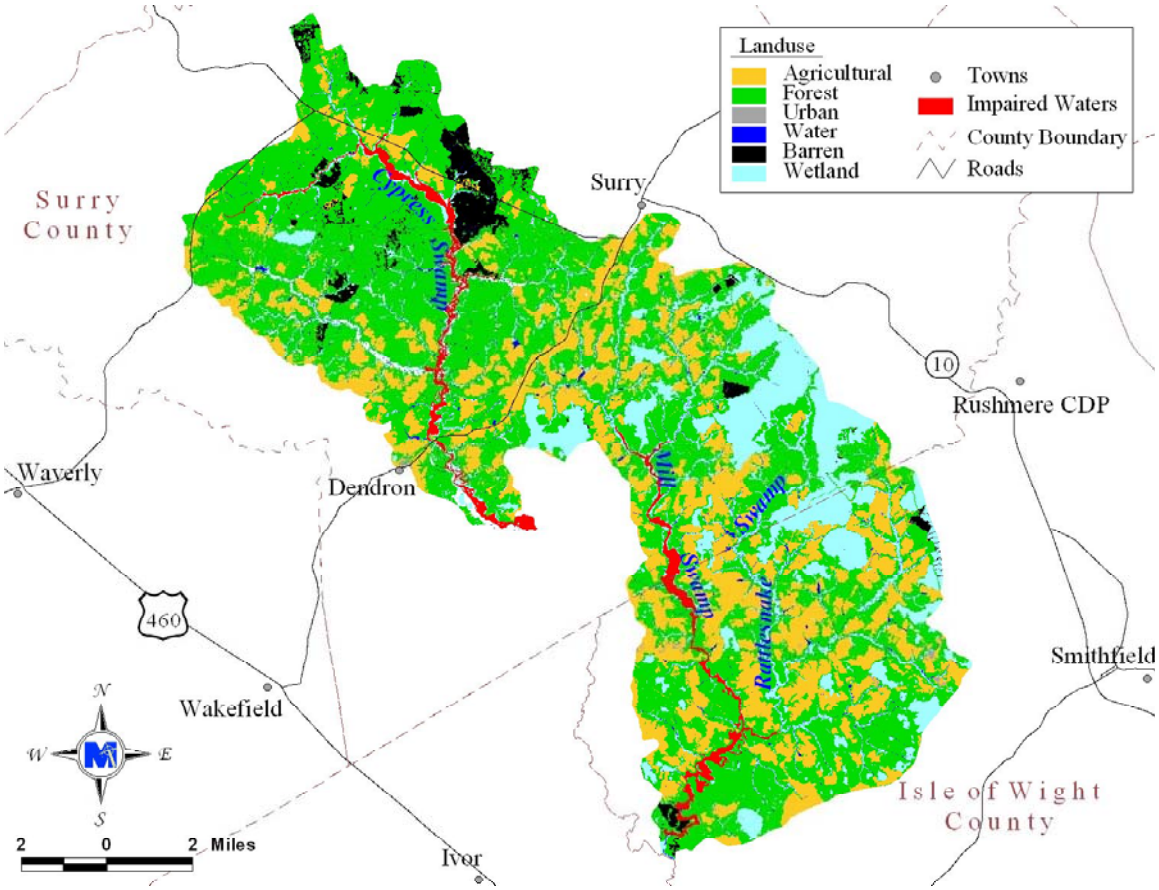

Figure 1.4 Land uses in the Cypress Swamp, Mill Swamp, and Rattlesnake (Creek) Swamp watersheds.

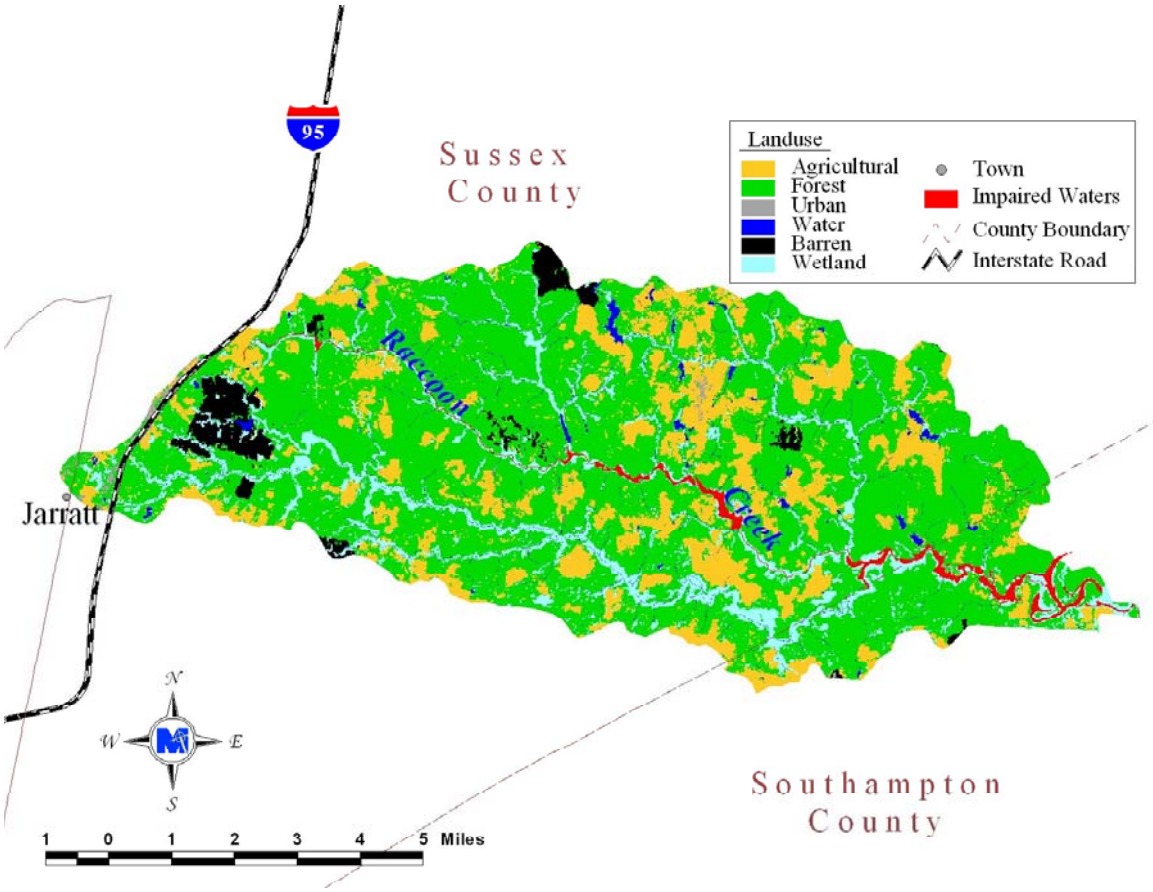

Figure 1.5 Land uses in the Raccoon Creek watershed.

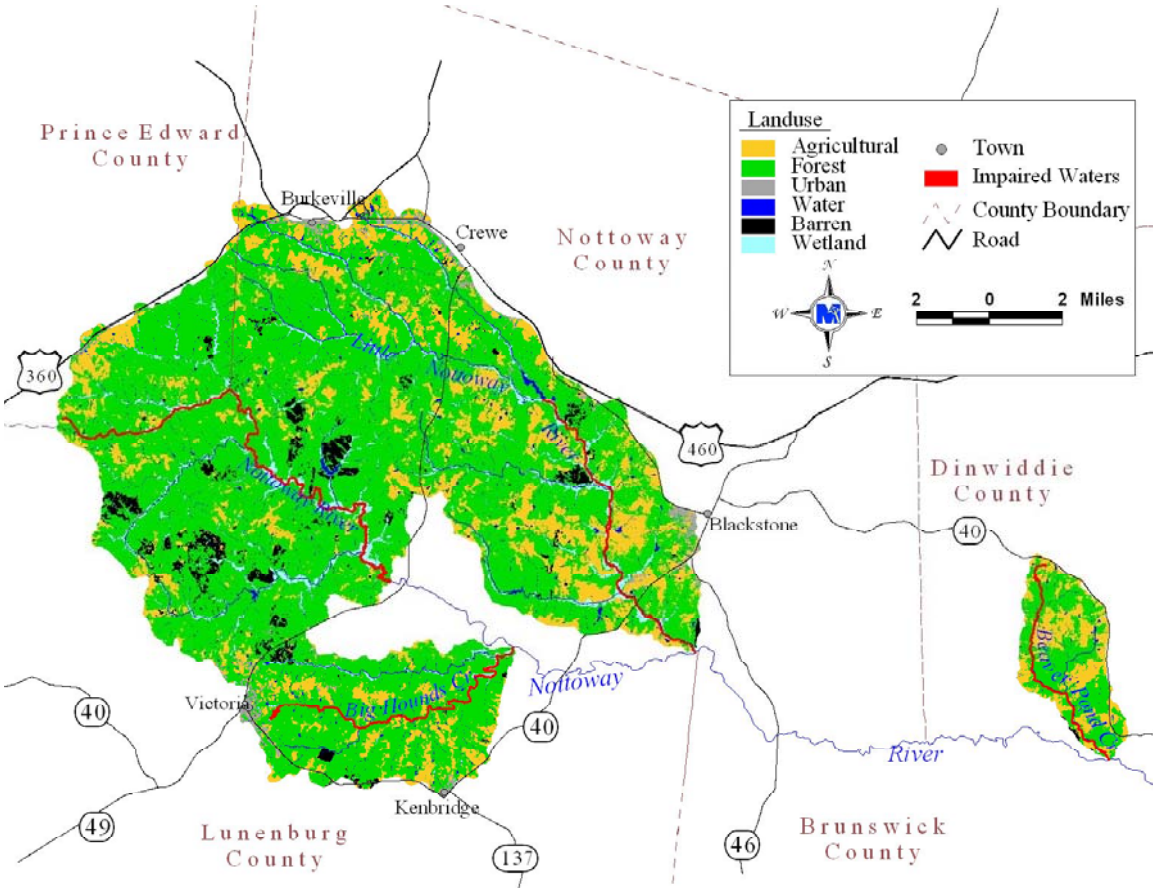

Figure 1.6 Land uses in the Nottoway River, Little Nottoway River, Big Hounds Creek and Beaverpond Creek watersheds.

Table 1.2 Contributing land use area for Chowan Study Area impaired segments for which IPs will be developed.

Impaired Segment	Land Use								
	Water (acres)	Residential (acres)	Commercial & Services (acres)	Barren (acres)	Woodland (acres)	Pasture (acres)	Cropland (acres)	Wetlands (acres)	Livestock Access (acres)
Upper Blackwater River Basin									
Cypress Swamp	497	29	11	2,286	25,086	1,693	4,506	3,572	14
Mill Swamp	266	35	20	161	10,746	2,234	5,090	5,283	25
Rattlesnake Swamp	338	50	29	255	14,322	2,008	7,045	7,725	37
Upper Nottoway River Basin									
Beaverpond Creek	118	14	5	29	3,745	1,607	758	30	37
Big Hounds Creek	186	329	58	173	8,144	1,922	216	151	23
Little Nottoway River	862	756	340	631	32,381	10,678	733	1,951	185
Nottoway River*	698	140	59	2,076	33,100	3,664	393	2,042	63
Raccoon Creek	601	48	259	1,266	28,324	2,627	5,489	4,866	23

* Impairment begins at the headwaters and extends downstream to river mile 146.08.

Table 1.3 lists agricultural production rankings for counties in Chowan Study Area compared to all counties in Virginia. This information is provided in order to show the agricultural operations in each county.

Table 1.3 Agricultural production rankings for counties in the Chowan Study Area compared to all counties in Virginia*.

County / City	County Rankings Compared to Other Counties in Virginia						
	Cattle & Calves	Dairy	Beef	Horses	Layers	Broilers	Swine
Dinwiddie	61	35	63	55	43	21	N/A
Isle of Wight	67	N/A	66	76	18	13	2
Lunenburg	43	N/A	45	N/A	7	N/A	N/A
Nottoway	43	35	39	60	5	8	N/A
Prince Edward	44	28	30	72	9	15	N/A
Southampton	63	N/A	59	73	11	12	4
Surry	83	N/A	71	N/A	90	N/A	N/A
Sussex	73	N/A	76	67	N/A	N/A	N/A

*VASS, 2002.

For the period from 1972 to 2004, the portion of the Chowan Study Area near Fort Pickett, Virginia (Upper Nottoway River watershed) received average annual precipitation of approximately 46.44 inches, with 53% of the precipitation occurring during the May through October growing season (SERCC, 2004). Average annual snowfall is 7.9 inches, with the highest snowfall occurring during January (SERCC, 2004). Average annual daily temperature is 56.4 ºF. The highest average daily temperature of 86.8 ºF occurs in August, while the lowest average daily temperature of 24.0 ºF occurs in January (SERCC, 2004).

For the period from 1948 to 2004, the portion of the Chowan Study Area near Stony Creek, Virginia (Upper Blackwater River watershed) received average annual precipitation of approximately 44.98 inches, with 55% of the precipitation occurring during the May through October growing season (SERCC, 2004). Average annual snowfall is 8.6 inches, with the highest snowfall occurring during February (SERCC, 2004). Average annual daily temperature is 57.9 ºF. The highest average daily temperature of 90.2 ºF occurs in July, while the lowest average daily temperature of 26.4 ºF occurs in January (SERCC, 2004).

1.2 Applicable Water Quality Standards

In developing the IPs, elements from both State and Federal guidance were incorporated. Specifically, Virginia's 1997 WQMIRA establishes that an IP shall include the date of expected achievement of water quality objectives, measurable goals, necessary control measures, and the associated costs, benefits, and environmental impact of addressing the impairments. The United States Environmental Protection Agency (EPA) outlines the minimum elements of an approvable IP in its 1999 proposal, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA, 1999). These elements include implementation actions/management measures, time line, legal or regulatory controls, time required to attain water quality standards, monitoring plan, and milestones for attaining water quality standards. The process of incorporating these state and federal guidelines into an IP consisted of three major components: 1) public participation, 2) identification and assessment of potential control measures, and 3) assessment of progress toward end goals.

Once developed, VADEQ will take TMDL implementation plans to the State Water Control Board (SWCB) for approval as the plan for implementing the pollutant allocations and reductions contained in the TMDLs. Also, VADEQ will request SWCB authorization to incorporate the TMDL implementation plan into the appropriate Water Quality Management Plan (WQMP) in accordance with the CWA's Section 303(e). In response to a Memorandum of Understanding (MOU) between EPA and VADEQ, VADEQ also submitted a draft Continuous Planning Process to EPA in which VADEQ commits to regularly updating the WQMPs. Thus, the WQMPs will be, among other things, the repository for all TMDLs and TMDL implementation plans developed within a river basin.

According to 9 VAC 25-260-5 of Virginia's State Water Control Board *Water Quality Standards,* the term 'water quality standards' means "…provisions of state or federal law which consist of a designated use or uses for the waters of the Commonwealth and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law and the federal Clean Water Act."

As stated in Virginia state law 9 VAC 25-260-10 (Designation of uses),

A. All state waters, including wetlands, are designated for the following uses: recreational uses, e.g., swimming and boating; the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources, e.g., fish and shellfish.

D. At a minimum, uses are deemed attainable if they can be achieved by the imposition of effluent limits required under §§301(b) and 306 of the Clean Water Act and cost-effective and reasonable best management practices for nonpoint source control.

The applicable water quality criteria for fecal bacteria impairments in the Upper Blackwater and Nottoway watersheds are covered in Section 9 VAC 25-260-170.

EPA recommended that all states adopt an *E. coli* or *Enterococci* standard for fresh water and *Enterococci* criteria for marine waters by 2003. EPA is pursuing the states' adoption of these standards because there is a stronger correlation between the concentration of these organisms (*E. coli* and *Enterococci*) and the incidence of gastrointestinal illness than with fecal bacteria. *E. coli* and *Enterococci* are both bacteriological organisms that can be found in the intestinal tract of warm-blooded animals. Like fecal bacteria, these organisms indicate the presence of fecal contamination. The adoption of the *E. coli* and *Enterococci* standard went into effect in Virginia on January 15, 2003.

The new criteria, used in developing the bacteria TMDL in this study, is outlined in 9 VAC 25-260-170 and reads as follows:

A. In surface waters, except shellfish waters and certain waters identified in subsection B of this section, the following criteria shall apply to protect primary contact recreational uses:

1. Fecal coliform bacteria shall not exceed a geometric mean of 200 fecal coliform bacteria per 100 ml of water for two or more samples over a calendar month nor shall more than 10% of the total samples taken during any calendar month exceed 400 fecal coliform bacteria per 100 ml of water. This criterion shall not apply for a sampling station after the bacterial indicators described in subdivision 2 of this subsection have a minimum of 12 data points or after June 30, 2008, whichever comes first.

2. E. coli and Enterococci bacteria per 100 ml of water shall not exceed the following:

	Geometric Mean[1]	*Single Sample Maximum*[2]
Freshwater[3]		
E. coli	*126*	*235*
Saltwater and Transition Zone[3]		
Enterococci	*35*	*104*

[1] For two or more samples taken during any calendar month.
[2] No single sample maximum for *Enterococci* and *E. coli* shall exceed a 75% upper one-sided confidence limit based on a site-specific log standard deviation. If site data are insufficient to establish a site-specific log standard deviation, then 0.4 shall be used as the log standard deviation in freshwater and 0.7 shall be as the log standard deviation in saltwater and transition zone. Values shown are based on a log standard deviation of 0.4 in freshwater and 0.7 in saltwater.
[3] See 9 VAC 25-260-140 C for freshwater and transition zone delineation.

1.3 Designated Uses

All waters in the Commonwealth have been designated as "primary contact" for the swimming use regardless of size, depth, location, water quality or actual use. The fecal coliform bacteria standard is described in 9 VAC 25-260-170 (Section 1.2). This standard is to be met during all stream flow levels and was established to protect bathers from ingestion of potentially harmful bacteria. However, many headwater streams are small and shallow during base flow conditions when surface runoff has minimal influence on stream flow. Even in pools, these shallow streams do not allow full body immersion during periods of base flow. In larger streams, lack of public access often precludes the swimming use.

Recognizing that all waters in the Commonwealth are not used extensively for swimming, Virginia has approved a process for re-designation of the swimming use for secondary contact in cases of: 1) natural contamination by wildlife, 2) small stream size, and 3) lack of accessibility to children, as well as due to widespread socio-economic impacts resulting from the cost of improving a stream to a “swimmable” status.

The re-designation of the current swimming use in a stream will require the completion of a Use Attainability Analysis (UAA). The UAA is a structured scientific assessment of the factors affecting the attainment of the use, which may include physical, chemical, biological, and economic factors as described in the Federal Regulations. The stakeholders in the watershed, Virginia, and EPA will have an opportunity to comment on these special studies.

1.4 Addressing Wildlife Contributions

In some streams for which TMDLs have been developed, water quality modeling indicates that, even after removal of all bacteria sources (other than wildlife), the stream will not attain standards under all flow regimes at all times. As is the case for the Chowan Study Area, these streams may not be able to attain standards without some reduction in wildlife load. **Virginia and EPA are not proposing the reduction of wildlife to allow for the attainment of water quality standards.**

To address this issue, Virginia has proposed (during its recent triennial water quality standards review) a new "secondary contact" category for protecting the recreational use in state waters. On March 25, 2003, the Virginia State Water Control Board adopted criteria for "secondary contact recreation" which means "a water-based form of recreation, the practice of which has a low probability for total body immersion or ingestion of waters (examples include but are not limited to wading, boating and fishing)". These new criteria will become effective pending EPA approval and can be found at http://www.deq.state.va.us/wqs/rule.html.

In order for the new criteria to apply to a specific stream segment, the primary contact recreational use must be removed. To remove a designated use, the state must demonstrate that 1) the use is not an existing use, 2) downstream uses are protected, and 3) the source of bacterial contamination is natural and uncontrollable by effluent limitations and by implementing cost-effective and reasonable best management practices (BMPs) for nonpoint source control (9 VAC 25-260-10). This, and other, information is collected through the UAA study. All site-specific criteria or designated use changes must be adopted as amendments to the water quality standards regulations. Watershed stakeholders and EPA will be able to provide comment during this process.

Based on the above, EPA and Virginia have developed a process to address the wildlife issue. First in this process is the development of a Stage I scenario. The pollutant reductions in the Stage I scenario are targeted only at the controllable, anthropogenic bacteria sources identified in the TMDL, setting aside control strategies for wildlife except for cases of over-populations. During the implementation of the Stage I scenario, all controllable sources

would be reduced to the maximum extent practicable using the iterative approach described in Section 6.1. VADEQ will re-assess water quality in the stream during and subsequent to the implementation of the Stage I scenario to determine if the water quality standard is attained. This effort will also evaluate if the modeling assumptions were correct. If water quality standards are not being met, a UAA may be initiated to reflect the presence of naturally high bacteria levels due to uncontrollable sources. In some cases, the effort may never have to go to the UAA phase because the water quality standard exceedances attributed to wildlife in the model may have been very small and infrequent and within the margin of error.

1.5 Project Methodology

The overall goal of this project was to begin the process of restoring water quality in the Chowan Study Area. Specific objectives in meeting this goal are:

1. Development of a staged IP for Rattlesnake (Creek) Swamp, Mill Swamp, Cypress Swamp, Raccoon Creek, Nottoway River, Little Nottoway River, Big Hounds Creek, and Beaverpond Creek,
2. Coordination of public participation, and
3. BMP implementation.

As stated above, key components of an IP include public participation, assessment of needs, cost/benefit analysis, measurable goals, and a timeline to achieve water quality objectives. Public participation was an integral part of the TMDL IP Development and is critical to promote reasonable assurances that the implementation activities will occur. Public participation took place on three levels. First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project, and for soliciting participation in the smaller, more-targeted meetings. Second, working groups were assembled from communities of people with common concerns regarding the TMDL process and were the primary arena for seeking public input. Working groups consisted of the following: Industrial (including agriculture and industry) and Non-Industrial (including residents, environmental group representatives, and government agents). A representative 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 formulating the Chowan River Basin TMDL IPs.

Potential control measures were identified through working group input, literature review, and discussion with the local SWCDs, Natural Resources Conservation Service (NRCS), VADEQ, VADCR, VDH, Virginia Cooperative Extension (VCE), and local government. Control measures that can be promoted through existing programs were identified, as well as control measures that are not currently supported by existing programs and their potential funding sources. Control measures were assessed based on cost, availability of existing funds, reasonable assurance of implementation, and water quality impacts. The cost of installing potential control measures was determined through discussion with working groups, SWCDs, NRCS, VADEQ, VADCR, VDH, VCE, and county governments. Availability of existing programs was determined through discussion with state and local officials participating in the Non-Industrial Working Group. The assurance of implementation of specific control measures was assessed through discussion with appropriate working groups, and control measures were assessed based on their perceived potential for being successfully implemented. The assessment of water quality impacts consisted of the development and evaluation of implementation scenarios. Implementation strategies were presented to and evaluated by the Steering Committee.

Based on the evaluated strategies, staged implementation timelines were developed. Implicit in the process of a staged implementation is the targeting of control measures. Targeting was proposed to ensure optimum utilization of resources. Monitored data collected during the TMDL development process was used together with modeling to target the staged implementation. Modeling was used to evaluate measurable goals and milestones by linking water quality with specific levels of implementation (*e.g.*, a 50% reduction in livestock access to streams may result in a 90% reduction in violations of the state standard). Through this process, a staged implementation plan was developed that will establish full implementation within five years.

The stated key components of the staged implementation plan are discussed in detail in the following sections: Review of TMDL development, Process for Public Participation, Assessment of Needs, Cost/Benefit Analysis, and Implementation.

With successful completion of these IPs, Virginia will be well on the way to restoring the impaired waters and enhancing the value of this important resource. Additionally, development of an approved IP will improve each locality's chances for obtaining monetary assistance during implementation.

2. STATE AND FEDERAL REQUIREMENTS FOR IMPLEMENTATION PLANS

There are a number of state and federal requirements and recommendations for TMDL IPs. The goal of this chapter is to clearly define these and explicitly state if the "elements" are a required component of an approvable IP or are merely a recommended topic that should be covered in a thorough IP. This chapter has three sections that discuss the a) requirements outlined by Virginia's WQMIRA that must be met in order to produce an IP that is acceptable and approvable by the Commonwealth, b) EPA recommended elements of IPs, and c) required components of an IP in accordance to Section 319 guidance.

2.1 State Requirements

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia). WQMIRA directs VADEQ 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 include the following elements as stated in WQMIRA:

- Date of expected achievement of water quality objectives,
- Measurable goals,
- The corrective actions necessary,
- The associated costs, benefits, and environmental impacts of addressing the impairment, and
- The expeditious development and implementation of TMDLs when appropriate.

2.2 Federal Recommendations

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. However, EPA does 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.

2.3 Requirements for Section 319 Fund Eligibility

EPA develops guidelines that describe the process and criteria to be used to award CWA Section 319 nonpoint source grants to states. The guidance is subject to revision and the most recent version should be considered for IP development. The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine actions that must be undertaken and covered in the IP in order to meet the 319 requirements.

1. Identify the causes and sources of groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan.
2. Estimate the load reductions expected to achieve water quality standards.
3. Describe the NPS management measures that will need to be implemented to achieve the identified load reductions.
4. Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan.
5. Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures.
6. Provide a schedule for implementing the NPS management measures identified in the watershed-based plan.
7. Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.
8. Identify a set of criteria for determining if loading reductions are being achieved and progress is being made towards attaining water quality standards and, if not, the criteria for determining if the watershed-based plan needs to be revised.
9. Establish a monitoring component to evaluate the effectiveness of the implementation efforts.

3. REVIEW OF TMDL DEVELOPMENT

MapTech, Inc., contracted by the VADEQ, developed TMDLs for the Chowan Study Area, which is made up of the Upper Blackwater River watershed and the Upper Nottoway River watershed in Virginia. The approved TMDL document can be obtained via the Internet at www.deq.virginia.gov/wqs/rule.html. Water quality monitoring, water quality modeling, and allocated reductions were reviewed to determine the implications of TMDL and modeling procedures on IP development.

3.1 TMDL Water Quality Monitoring Results

MapTech, Inc. was contracted to perform an analysis of fecal bacteria and *E. coli* concentrations as well as Bacterial Source Tracking (BST). BST is intended to aid in identifying sources (*i.e.*, human, pets, livestock, or wildlife) of fecal contamination in water bodies. Data collected 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.

Several procedures are currently under study for use in BST. Virginia has adopted the Antibiotic Resistance Analysis (ARA) methodology implemented by MapTech's Environmental Diagnostics Laboratory (EDL). This method was selected because it has been demonstrated to be a reliable procedure for confirming the presence or absence of human, pet, livestock, and wildlife sources in watersheds in Virginia. The results were reported as the percentage of isolates acquired from the sample that were identified as originating from either humans, pets, livestock, or wildlife.

The BST results of water samples collected at eight ambient stations in the Chowan Study Area drainage are reported in Tables 3.1 through 3.8. The *E. coli* enumerations are given to indicate the bacteria concentrations at the time of sampling. The proportions reported are formatted to indicate statistical significance (*i.e.*, **BOLD** numbers indicate a statistically significant result). The statistical significance was determined through two tests. The first was based on the sample size. A z-test was used to determine if the proportion was significantly different from zero (alpha = 0.10). Second, the rate of false positives was calculated for each source category in each library, and a proportion was not considered

significantly different from zero unless it was greater than the false-positive rate plus three standard deviations. Table 3.9 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.

Table 3.1 Summary of bacterial source tracking results from water samples collected in the Nottoway River impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as:			
				Wildlife	Human	Livestock	Pet
5ANTW155.06	7/31/2003	2,700	300	0%	0%	**79%**	**21%**
	8/20/2003	630	160	**46%**	0%	**29%**	**25%**
	9/11/2003	150	240	6%	0%	**19%**	**75%**
	10/14/2003	70	20	0%	0%	0%	100%
	11/13/2003	190	124	0%	0%	**33%**	**67%**
	12/8/2003	50	60	**83%**	0%	0%	**17%**
	2/4/2004	120	60	**42%**	**12%**	**42%**	4%
	2/25/2004	10	6	80%	0%	20%	0%
	3/24/2004	10	6	25%	0%	0%	75%
	4/19/2004	10	30	63%	0%	12%	25%
	5/10/2004	120	40	25%	0%	0%	75%
	6/23/2004	320	190	**90%**	5%	5%	0%

BOLD type indicates a statistically significant value.

Table 3.2 Summary of bacterial source tracking results from water samples collected in the Little Nottoway River impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as: Wildlife	Human	Livestock	Pet
5ALNT004.68	7/31/2003	3,800	360	**38%**	**17%**	12%	**33%**
	8/20/2003	2,200	160	**25%**	8%	**46%**	**21%**
	9/11/2003	420	620	**33%**	0%	**21%**	**46%**
	10/14/2003	160	110	**25%**	0%	17%	**58%**
	11/13/2003	310	240	**12%**	0%	12%	**76%**
	12/8/2003	100	330	**46%**	**21%**	8%	**25%**
	2/4/2004	60	140	**33%**	**12%**	**33%**	**22%**
	2/25/2004	30	48	**33%**	0%	**59%**	8%
	3/24/2004	40	20	**50%**	20%	0%	**30%**
	4/19/2004	140	220	**63%**	**17%**	8%	**12%**
	5/10/2004	190	270	**29%**	**38%**	**33%**	0%
	6/23/2004	130	170	**31%**	**57%**	12%	0%

BOLD type indicates a statistically significant value.

Table 3.3 Summary of bacterial source tracking results from water samples collected in the Big Hounds Creek impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as: Wildlife	Human	Livestock	Pet
5ABHC003.73	7/31/2003	680	290	**17%**	8%	**71%**	4%
	8/20/2003	3,200	280	**33%**	**33%**	8%	**26%**
	9/11/2003	370	500	**54%**	0%	8%	**38%**
	10/14/2003	140	90	0%	0%	88%	12%
	11/13/2003	320	218	4%	0%	**25%**	**71%**
	12/8/2003	70	64	**25%**	**12%**	8%	**55%**
	2/4/2004	150	34	**29%**	0%	**50%**	**21%**
	2/25/2004	30	4	0%	0%	0%	100%
	3/24/2004	40	34	**38%**	5%	0%	**57%**
	4/19/2004	20	60	50%	0%	33%	17%
	5/10/2004	240	160	20%	**40%**	0%	**40%**
	6/23/2004	540	200	**74%**	13%	13%	0%

BOLD type indicates a statistically significant value.

Table 3.4 Summary of bacterial source tracking results from water samples collected in the Beaverpond Creek impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as:			
				Wildlife	Human	Livestock	Pet
5ABPC000.12	7/31/2003	200	86	0%	0%	**100%**	0%
	8/20/2003	5,600	2,000	**17%**	**71%**	4%	8%
	9/11/2003	480	510	4%	0%	**58%**	**38%**
	10/14/2003	4,000	3,000	**50%**	**21%**	4%	**25%**
	11/13/2003	170	270	**29%**	**12%**	0%	**59%**
	12/8/2003	170	142	0%	**17%**	8%	**75%**
	2/4/2004	100	58	**71%**	0%	**21%**	8%
	2/25/2004	10	36	**71%**	4%	**17%**	8%
	3/24/2004	40	94	**59%**	**21%**	8%	**12%**
	4/19/2004	100	106	**46%**	**21%**	12%	**21%**
	5/10/2004	30	410	**38%**	**33%**	4%	**25%**
	6/23/2004	2,000	1,800	**38%**	8%	**33%**	**21%**

BOLD type indicates a statistically significant value.

Table 3.5 Summary of bacterial source tracking results from water samples collected in the Raccoon Creek impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as:			
				Wildlife	Human	Livestock	Pet
5ARCN003.36	7/22/2003	800	610	**25%**	4%	12%	**59%**
	8/13/2003	430	160	0%	0%	88%	12%
	9/17/2003	330	10	**56%**	0%	6%	**38%**
	10/20/2003	130	130	**50%**	0%	**31%**	**19%**
	11/17/2003	140	88	8%	0%	**63%**	**29%**
	12/9/2003	4	8	83%	0%	17%	0%
	1/14/2004	30	14	**44%**	0%	0%	**56%**
	2/10/2004	10	0	0%	0%	0%	0%
	3/2/2004	30	32	**31%**	**23%**	0%	**46%**
	4/13/2004	40	320	**17%**	**17%**	**17%**	**49%**
	5/4/2004	60	80	**30%**	0%	5%	**65%**
	6/29/2004	190	60	17%	33%	0%	50%

BOLD type indicates a statistically significant value.

Table 3.6 Summary of bacterial source tracking results from water samples collected in the Cypress Swamp impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as:			
				Wildlife	Human	Livestock	Pet
5ACPP003.20	7/23/2003	600	250	**29%**	4%	**50%**	**17%**
	8/13/2003	6,000	290	**38%**	0%	**62%**	0%
	9/15/2003	350	240	0%	0%	**100%**	0%
	10/14/2003	120	40	0%	0%	50%	50%
	11/12/2003	340	48	**54%**	0%	4%	**42%**
	12/3/2003	100	40	**50%**	4%	**25%**	**21%**
	1/14/2004	20	16	**30%**	0%	10%	**60%**
	2/17/2004	30	12	50%	0%	12%	38%
	3/3/2004	30	44	**84%**	0%	8%	8%
	4/15/2004	40	48	**84%**	0%	4%	**12%**
	5/12/2004	20	70	88%	0%	12%	0%
	6/9/2004	1	270	**66%**	**17%**	0%	**17%**

BOLD type indicates a statistically significant value.

Table 3.7 Summary of bacterial source tracking results from water samples collected in the Mill Swamp impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as:			
				Wildlife	Human	Livestock	Pet
5AMSW006.77	7/14/2003	670	400	0%	4%	**96%**	0%
	8/11/2003	2,800	140	0%	0%	88%	12%
	10/20/2003	80	20	100%	0%	0%	0%
	11/17/2003	150	134	**71%**	0%	4%	**25%**
	12/8/2003	60	66	**88%**	4%	8%	0%
	1/12/2004	20	14	72%	14%	14%	0%
	2/9/2004	120	24	**27%**	0%	0%	**73%**
	3/15/2004	50	38	**17%**	0%	0%	**83%**
	4/12/2004	20	64	**50%**	8%	4%	**38%**
	5/10/2004	50	120	**25%**	0%	**25%**	**50%**
	6/14/2004	100	110	**50%**	0%	**25%**	**25%**

BOLD type indicates a statistically significant value.

Table 3.8 Summary of bacterial source tracking results from water samples collected in the Rattlesnake (Creek) Swamp impairment.

Station	Date	Fecal Bacteria (cfu/100 ml)	*E. coli* (cfu/100 ml)	Percent Isolates classified as:			
				Wildlife	Human	Livestock	Pet
5ARKN006.40	7/14/2003	270	130	0%	4%	**96%**	0%
	8/11/2003	5,900	170	12%	0%	**88%**	0%
	9/8/2003	770	260	**71%**	0%	**21%**	8%
	10/20/2003	120	40	25%	0%	75%	0%
	11/17/2003	160	144	**50%**	0%	**33%**	**17%**
	12/8/2003	110	142	**84%**	8%	8%	0%
	1/12/2004	30	28	**25%**	6%	**19%**	**50%**
	2/9/2004	70	104	**25%**	4%	**33%**	**38%**
	3/15/2004	50	28	5%	**16%**	5%	**74%**
	4/12/2004	20	92	**71%**	0%	**17%**	**12%**
	5/10/2004	70	110	75%	0%	0%	25%
	6/14/2004	150	190	**59%**	9%	0%	**32%**

BOLD type indicates a statistically significant value.

Table 3.9 Load-weighted average proportions of fecal bacteria originating from wildlife, human, livestock, and pet sources.

Station Name	Station ID	Weighted Averages:			
		Wildlife	Human	Livestock	Pet
Beaverpond Creek	5ABPC000.12	33%	33%	12%	22%
Nottoway River	5ANTW155.06	28%	2%	42%	28%
Little Nottoway River	5ALNT004.68	36%	14%	20%	30%
Big Hounds Creek	5ABHC003.73	30%	11%	28%	31%
Raccoon Creek	5ARCN003.36	21%	9%	20%	50%
Cypress Swamp	5ACPP003.20	38%	3%	48%	11%
Mill Swamp	5AMSW006.77	23%	2%	57%	18%
Rattlesnake Cr. Sw.	5ARKN006.40	37%	3%	43%	17%

3.2 Water Quality Modeling

In order to understand the implications of the load allocations determined during TMDL development, it is important to understand the modeling methods used in the analysis. The United States Geological Survey (USGS) Hydrologic Simulation Program - Fortran (HSPF) water quality model was selected as the modeling framework to simulate existing conditions and perform TMDL allocations. Seasonal variations in hydrology, climatic conditions, and watershed activities can be explicitly accounted for in the HSPF model.

3.2.1 Fecal Bacteria Sources

Potential sources of fecal bacteria considered in the development included both point source and nonpoint source contributions. Permitted point sources are shown in Table 3.10. Five of these point sources are permitted in the Chowan Study Area through the Virginia Pollutant Discharge Elimination System (VPDES). Three of the five point sources are permitted in the Upper Nottoway River watershed, and two are in the Upper Blackwater River watershed. Figure 3.1 and Figure 3.2 show the permitted locations. Permitted point discharges that may contain pathogens associated with fecal matter are required to maintain a fecal bacteria concentration below 200 cfu/100 ml. Currently, these permitted discharges are expected not to exceed the 126 cfu/100ml *E. coli* standard.

Table 3.11 summarizes data from VPDES Confined Animal Feeding Operations (CAFO) and from Virginia Pollution Abatement (VPA) facilities along with the streams that receive potential runoff from these facilities. Figure 3.3 shows the VPA and CAFO locations. These 11 permitted sources do not have direct discharges to waterways but runoff from the area could contain fecal bacteria and *E. coli* bacteria.

Table 3.10 Summary of VPDES permitted point sources in the Chowan Study Area.

Receiving Water	Facility Name	Permit No	Design Flow (MGD)	Permitted For Fecal Control	Data Availability
Upper Blackwater River Basin					
Cypress Swamp (Hazel Swamp)	Surry County High School	VA0029025	0.020	Yes	1/90 – 3/01
Cypress Swamp (Hazel Swamp)	Surry County WWTF	VA0088463	0.13	Yes	3/01 – 8/04
Upper Nottoway River Basin					
Big Hounds Creek/U.T.	Victoria East Sewage Treatment Plant	VA0020184	0.4	Yes	2/99 - 4/04
Mallory Creek	DOC - Nottoway Correctional Center	VA0066869	0.35	Yes	5/99 - 4/04
Little Nottoway River/U.T.	Nottoway County Schools Nottoway High	VA0061158	0.0256	Yes	5/99 - 4/04

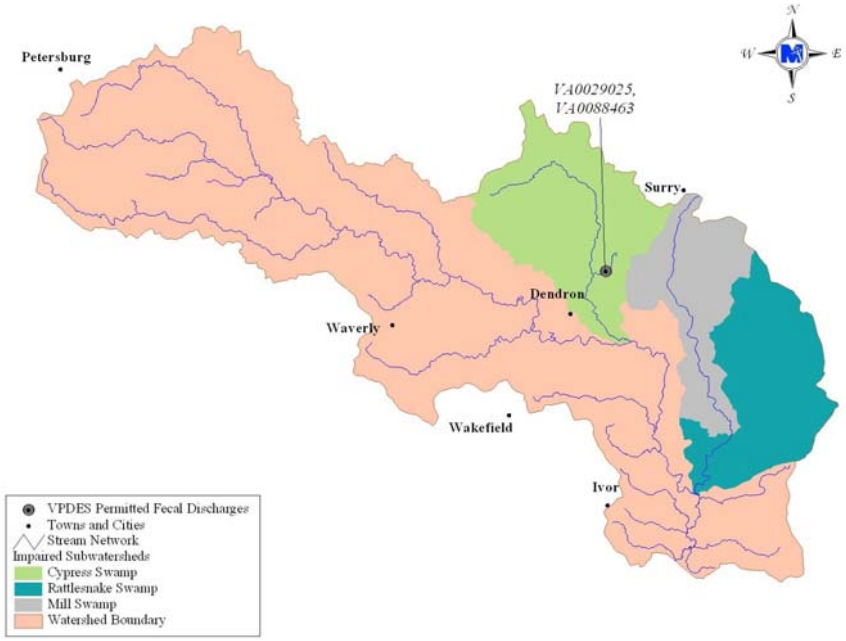

Figure 3.1 Location of VPDES permitted point sources in the Upper Blackwater River watershed.

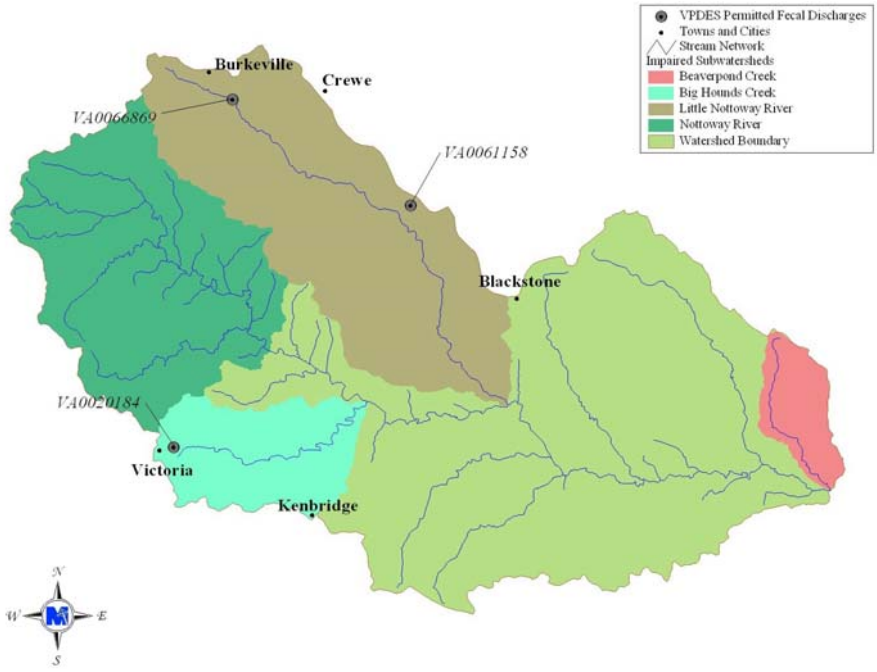

Figure 3.2 Location of VPDES permitted point sources in the Upper Nottoway River watershed.

Table 3.11 Summary of VPA and CAFO permits in the Chowan Study Area.

Watershed	Facility Name	Permit No	Design Flow (MGD)	Permitted For Fecal Control	Data Availability
Upper Nottoway River Basin					
Little Nottoway River	Hood Wallace	VPG270010	Poultry	No	ND
Little Nottoway River	Ingram Charles	VPG270058	Poultry	No	ND
Little Nottoway River	Ingram William T	VPG270074	Poultry	No	ND
Little Nottoway River	Oakmotte Farm	VPG270081*	Poultry	No	ND
Little Nottoway River	Randy Reynolds	VPG270087	Poultry	No	ND
Little Nottoway River	Rolling Acres Farm	VPG270049*	Poultry	No	ND
Little Nottoway River	Triple R Farm	VPG270018*	Poultry	No	ND
Upper Nottoway River	Jeffrey W. Dunn	VPG270062*	Poultry	No	ND
Upper Nottoway River	Big Oak Farm	VPG170043	CAFO	No	ND
Upper Nottoway River	Super Chic Ltd.	VPG270024	Poultry	No	ND
Upper Nottoway River	Walter Berryman Glascock	VPG270068	Poultry	No	ND

* Indicates poultry facility with some animals outside watershed boundary.
ND – no data, facility not required to submit monitoring data.

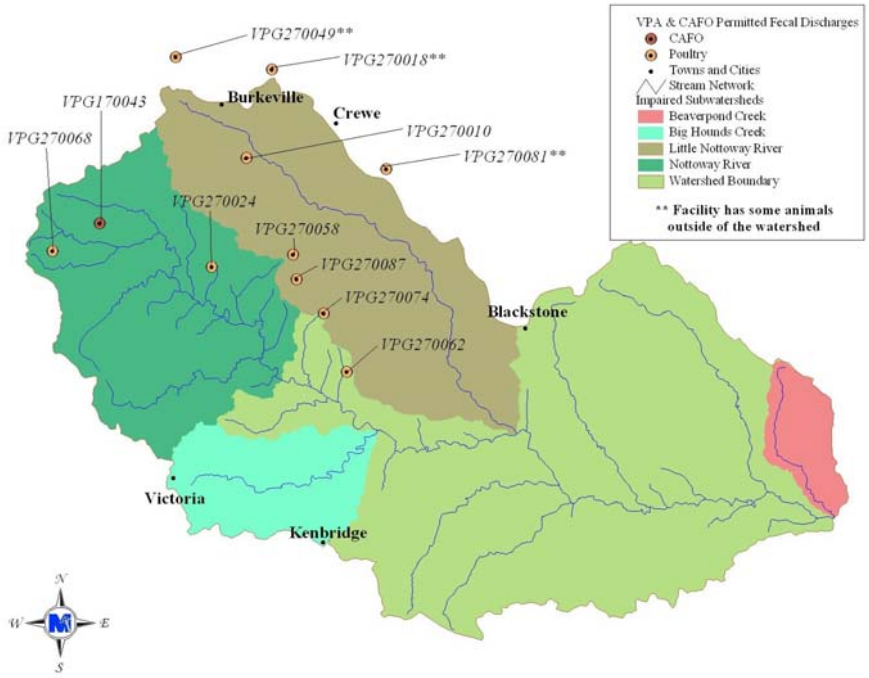

Figure 3.3 Location of VPA and CAFO permitted point sources in the Upper Nottoway River watershed.

Both urban and rural nonpoint sources of fecal bacteria were considered. Sources included residential sewage treatment systems, land application of waste (livestock and biosolids), livestock, wildlife, and domestic pets. It is important to understand the types of sources modeled, their delivery mechanisms, and temporal variations. Table 3.12 gives a summary of nonpoint loads. Loads were represented either as land-based loads, where they were deposited on land and available for wash-off during a rainfall event, or as direct loads, where they were directly deposited to the stream. Land-based nonpoint sources are represented as an accumulation of pollutants on land, where some portion is available for transport in runoff. The amount of accumulation and availability for transport vary with land use type and season. The model allows a maximum accumulation to be specified. The maximum accumulation was adjusted seasonally to account for changes in die-off rates, which are dependent on temperature and moisture conditions. Some nonpoint sources, rather than being land-based, are represented as being deposited directly to the stream (*e.g.*, animal defecation in stream, houses that utilize straight pipes to discharge waste). These sources are modeled similarly to point sources, as they do not require a runoff event for delivery to the stream. These sources are primarily due to animal activity, which varies with the time of day. Direct depositions by nocturnal animals were modeled as being deposited from 6:00 PM to 6:00 AM, and direct depositions by diurnal animals were modeled as being deposited from 6:00 AM to 6:00 PM. Once in-stream, die-off is represented by a first-order exponential equation.

Table 3.12 Fecal bacteria sources modeled during TMDL development.

Source	Delivery Mechanism(s)	Variation
Wildlife		
Raccoon	Land-Based & Direct	Temporal and Spatial
Muskrat	Land-Based & Direct	Temporal and Spatial
Beaver	Direct	Temporal and Spatial
Deer	Land-Based & Direct	Temporal and Spatial
Turkey	Land-Based & Direct	Temporal and Spatial
Goose	Land-Based & Direct	Temporal and Spatial
Duck	Land-Based & Direct	Temporal and Spatial
Agricultural		
Dairy Cattle	Land-Based & Direct	Temporal and Spatial
Beef Cattle	Land-Based & Direct	Temporal and Spatial
Horse	Land-Based	Temporal and Spatial
Swine	Land-Based	Temporal and Spatial
Sheep	Land-Based	Temporal and Spatial
Goat	Land-Based	Temporal and Spatial
Residential		
Failing Septic Systems	Land-Based	Temporal and Spatial
Uncontrolled Discharges	Direct	Temporal and Spatial
Dogs & Cats	Land-based	Temporal and Spatial

3.2.2 Model Allocation

Several model runs were made investigating scenarios that would meet the current water quality standards. The final load allocations for all impairments are shown in Table 3.13. Each allocation had 100% reductions of livestock in-stream deposition, uncontrolled residential discharges, and sewer overflows. The impairments require reductions from 91 to 99% of land-based fecal bacteria from residential areas. The impairments also require 99% reductions of land-based fecal bacteria from agricultural areas.

Table 3.13 Load reductions allocated during TMDL development.

Impairment	Percent Reduction in Loading from Existing Conditions					
	Direct Wildlife	**NPS Forest / Wetland**	**Direct Livestock**	**NPS Pasture / Livestock Access / Crops**	**Straight Pipe / Sewer Overflow**	**NPS Res/ Urban**
Upper Nottoway River Basin						
Little Nottoway River	67	95	100	99	100	99
Big Hounds Creek	0	81	100	99	100	91
Nottoway River	21	86	100	99.9	100	99
Beaverpond Creek	99.4	67	100	99.625	100	99
Raccoon Creek	0	95	100	99	100	99
Upper Blackwater River Basin						
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.

3.3 Implications of TMDL and Modeling Procedure on Implementation Plan Development

The major implications of the TMDL development are that all uncontrolled discharges must be identified and corrected, all livestock must be excluded from streams in the Upper Nottoway impairments, a majority of the NPS loads from urban and agriculture sources must be reduced, and a majority of the direct deposition and NPS loads from wildlife/forest land must be reduced. There are subtler implications as well. Implicit in the requirement for 100% correction of uncontrolled discharges is the need to maintain all functional septic systems.

Wildlife direct deposition and NPS loads will not be explicitly addressed by this implementation plan. All efforts will be directed at controlling anthropogenic sources. See Section 1.4 in this report for a discussion of regulatory issues regarding wildlife.

In terms of livestock access to streams, only cattle were modeled explicitly as supplying direct inputs to the stream (Table 3.12). Implicit in the modeling scheme was that other livestock do not have access to the stream. The HSPF model is calibrated to measured levels

of fecal bacteria, regardless of source, so the modeled load of fecal bacteria directly deposited by cattle is representative of direct loads from all forms of livestock. Therefore, all livestock with stream access will be considered in order to reach the reduction in direct depositions that has been deemed necessary (*i.e.*, 100%). Additionally, calibration helps to ensure that all direct loads have been included in spite of the transport pathway.

4. PUBLIC PARTICIPATION

Public participation was an integral part of the TMDL Implementation Plan development in the Chowan Study Area, and it is also critical to promote reasonable assurances that the implementation activities will occur. In order to encourage the greatest participation, two sets of meetings were held in the Chowan Study Area watershed. Public participation was encouraged through two sets of meetings, one for the Nottoway Study Area (Big Hounds Creek, Beaverpond Creek, Nottoway River, and Little Nottoway River) and one for the Blackwater/Raccoon Study Area (Raccoon Creek, Cypress Swamp, Mill Swamp, and Rattlesnake Swamp). For both of these areas, public participation took place on three levels.

First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project as well as for soliciting participation in the smaller, more-targeted meetings. Second, working groups were assembled from communities of people with common concerns regarding the TMDL process, and were the primary arena for seeking public input. The Industrial Working Group (IWG) consisted of representatives from agricultural producers and biosolids applicators. The Non-Industrial Working Group (NIWG) consisted of representatives from environmental groups, local government agencies, landowners, and residents. 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. Minutes from each of the Working Group and Steering Committee meetings are included in Appendix A.

The overall goal of the Industrial and Non-Industrial Working Groups was to identify obstacles to implementation in their respective communities and recommend workable solutions that will overcome these obstacles. In addition, the Working Groups were expected to: identify funding/partnering opportunities that would help to overcome obstacles to implementation, review the IP from an environmental perspective, identify the regulatory authority in the specific areas related to implementation, identify existing programs and resources that might be relevant to the situation, and propose additional programs that would support implementation. The Steering Committee had the express purpose of formulating the TMDL IP. In addition, this committee had the responsibility for identifying control measures

that are founded in practicality, establishing a time-line to ensure expeditious implementation, and setting measurable goals and milestones for attaining water quality standards.

Attendance at public meetings is critical to the public participation effort, and was encouraged through announcements in the *Virginia Register* and contact with community groups and local SWCDs.

All meetings conducted during the course of the TMDL IP development are listed in Table 4.1 and Table 4.2. Hundreds of work-hours were devoted to attending meetings by individuals representing agricultural, residential, environmental, and governmental interests on a local, state, and federal level.

4.1 Public Meetings for the Upper Blackwater River and Raccoon Creek watersheds

The first public meeting for the Upper Blackwater River and Raccoon Creek areas was held at the Airfield 4-H Center in Wakefield, Virginia on March 3, 2005. This meeting was the forum for presenting results from both the Upper Blackwater River TMDLs and the Raccoon and Sappony Creek TMDLs, as well as the kickoff of the implementation planning process. There were 18 people in attendance.

Table 4.1 Meetings held for TMDL IP development in the Upper Blackwater River and Raccoon Creek watershed areas.

Date	Meeting Type	Location	Attendance
3/3/2005	First Public	Airfield 4-H Center Wakefield, VA	18
5/17/2005	1st Industrial WG	Airfield 4-H Center Wakefield, VA	7
5/17/2005	1st Non-Industrial WG	Airfield 4-H Center Wakefield, VA	9
5/26/2005	1st Steering Committee	Airfield 4-H Center Wakefield, VA	12
6/7/2005	2nd Industrial WG	Ruritan Club Zuni, VA	11
6/7/2005	2nd Non-Industrial WG	Ruritan Club Zuni, VA	8
6/13/2005	2nd Steering Committee	Ruritan Club Zuni, VA	8
6/27/2005	Final Public	Airfield 4-H Center Wakefield, VA	NA

The final public meeting was held on June 27, 2005 at the Airfield 4-H Center in Wakefield, VA. The primary purpose of this meeting was to present the Final TMDL Implementation

Plan. A presentation was given describing the implementation plan using major components as an outline: Review of TMDL development, public participation, assessment of needs, cost/benefit analysis, and implementation. A draft implementation plan and presentation was distributed to attendees. Maps with land use, topographic features, and analysis results were displayed and discussed after the presentation.

4.1.1 Industrial Working Group for Upper Blackwater River and Raccoon Creek

The first meeting of the Blackwater/Raccoon IWG occurred on May 17, 2005 at the Airfield 4-H Center in Wakefield, VA. Participants included one local resident as well as representatives from VADEQ, VADCR, VCE, Chowan SWCD, MapTech, and the Blackwater Nottoway Riverkeeper Program (BNRP). Due to the lack of attendance by agricultural producers, those attending discussed how to encourage local stakeholders to participate, while noting that spring planting and hay harvest are occurring which results in little opportunity for farmers to participate at this time.

The primary responsibilities of the IWG, as presented at the meeting, are:

- Identify outreach methods for reaching agricultural producers
- Review implementation strategies from an agricultural perspective
- Identify potential constraints to implementation of agricultural BMPs
- Identify BMPs for biosolids application
- Identify funding sources/partnerships that will promote implementation
- Identify timeline and measurable goals for meeting implementation goals

Other topics discussed at this meeting were accuracy of animal numbers, programs for disseminating information about BMPs, and possible funding sources. It was determined that the IWG's representative would present the following recommendations to the Steering Committee: 1.) More participation is needed from agricultural producers, 2.) Available support for BMP maintenance costs should be addressed in the IP, and 3.) Additional funding sources may need to be identified to cover the needs of implementation.

The second meeting of the IWG occurred on June 7, 2005 at the Ruritan Club in Zuni, Virginia; there were 11 people in attendance. Topics of discussion included: the sources of fecal bacteria in the impaired stream segments, the staged approach to the TMDL, horses as a major source of fecal bacteria, the best way to approach the milestones with regard to BMP

installation, the attitudes of farmers, and the state of current cost-share programs. Each of the SWCDs indicated that they could handle the management of the industrial implementation, and the FTE job description was distributed for review.

4.1.2 Non-Industrial Working Group for Upper Blackwater River and Raccoon Creek

The first meeting of the Blackwater/Raccoon NIWG occurred on May 17, 2005 at the Airfield 4-H Center in Wakefield, VA. Participants included several local residents as well as representatives from VADEQ, VADCR, Sussex County VDH, Crater VDH District, and MapTech. The issues discussed that were to be passed on to the Steering Committee are the following: 1.) The numbers of failing septic systems and straight pipes appear to be high and should be revised; 2.) Possible BMPs for dealing with dog waste from kennels were identified; and 3.) Participation from local and county governments should be sought in implementing dog waste pick-up programs.

The second and final meeting of the NIWG took place on June 7, 2005 at the Ruritan Club in Zuni, Virginia; there were eight people in attendance. The NIWG decided that estimates of failing septic systems and straight pipes presented in the TMDL should be used in the IP development to remain consistent. The NIWG also discussed a graduated or phased approach to milestones which can be adjusted as the BMPs are implemented.

VADCR presented information on costs for BMPs that could be used on dog kennels. It was decided by the NIWG committee that research on the best BMP for dog waste disposal is warranted. The agency in charge, the role, and the job description of the Non-Industrial FTE were discussed, as were potential funding sources. Additional research on state cost-share funds is needed to see what may be available for residential septic systems.

4.1.3 Steering Committee for Upper Blackwater River and Raccoon Creek

The first Blackwater/Raccoon Steering Committee meeting took place on May 26, 2005 at the Airfield 4-H Center in Wakefield, Virginia. The committee consisted of 12 members with representatives from the local community, the Industrial and Non-Industrial Working Groups, VADEQ, VADCR, BNRP, Chowan SWCD, Isle of Wight Planning Dept., Isle of Wight County Rural Economic Development, and MapTech.

Committee members reviewed the sources of fecal bacteria in the impaired stream segments as well as the final allocation scenarios for each impairment. The BST that was conducted during TMDL development was explained and the predominant source of fecal bacteria for each impairment was specified. The minutes of the IWG and the NIWG meetings were presented and issues regarding funding were discussed.

Action items resulting from the first Steering Committee meeting were: SWCD and VADCR will research more accurate costs for NPS agricultural BMPs, and boundary GIS shapefiles will be distributed to interested individuals.

The second and final meeting of the Steering Committee took place on June 13, 2005 at the Airfield 4-H Center in Wakefield, Virginia; eight members were in attendance. In addition to reviewing the minutes of the IWG and the NIWG meetings, the Steering Committee discussed monitoring that will be conducted by VADEQ, possible monitoring by BNRP members, IP costs, and possible funding sources.

Two action items resulted from the meeting. First, VADEQ will create a monitoring plan for Raccoon Creek and the Blackwater tributaries. The agency will provide the plan, station locations, and descriptions to MapTech. Second, MapTech will quantify the required (industrial) BMPs and their associated costs, identify possible funding scenarios for one year, perform modeling required for targeting of BMPs, finish the draft report and booklet, create a presentation for final meeting, and send all of this information to VADEQ for review.

4.2 Public Meetings for the Nottoway Study Area

Several meetings were held for stakeholders of the Nottoway Study Area (Table 4.2). The first public meeting was held at the Southern Piedmont Agricultural Research & Extension Center in Blackstone, Virginia on January 12, 2005. The meeting was publicized in the *Virginia Register* and was attended by 13 people, including three citizens, nine government agents and two consultants. Because this meeting was also the final public meeting for the TMDL, the topics discussed included finalization of the TMDL process, load allocations, BST results, and the kickoff of the implementation planning process.

Table 4.2 Meetings held for TMDL IP development in the Upper Nottoway River watershed.

Date	Meeting Type	Location	Attendance
1/12/2005	First Public	S. Piedmont Ag Research & Extension Center Blackstone, VA	13
5/18/2005	1st Industrial WG	S. Piedmont Ag Research & Extension Center Blackstone, VA	5
5/18/2005	1st Non-Industrial WG	S. Piedmont Ag Research & Extension Center Blackstone, VA	5
5/26/2005	1st Steering Committee	S. Piedmont Ag Research & Extension Center Blackstone, VA	9
6/8/2005	2nd Industrial WG	S. Piedmont Ag Research & Extension Center Blackstone, VA	5
6/8/2005	2nd Non-Industrial WG	S. Piedmont Ag Research & Extension Center Blackstone, VA	2
6/13/2005	2nd Steering Committee	S. Piedmont Ag Research & Extension Center Blackstone, VA	8
6/27/2005	Final Public	S. Piedmont Ag Research & Extension Center Blackstone, VA	NA

4.2.1 Industrial Working Group for Nottoway Study Area

The IWG for the Upper Nottoway River watershed area met for the first time on May 18, 2005 at the Southern Piedmont Agricultural Research & Extension Center in Blackstone, Virginia. Five people, representing VCE, Southside SWCD, Piedmont SWCD, VADEQ, and MapTech, attended the meeting. Discussions took place regarding meeting dates and times and the best way to advertise, the pros and cons of SL-6 and CREP, funding sources, fencing estimates, and technical constraints.

The second and final meeting of the IWG took place on June 8, 2005 at the Southern Piedmont Agricultural Research & Extension Center in Blackstone, Virginia. (The IWG held a joint meeting with the NIWG on this date, due to the fact that there were only 2 attendants at the NIWG meeting.)

An agricultural producer attending the meeting provided a farmer's point of view on many of the issues at hand. He made the following comments: the cost-share is not realistic because it does not cover maintenance and operational costs, the tax credit is not appealing (or

valuable) to all farmers, the struggle to find qualified farm laborers, and farmers who rent land cannot implement BMPs.

It was emphasized by a MapTech representative that this project is not trying to put producers out of business. The practice of targeting was explained and wetland mitigation banking was discussed. The following topics were also covered: the use of lime on land, breaking up cowpies in fields, free soil sampling for agricultural producers, and milestones for BMP installation. The dates for the final Steering Committee meeting, the final Public meeting, and the 30-day Public Comment Period were presented.

4.2.2 Non-Industrial Working Group for Nottoway Study Area

The NIWG for the Upper Nottoway River watershed area held their first meeting on May 18, 2005 at the Southern Piedmont Agricultural Research & Extension Center in Blackstone, Virginia. Five people, representing Virginia Department of Forestry (VADOF), Dinwiddie County VDH, Nottoway County VDH, VADEQ, and MapTech, attended the meeting. The topics discussed included the following: the estimates of failing septic systems and straight pipes seem high for some areas; the best way to deal with the dog waste generated by dog kennels; alternatives to increasing the capacity of Waste Water Treatment Plants (WWTPs); the need for county-wide programs that encourage citizens to pick up pet waste; and the educational role of the technical person hired to oversee the IP.

The second and final meeting of the Nottoway Study Area NIWG took place on June 8, 2005 at the Southern Piedmont Agricultural Research & Extension Center in Blackstone, Virginia. Due to the small number of attendants at this meeting (two), the NIWG and the IWG held a joint meeting, which is described above in section 4.2.1.

4.2.3 Steering Committee for the Nottoway Study Area

The first meeting of the Steering Committee took place on May 26, 2005 at the Southern Piedmont Agricultural Research & Extension Center in Blackstone, Virginia. The committee consisted of nine members with representatives from the Industrial and Non-Industrial Working Groups, NRCS, VADEQ, VADCR, Appomattox River SWCD, Southside SWCD, Prince Edward County Planning Commission, and MapTech. Committee members reviewed the sources of fecal bacteria in the impaired stream segments and final allocation scenarios

for each impairment, and the BST analysis done during the TMDL development was explained. The minutes of the IWG and the NIWG meetings were discussed and different committee members agreed to accomplish the following: contact VDH for specifications on treating dog waste, create a preliminary job description for the Residential and Ag FTEs, and send out a map of the Upper Nottoway River watershed.

The second and final Steering Committee meeting was held on June 13, 2005 at the Southern Piedmont Agricultural Research & Extension Center in Blackstone, Virginia; eight members were in attendance. In addition to reviewing the minutes of the IWG and the NIWG meetings, the Steering Committee also discussed VADEQ monitoring, and IP costs and possible funding sources. The committee decided that the SWCDs would be in charge of all agricultural funds and one of the SWCDs may be able to house the Non-Industrial FTE.

The Steering Committee decided upon the following action items:

1. VADEQ will provide the current monitoring plan, station locations and descriptions to MapTech.
2. VADEQ will contact two counties to obtain information about dog kennels and provide this information to MapTech.
3. VADCR will provide the average residential educational program (from existing IP projects) to MapTech.
4. MapTech will quantify the required agricultural and residential BMPs and their associated costs and provide this information to the Steering Committee.
5. MapTech will identify possible funding scenarios for one year, perform all modeling required to determine milestone water quality goals, perform all modeling required to determine targeting of BMPs, finish the draft report and booklet, create presentation for final meeting, and send all this to VADEQ for review.

4.2.4 Summary

Varied opinions were voiced throughout the public participation meetings regarding the IP process. Most members of the working groups agreed that the cornerstone of the IP is cultivating public involvement and education and encouraging commitment and partnerships among the citizens and agencies in the watershed in order to reduce fecal bacteria pollution. An assertion to individual responsibility provides a foundation for building partnerships among citizens, businesses, interest groups, and government agencies. It can also cultivate voluntary implementation and long-term support for reducing bacteria levels and restoring water quality in the Chowan Study Area watershed.

5. ASSESSMENT OF IMPLEMENTATION ACTION NEEDS

An important element of the TMDL IP is the encouragement of voluntary compliance with implementation actions by local, state, and federal government agencies, business owners, and private citizens. In order to encourage voluntary implementation, information was obtained on the types of actions and program options that can achieve the goals practically and cost-effectively.

5.1 Identification of Control Measures (Best Management Practices)

Potential control measures, or BMPs, and costs were identified through Working Group input, literature review, and discussion with local SWCDs, NRCS, VADEQ, VADCR, VDH, VCE, and county government representatives. Control measures were assessed based on cost, availability of existing funds, reasonable assurance of implementation, and water quality impacts (Table 5.1).

Control measures that can be promoted through existing programs were identified, and control measures that are not currently supported by existing programs (along with their potential funding sources) were also noted. Availability of existing programs was determined through discussion with local SWCDs, NRCS, VADEQ, VADCR, and VDH officials participating in the Working Groups. The assurance of implementation of specific control measures was assessed through discussion with the Working Groups and the Steering Committee.

Table 5.1 Potential control measure (BMP) information.

Control Measure	Unit	Cost per Unit[1]	Fecal Bacteria Removal Efficiency
Potential Agricultural BMPs:			
Grazing Land Protection (SL-6)	system	$44,500	100% Reduction in direct deposition
Stream Protection (WP-2)	system	$24,700	100% Reduction in direct deposition
Forested Buffer	ft (width)	Varies[2]	50-65% Reduction in land-based loads
Grass Buffer	ft (width)	Varies	35-50% Reduction in land-based loads
Alternative Water Source	system	$10,000 – $20,000	50-80% Reduction in direct deposition without streamside fencing
Improved Pasture management	acre	$170	[3]
Hardened Crossing	system	$6,900	100% Reduction in direct deposition
Potential Animal Waste Management:			
Compost Facility	system	$4,100	99% Reduction in land-based load
Waste Storage Building	building	$20,000	~ 85% Reduction in land-based load
Manure/Biosolids Injection/Incorporation	acre	$18	~ 90% Reduction in land-based loads
Potential Residential BMPs: *Repaired Septic System or Straight-pipe:*			
Sewer Line Connection	system	$4,000 – $5,000	100% Reduction in direct and land-based loads
Septic System	system	$3,000 – $5,000	100% Reduction in direct and land-based loads
Alternative Waste Treatment System	system	$10,000-$20,000	100% Reduction in direct and land-based loads
Septic System Repair	system	$100 – $3,000	
Potential Kennel BMPs:			
Compost System	system	$250 – $400	99% Reduction in land-based load
Septic System with filter	system	$4,000	100% Reduction in land-based load
Landfill	system	$300	100% Reduction in land-based load
Potential Land-based BMPs:			
Bioretention pond	acre	$12,000	~ 85% Reduction in land-based loads
Infiltration trench	acre	$9,000	~ 90% Reduction in land-based loads
Retention pond	acre	$2,000	~ 80% Reduction in land-based loads

[1] Installation costs are represented here. Maintenance costs are discussed in Chapter 6. Costs shown in this table represent an average cost or range of costs used to estimate total and annual expenditures.

[2] Installation costs associated with stream buffers vary widely and can include planting, stream bank stabilization, and the cost of taking the land out of production.

[3] Minimal reduction by itself; however, it improves farm production, which makes implementing the full system (*i.e.*, streamside fencing, alternative water, and cross-fencing) more attractive. Additionally, it reduces sediment and nutrient losses from the land, which may help with future TMDLs.

The allocations determined during the TMDL development dictate, largely, the control measures that must be employed during implementation. In order to meet the 100% reductions in direct deposition from livestock, some form of stream exclusion is necessary. Fencing is the most obvious choice; however, the type of fencing, distance from the stream bank, and the most appropriate management strategy for the fenced pasture are less obvious. The reductions from agricultural land-based sources indicate that there is a need to prevent fecal bacteria from production animal waste from getting into nearby streams. The 100% reduction in loads from straight pipes implies that all straight pipes in the watersheds should be replaced, and that all onsite sewage treatment systems (OSTS) (*e.g.*, septic systems and alternative waste treatment systems) must be maintained in proper working condition. The reductions from urban land-based sources means failing septic systems need to be addressed and dog waste needs to be disposed of properly.

While it is recognized that farmers will want to minimize the cost of fencing and the amount of pasture lost, it was determined that any fencing installed through the use of cost-share programs should follow established NRCS specifications and be located 35 ft. from the stream bank, at a minimum, as is specified in existing Virginia Cost-Share programs. It is therefore recommended that all fencing, even that which is installed solely at the landowner's expense, be placed at least 35 ft. from the stream.

An alternative water source will typically be required where pasture is fenced off from streams. Water systems alone (with no streamside fencing) have been shown to reduce the amount of time cattle spend in the stream by as much as 50 to 80%. This is not a large enough reduction to meet the TMDL, however it has been recognized that some farmers may be willing to install their own fence to their own specifications if cost-share money is available for the water system.

From an environmental perspective, the best management scenario would be to exclude livestock from the stream bank 100% of the time and establish permanent vegetation in the buffer area. This prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from the pasture, and establishes (with the growth of streamside vegetation) one of the foundations for healthy aquatic life. From a livestock-

production perspective, the best management scenario is one that provides the greatest profit to the farmer. Obviously, taking land (even a small amount) out of production is contrary to that goal. However, a clean water source has been shown to improve milk production and weight gain. Clean water will also improve the health of animals (*e.g.*, cattle and horses) by decreasing the incidence of waterborne illnesses and exposure to swampy areas near streams. Additionally, intensive pasture management, which becomes possible with an alternative water source, has been shown to improve overall farm profitability and environmental impact. From a part-time farmer's perspective, the best management scenario is one that requires minimal input of time. This would seem to preclude intensive pasture management; however, those farmers who have adopted an intensive pasture-management system typically report that the additional management of the established system amounts to "opening a gate and getting out of the way" every couple of days. Additionally, the efficient use of the pasture often means that fewer supplemental feedings are necessary. Among both part-time and full-time farmers, there are individuals who are hesitant to allow streamside vegetation to grow unrestricted because of aesthetic preferences or because they have spent a lifetime preventing this growth.

A list of the agricultural control measures identified is shown in Table 5.1. Some control measures will typically be offered packaged together as a system. For instance, a possible solution might include a system of streamside fencing with tree plantings in the stream-buffer area, an alternative water source, and cross-fencing to improve pasture management. For the environment, this system would provide: exclusion of cattle from the stream, a forested buffer to filter runoff, a food source for the lower levels of aquatic life, stream temperature mediation, and improved pasture, thereby reducing sediment loads and promoting infiltration. For the producer, this system would provide a clean dependable water source as well as improved pasture management, both of which would improve profitability. A different combination of these control measures could be designed for specific scenarios.

The options identified for correcting straight pipes and fixing failing septic systems include: sewer line connection, installation of septic system, and installation of alternative waste treatment system. Connection to a sewer line was viewed as the most permanent solution to the problem, but this solution is not available to most residents in these watersheds. It is

anticipated that some portion of straight pipes will be located in areas where an adequate site for a septic drain field is not available. In these cases, the landowner will have to consider a sewer connection if a sewer line exists in close proximity, or an alternative waste treatment system.

The options identified for treating dog kennel waste included: composting, burying, landfilling, and septic systems with filters. Composting is the most economically feasible solution as composting bins can be constructed easily from scrap lumber. However, there is concern that dog manure compost takes a long time to cure (become stable) and may not become hot enough to kill all pathogens potentially present in the feces. Composting is still a viable BMP because, with education, dog kennel owners will learn the correct carbon to nitrogen ratio and how to determine when the compost batch has cured. The compost can then be used as a fertilizer in flowerbeds. Burying dog waste requires a pit lined with geotextile fabric and compacted with clay or fecal bacteria and other pathogens could leach into the groundwater. Landfilling dog waste is a viable alternative if dog kennel owners agree to haul the waste to a collection site. Septic systems with filters are alternative BMPs to install at kennels with concrete pads where owners typically wash the dog pens with water.

5.2 Quantification of Control Measures

The quantity of control measures required during implementation was determined through spatial analyses of land use, taxed use, zoning, stream network, and elevation, along with field inspections and data archived from the VADCR Agricultural BMP Database and TMDL development documents.

5.2.1 Agricultural Control Measures

5.2.1.1 Streamside Fencing BMPs

To estimate streamside fencing requirements, the National Hydrography Dataset (NHD) stream network was overlaid with land use. Stream segments that flowed through, or within 500 feet of, land uses that had a potential for supporting cattle (*e.g.*, improved pasture) were identified. Land uses included farmsteads, pasture, other feeding operations, grazed woodlands, and a portion of forest. Not every land use identified as pasture has livestock on it at any given point in time. However, it is assumed that all pasture areas have the potential for livestock access. If a stream segment flowed through one of these land uses, it was assumed that fencing was required on both sides of the stream; if a stream segment flowed adjacent to the land use, it was assumed that fencing was required on only one side of the stream. These assumptions were further refined to examine land use criteria, size of resultant pasture, and existing BMPs. Perennial and intermittent streams were included in this process. A map of potential streamside fencing required for streams in the Nottoway Study Area is shown in Figure 5.1. Figure 5.2 shows potential streamside fencing required in Raccoon Creek. The Chowan Study Area TMDLs identified that all cattle are already fenced out of Cypress, Swamp, Mill Swamp and Rattlesnake Swamp, therefore, they require no streamside fencing.

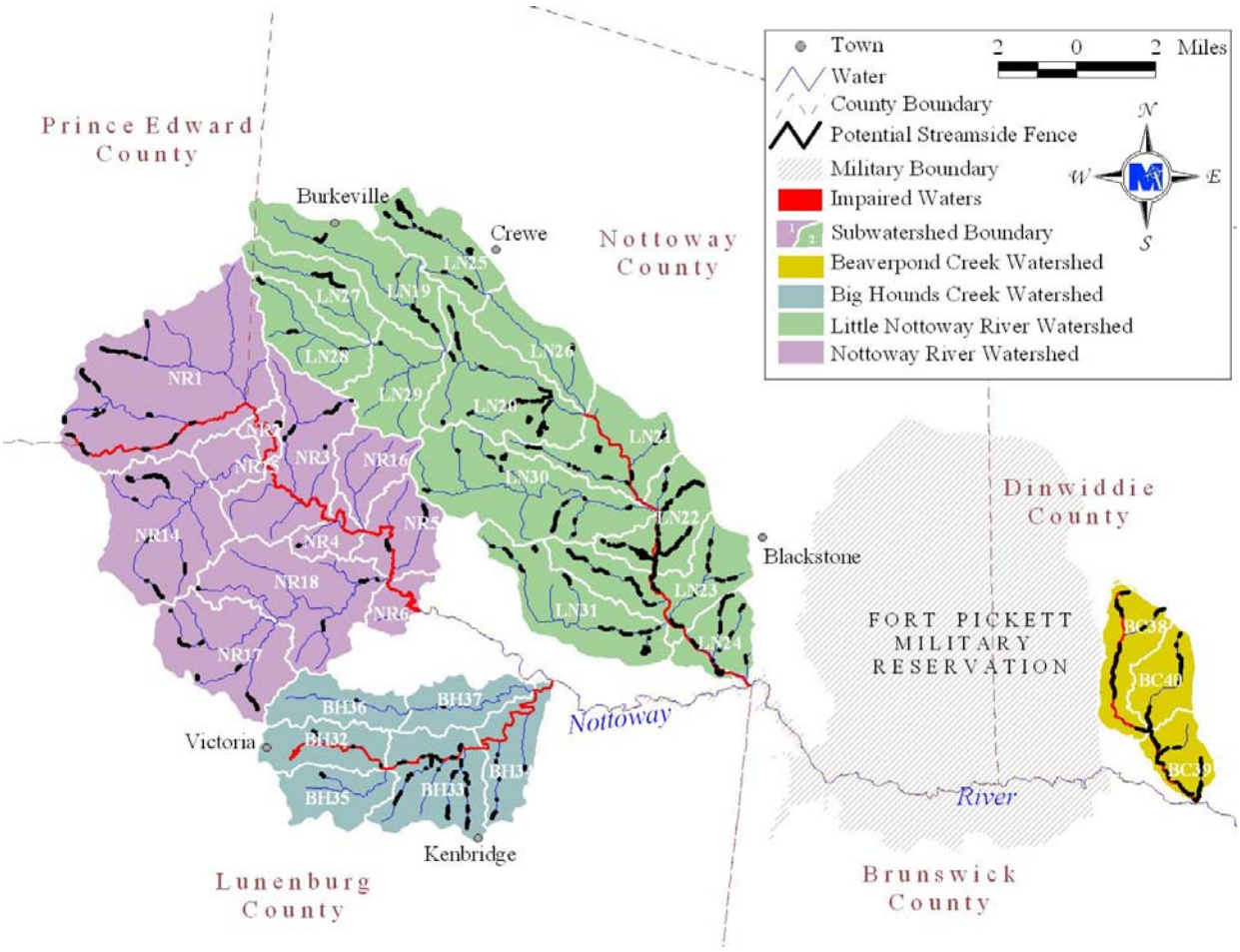

Figure 5.1 Potential streamside fencing for perennial and intermittent streams in the Nottoway Study Area.

Figure 5.2 Potential streamside fencing for perennial and intermittent streams in the Raccoon Creek watershed.

Potential streamside fencing needs were adjusted to account for existing fence installed through the state cost-share and CREP programs. Figure 5.3 indicate the locations of stream fencing BMPs already installed in the impaired watersheds of the Nottoway Study Area. There are no stream fencing BMPs currently in place in the Upper Blackwater River impaired watersheds.

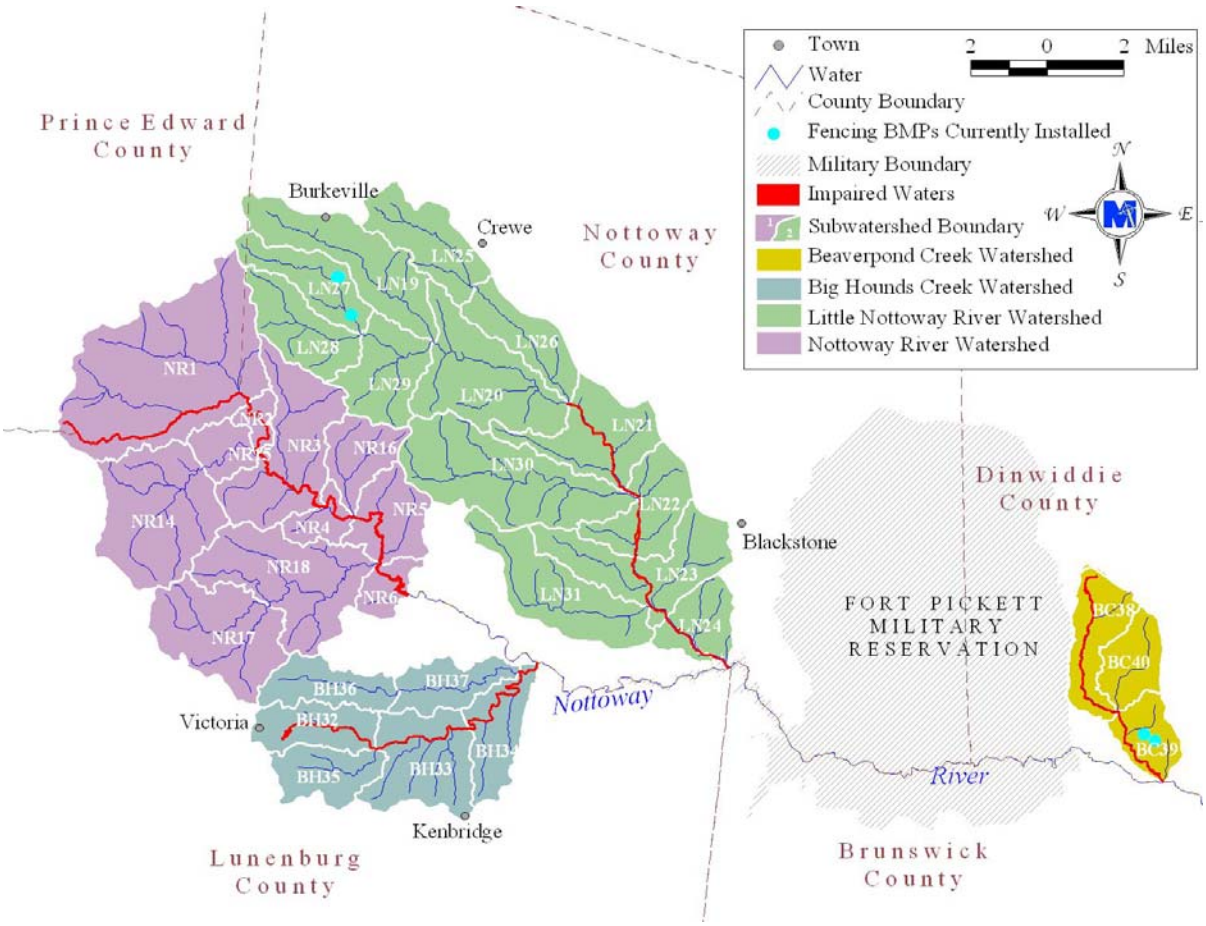

Figure 5.3 Location of existing livestock exclusion BMPs in the Nottoway Study Area.

The VADCR Agricultural BMP Database and information from the SWCDs were utilized to determine typical characteristics (*e.g.*, streamside fencing length per practice) of full livestock exclusion systems leading to the quantification of the number of required systems. The database was queried for information on Grazing Land Protection Systems (SL-6) and Stream Protection Systems (WP-2) installed in the Chowan River Basin. The SL-6 system includes streamside fencing, hardened crossings, alternative watering system, and a 35-ft buffer from the stream. The WP-2 system includes streamside fencing, hardened crossings, and a 35-ft buffer from the stream. In cases where a watering system already exists, a WP-2 system is a more appropriate choice. In the Chowan River Basin, 88 SL-6 systems and three WP-2 systems have been installed since 1989. The SWCD and the average streamside fencing length per system for each impairment are shown in Table 5.2.

Table 5.2 The final estimated average fence length per system.

Impairment	SWCD	Average Fence Length per System (ft)
Big Hounds Creek	Southside	3,000
Nottoway River	Southside and Piedmont	3,000
Little Nottoway River	Piedmont	1,238
Beaverpond Creek	Appomattox River	1,238
Raccoon Creek	Chowan	1,000
Cypress Swamp	Peanut	NA[1]
Mill Swamp	Peanut	NA
Rattlesnake (Creek) Swamp	Peanut	NA

[1] The Chowan Study Area TMDL results showed that there is no direct deposition by cattle in these watersheds; therefore, an average length per system was not calculated.

To establish the total number of full livestock exclusion systems necessary to achieve full implementation, systems were calculated by dividing the potential pasture streamside fencing required by the average streamside fencing length per system. The number of hardened crossings was calculated by intersecting the streams that required potential fencing on both sides with property boundaries. The resulting parcels were then analyzed for land use and resultant pasture size; parcels which were at least one acre of grazable land were identified as sufficient for livestock, and were included in the count of hardened water crossings.

For the Blackwater/Raccoon Study Area only the Raccoon Creek watershed required reductions from direct livestock sources. It was determined that 23 total livestock exclusion systems (SL-6 and WP-2) and 21 hardened water crossings are required (Table 5.3).

Table 5.3 Estimation of total streamside fencing, number of SL-6 and WP-2 systems, and number of hardened stream crossings required in the Raccoon Creek subwatersheds.

Impairment	Subwatershed	Total Fence Required (ft)	SL-6 Systems	WP-2 Systems	Hardened Crossings
Raccoon Creek	18	2,261	2	1	2
	19	4,329	4	1	5
	20	0	0	0	0
	21	203	1	0	0
	22	0	0	0	0
	23	8,835	8	1	7
	24	0	0	0	0
	25	322	1	0	2
	26	3,009	3	1	5
Impairment Total		*18,959*	*19*	*4*	*21*

For the Nottoway Study Area, 70 livestock exclusion systems (SL-6 and WP-2) and 71 hardened crossings are required (Tables 5.4 and 5.5).

The length of fencing required to fence livestock out of perennial and intermittent streams in the Nottoway Study Area and the Raccoon Creek watershed is approximately 14.9 miles and 3.6 miles, respectively. This IP focuses on fencing along both perennial and intermittent streams because the TMDL requires stringent reductions of fecal bacteria from direct livestock and agricultural nonpoint sources.

Table 5.4 Estimation of total streamside fencing, number of SL-6 and WP-2 systems, and number of hardened stream crossings required in the Big Hounds Creek and Nottoway River subwatersheds.

Impairment	Subwatershed	Total Fence Required (ft)	SL-6 Systems	WP-2 Systems	Hardened Crossings
Big Hounds Creek	32	338	1	0	0
	33	5,460	1	1	4
	34	1,058	1	0	2
	35	84	1	0	0
	36	39	1	0	0
	37	35	1	0	0
Impairment Total		*7,014*	*6*	*1*	*6*
Nottoway River	1	5,086	1	1	6
	2	538	1	0	0
	3	1,478	1	0	1
	4	205	1	0	1
	5	1,570	1	0	1
	6	0	0	0	0
	14	4,652	1	1	3
	15	0	0	0	0
	16	5	1	0	0
	17	2,409	1	0	3
	18	739	1	0	0
Impairment Total		*16,682*	*9*	*2*	*15*

Table 5.5 Estimation of total streamside fencing, number of SL-6 and WP-2 systems, and number of hardened stream crossings required in the Little Nottoway River and Beaverpond Creek subwatersheds.

Impairment	Subwatershed	Total Fence Required (ft)	SL-6 Systems	WP-2 Systems	Hardened Crossings
Little Nottoway River	19	1,556	1	1	0
	20	6,156	4	1	4
	21	1,754	1	1	2
	22	11,744	9	1	10
	23	6,029	4	1	6
	24	3,740	3	1	2
	25	3,711	2	1	5
	26	411	1	0	1
	27	0	0	0	0
	28	1,140	1	0	2
	29	80	1	0	1
	30	2,949	2	1	3
	31	4,195	3	1	5
Impairment Total		*43,467*	*32*	*9*	*41*
Beaverpond Creek	38	4,643	3	1	3
	39	3,879	3	1	4
	40	3,186	2	1	2
Impairment Total		*11,708*	*8*	*3*	*9*

5.2.1.2 Agricultural NPS BMPs

The Chowan Study Area TMDLs require large reductions to land-based industrial (agricultural) loads. In order to meet these strict requirements, the BMPs in Table 5.6 and 5.7 must be implemented.

Improved Pasture Management/Rotational Grazing consists of cross fencing, which allows farmers to move cattle around pastureland more efficiently. Less trampling and less overgrazing keep vegetation on the ground, which hold soil, nutrients and manure in place.

Manure/biosolids incorporation/injection is a practice in which farmers inject liquid manure below the soil surface or spread manure, then disk the land. The disking mixes manure with soil and has shown to keep manure and nutrients on the land longer. This practice can be done on cropland or pasture where manure or biosolids are applied.

A vegetated buffer is an area next to a stream where cattle are not allowed and vegetation is established. The area filters bacteria from runoff from adjacent land. The Nottoway Study Area and the Raccoon Creek watershed have a vegetated buffer associated with pasture due to the streamside fencing requirements. When cattle are fenced out of streams, the area between the fence and stream become a vegetated buffer over time as plants establish themselves. The values in Tables 5.6 and 5.7 are vegetated buffers on cropland only.

Table 5.6 Industrial NPS BMPs required to meet the Upper Blackwater River and Raccoon Creek TMDLs.

Impairment	Composting Facilities	Waste Storage Facilities	Improved Pasture Management	Manure/biosolids Incorporation/injection	Vegetated Buffer
	(#)	(#)	(ac)	(ac)	(ft)
Cypress Swamp	0	0	1,705	2,353	32,053
Mill Swamp	1	0	2,248	1,710	37,958
Rattlesnake (Creek) Swamp	0	0	2,054	507	20,319
Raccoon Creek	3	1	2,654	4,363	27,315
Total	4	1	8,661	8,933	117,645

Table 5.7 Industrial NPS BMPs required to meet the Upper Nottoway River TMDLs.

Impairment	Composting Facilities	Waste Storage Facilities	Improved Pasture Management	Manure/biosolids Incorporation/injection	Vegetated Buffer
	(#)	(#)	(ac)	(ac)	(ft)
Big Hounds Creek	0	0	1,891	883	0
Nottoway River	2	2	3,721	2,159	96
Little Nottoway River	4	3	10,875	6,040	2,717
Beaverpond Creek	1	0	1,658	713	1,413
Total	*7*	*5*	*18,145*	*9,795*	*4,226*

5.2.1.3 Industrial BMP Requirements Summary

Tables 5.8 and 5.9 show the BMPs needed to meet the industrial (livestock) portions of the Chowan Study Area TMDLs.

Table 5.8 The industrial BMPs required for the Blackwater/Raccoon Study Area.

Impaired Segment	SL-6 Systems (#)	WP-2 Systems (#)	Hardened Crossings (#)	Composting Facilities (#)	Waste Storage Facilities (#)	Improved Pasture Management (ac)	Manure/biosolids Incorporation/injection (ac)	Vegetated Buffer (ft)
Cypress Swamp	0	0	0	0	0	1,705	2,353	32,053
Mill Swamp	0	0	0	1	0	2,248	1,710	37,958
Rattlesnake (Creek) Swamp	0	0	0	0	0	2,054	507	20,319
Raccoon Creek	*19*	*4*	*21*	3	1	2,654	4,363	27,315
Total	*19*	*4*	*21*	*4*	*1*	*8,661*	*8,933*	*117,645*

Table 5.9 The industrial BMPs required for the Nottoway Study Area.

Impaired Segment	SL-6 Systems (#)	WP-2 Systems (#)	Hardened Crossings (#)	Composting Facilities (#)	Waste Storage Facilities (#)	Improved Pasture Management (ac)	Manure/biosolids Incorporation/injection (ac)	Vegetated Buffer (ft)
Big Hounds Creek	6	1	6	0	0	1,891	883	0
Nottoway River	9	2	15	2	2	3,721	2,159	96
Little Nottoway River	32	9	41	4	3	10,875	6,040	2,717
Beaverpond Creek	8	3	9	1	0	1,658	713	1,413
Total	55	15	71	23	97	18,145	7,107	4,226

5.2.2 Residential Control Measures

5.2.2.1 BMPs to Correct Failing Septic Systems and Straight Pipes

All straight pipes must be identified and replaced during implementation since a 100% load reduction from straight pipes was deemed necessary to meet the TMDL goal. A 99% reduction is required on land-based sources from residential area was deemed necessary to meet the TMDL goal. The number and location of failing septic systems and straight pipes were based on numbers reported in the TMDL report. Tables 5.10 through 5.12 show the number of failing septic systems and straight pipes for each subwatershed.

The Non-Industrial Working Groups (NIWG) identified the following BMPs to correct straight pipes: septic systems, alternative waste treatment systems, and sewer hook-up. Sewer service is not available in a majority of the Chowan Study Area. The NIWGs identified that most failing septic systems would need basic repairs. However, any residence with a failing system that does not pass the current VDH percolation tests may need a new alternative waste treatment system.

Table 5.10 Estimated failing septic systems and straight pipes in the Raccoon Creek watershed.

Impaired Segment	Subwatershed	Failing Septic Systems	Straight Pipes
Raccoon Creek	18	10	3
	19	11	6
	20	1	0
	21	0	0
	22	4	3
	23	20	15
	24	0	0
	25	23	5
	26	9	2
Impairment Total		*78*	*34*

Table 5.11 Estimated failing septic systems and straight pipes in the Upper Blackwater River impaired watersheds.

Impaired Segment	Subwatershed	Failing Septic	Straight Pipe
Blackwater River Basin			
Cypress Swamp	12	9	10
	13	11	6
	14	3	1
	15	23	5
	16	5	1
	17	6	1
	18	14	3
	19	12	11
	20	9	3
Impairment Total		*92*	*41*
Mill Swamp	21	17	4
	22	1	1
	23	5	2
	24	10	4
	25	6	3
	26	13	6
	27	22	11
	28	3	2
Impairment Total		*77*	*33*
Rattlesnake (Creek) Swamp	29	2	1
	30	18	8
	31	2	1
	32	1	1
	33	9	5
	34	15	2
	35	26	9
	36	14	6
Impairment Total		*87*	*33*

Table 5.12 Estimated failing septic systems and straight pipes in the Nottoway Study Area.

Impaired Segment	Subwatershed	Failing Septics	Straight Pipes
Big Hounds Creek	32	60	14
	33	29	11
	34	10	3
	35	25	7
	36	16	2
	37	5	2
Impairment Total		145	39
Nottoway River	1	31	5
	2	1	0
	3	10	4
	4	1	0
	5	4	2
	6	2	0
	14	9	1
	15	1	0
	16	2	1
	17	26	3
	18	12	1
Impairment Total		*99*	17
Little Nottoway River	19	82	6
	20	27	12
	21	21	3
	22	10	1
	23	32	1
	24	5	0
	25	41	24
	26	22	10
	27	10	1
	28	8	2
	29	4	2
	30	25	7
	31	9	1
Impairment Total		*296*	70
Beaverpond Creek	38	15	2
	39	6	1
	40	8	1
Impairment Total		*29*	4

5.2.2.2 Dog Kennel BMPs

Both Non-Industrial Working Groups (Blackwater/Raccoon and Nottoway) decided to concentrate on composting, landfilling and septic systems with filters for treating wastes from dog kennel BMPs. Tables 5.13 and 5.14 show the total number of BMPs required. For the Blackwater/Raccoon Study Area, the number of dog kennels was determined by communication with Isle of Wight County staff and a tour of the Raccoon Creek watershed by VADEQ. The values for Surry County (Cypress Swamp and portions of Mill and Rattlesnake (Creek) Swamps) were determined by extrapolating the number of dog kennels by land area (Table 5.13).

Table 5.13 Estimated number of dog kennels in the Blackwater/ Raccoon impaired watersheds.

Impaired Segment	Dog Kennels
Cypress Swamp	21
Mill Swamp	14
Rattlesnake (Creek) Swamp	8
Raccoon Creek	14
Total	**57**

For the Nottoway Study Area, the number of dog kennels was determined by communication with the County Treasurer's offices in Lunenburg, Nottoway, Dinwiddie, and Prince Edward counties (Table 5.14).

Table 5.14 Estimated number of dog kennels in the Nottoway Study Area.

Impaired Segment	Dog Kennels
Big Hounds Creek	5
Nottoway River	13
Little Nottoway River	13
Beaverpond Creek	6
Total	**37**

5.2.2.3 Stormwater Control Non-Industrial BMPs

In order to meet the non-industrial anthropogenic (human and pet) portions of the Chowan Study Area TMDLs, BMPs were required to treat runoff from commercial and residential land (Tables 5.15 and 5.16).

An infiltration trench is a shallow, excavated trench backfilled with a coarse gravel, then covered with soil with grass planted on the surface. Stormwater runoff diverted into the trench gradually infiltrates into the surrounding soils from the bottom and sides of the trench. These are quantified as the acres treated by infiltration trenches.

A retention pond or basin is a stormwater facility that includes a permanent pool of water in which runoff during storm events may be temporarily stored above the permanent pool. Retention ponds are quantified as the acres treated.

Table 5.15 The required stormwater control BMPs for the Blackwater/Raccoon Study Area.

Impairment	Infiltration (ac)	Retention (ac)
Cypress Swamp	0	0
Mill Swamp	0	31
Rattlesnake (Creek) Swamp	53.2	3.0
Raccoon Creek	51.4	0
Total	*104.6*	*34.0*

Table 5.16 The required stormwater control BMPs for the Nottoway Study Area.

Impairment	Infiltration (ac)	Retention (ac)
Big Hounds Creek	0	290
Nottoway River	142	55.5
Little Nottoway River	0	1,035.5
Beaverpond Creek	2.1	11.0
Total	*144.1*	*1,392*

5.2.2.4 Non-Industrial BMP Requirements Summary

Tables 5.17 and 5.18 show all the requirements to meet the non-industrial anthropogenic (human and pet) portions of the Chowan Study Area TMDLs. Both Non-Industrial Working Groups (Blackwater/Raccoon and Nottoway) agreed that education was an essential component for successful implementation. A Residential Education Program was included in the non-industrial BMP quantification to show that this program is as important as the BMPs.

Table 5.17 The non-industrial BMPs required for the Blackwater/Raccoon Study Area.

Impaired Segment	Failing Septic System Corrections	Straight Pipe Corrections	Dog Kennel BMPs	Infiltration Trenches	Retention Ponds	Residential Education Program
	(#)	(#)	(#)	(ac)	(ac)	(#)
Cypress Swamp	92	41	21	0	0	0.25
Mill Swamp	77	33	14	0	31	0.25
Rattlesnake (Creek) Swamp	87	33	8	53.2	3	0.25
Raccoon Creek	78	34	14	51.4	0	0.25
Total	**334**	**141**	**57**	**104.6**	**34**	**1.0**

Table 5.18 The non-industrial BMPs required for the Nottoway Study Area.

Impaired Segment	Failing Septic System Corrections	Straight Pipe Corrections	Dog Kennel BMPs	Infiltration Trenches	Retention Ponds	Residential Education Program
	(#)	(#)	(#)	(ac)	(ac)	(#)
Big Hounds Creek	145	39	5	0	290	0.25
Nottoway River	99	17	13	142	55.5	0.25
Little Nottoway River	296	70	13	0	1,035.5	0.25
Beaverpond Creek	29	4	6	2.1	11.0	0.25
Total	**569**	**130**	**37**	**144**	**1,392**	**1.0**

5.3 Technical Assistance and Education

Members of the Working Groups and the Steering Committee agree that technical assistance and education is key to getting people involved in implementation. There must be a proactive approach to contact farmers and residents to articulate exactly what the TMDL means to them and what practices will help meet the goal of improved water quality. Several education/outreach techniques will be utilized during implementation. Articles describing the TMDL process, the reasons why high levels of fecal bacteria are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the problem, and the potential ramifications of not dealing with the problem should be made available to the public through as many channels as possible, *e.g.*, Farm Bureau newsletters, Farm Service Agency (FSA) newsletters, and targeted mailings. Workshops and demonstrations should be organized to show landowners the extent of the problem, the effectiveness of control measures, and the process involved in obtaining technical and financial assistance.

For the agricultural community, field days, pasture walks, and presentations offered through local farm groups are recommended. The emphasis should be with local farmers discussing their experiences with cost-share programs, demonstrating the advantages of a clean water source and pasture management, and presenting monitoring results to demonstrate the problem. It is generally accepted that farmers will be more persuaded by discussion with local technical personnel or fellow farmers who have implemented the suggested control measures than through presentations made by state-agency representatives.

For residential issues, public outreach should focus on increasing awareness of private residential sewage treatment systems and dog kennel BMPs. This outreach effort will provide useful information to residents and increase the likelihood of identifying straight pipes, failing septic systems, and dog owners in need of BMPs in the impaired watersheds. Small community meetings similar to the small workshops proposed for the agricultural community can be organized for educating homeowners about residential issues. Information about the TMDL can be presented at Hunter's Safety classes and to hunting organizations such as Ducks Unlimited. Using media outlets, notices regarding

septic systems should be posted (*e.g.*, reminder to pump out septic tank every 3-5 years). An educational packet about septic system issues should be disseminated to new homeowners. Additionally, educational tools (*e.g.*, a model septic system used to demonstrate functioning and failing septic systems, a video of septic maintenance and repair) would be useful in communicating the problem to the public. The technical assistance and educational outreach tasks needed during implementation were identified during plan development. The following tasks associated with agricultural and residential programs were identified:

Agricultural Programs

1. Make contact with landowners in the watershed to make them aware of implementation goals and cost-share assistance programs.
2. Provide technical assistance for agricultural programs (*e.g.*, survey, design, layout, and approval of installation).
3. Develop educational materials & programs.
4. Organize educational programs (*e.g.*, pasture walks, presentations at field days or club events).
5. Distribute educational materials (*e.g.*, informational articles in FSA or Farm Bureau newsletters, local media).
6. Handle and track cost-share.
7. Assess and track progress toward BMP implementation goals.
8. Coordinate use of existing agricultural programs and suggest modifications where necessary.

Residential Programs

1. Work with VCE to set up a demonstration project with different BMPs for dog kennels.
2. Organize a field day for residents to view the demonstration project.
3. Develop educational materials & programs.
4. Organize educational programs (*e.g.*, demonstration project).
5. Distribute educational materials (*e.g.*, informational pamphlets on TMDL IP at Hunter's Safety classes).
6. Attend meetings of local hunting groups (*e.g.*, Ducks Unlimited, etc.) to encourage participation in the IP.
7. Track septic system, alternative waste treatment system, and dog kennel BMP installations.
8. Handle and track cost-share.
9. Assess progress toward implementation goals.

Table 5.19 shows the amount of industrial and non-industrial full-time equivalent (FTE) technical assistance required per SWCD. Members of the Blackwater/Raccoon and Nottoway Steering Committees agreed that one FTE each year over the five-year implementation period would be adequate to provide non-industrial technical assistance and educational outreach tasks. The Steering Committees believe that one of the SWCDs in each Study Area is the logical choice for the location of the non-industrial FTEs. The SWCD have good relationships with local residents, which would help the non-industrial FTE establish contacts with residents.

The SWCDs have preliminarily agreed to be in charge of using the funds for industrial FTEs either to pay existing staff or hire new employees to carry out the implementation of industrial BMPs. Historical work records of the SWCDs were utilized to determine the level of industrial technical assistance needed to complete implementation. It is logical to start implementation with two industrial and two non-industrial FTEs and evaluate after one year if more technical assistance is required.

Table 5.19 Recommended technical FTEs per SWCD for the Chowan Study Area.

SWCD	Impairment(s)	Non-Industrial FTE (#)	Industrial FTE (#)
Blackwater/Raccoon:			
Chowan	Raccoon Creek	0.25	1.0
Peanut	Cypress, Mill, and Rattlesnake (Creek) Swamps	0.75	1.0
Subtotal		*1.0*	*2.0*
Nottoway:			
Appomattox River	Beaverpond Creek	0.25	0.15
Piedmont	Nottoway River and Little Nottoway River	0.375	1.5
Southside	Nottoway River and Big Hounds Creek	0.375	0.35
Subtotal		*1.0*	*2.0*
FTE Total		**2.0**	**4.0**

5.4 Cost / Benefit Analysis

5.4.1 Cost Analysis

5.4.1.1 Costs of Industrial Control Measures

Streamside fencing through, or adjacent to, pasture with potential livestock access was translated and quantified into full livestock exclusion systems as described in Section 5.2.1.1. The costs for one SL-6 and one WP-2 system were estimated from systems already in place in the Chowan River Basin. All costs were estimated by a local SWCD specialist unless otherwise noted in Table 5.20. The Blackwater/Raccoon and Nottoway Steering Committees agreed upon these values.

Table 5.20 Costs for SL-6, WP-2, and hardened water crossings in the Chowan Study Area.

Impairment	Average Cost		
	SL6 System	WP2T System	Hardened Crossing
Raccoon Creek	$10,000	$3,000	$2,000
Big Hounds Creek	$12,500	$3,900[1]	$1,000[1]
Nottoway River	$60,000	$45,900	$12,000
Little Nottoway River	$60,000	$45,900	$12,000
Beaverpond Creek	$45,500	$2,959[1]	$2,775

[1] Values from VADCR BMP database

A high cost estimation for streamside fencing BMPs was calculated by multiplying the unit cost of an SL-6 system by the total number of exclusion systems required in Blackwater/Raccoon Study Area (23) and the Nottoway Study Area (70) and adding the cost of hardened crossings (Tables 5.21 and 5.22). A low cost estimation was calculated by multiplying the unit cost of a WP-2 system by the total number of exclusion systems required in Blackwater/Raccoon Study Area (23) and the Nottoway Study Area (70) without hardened crossings costs. Consequently, the total cost to install control measures that will ensure full livestock exclusion from streams in the watersheds is between $2.52 million and $4.68 million, excluding technical assistance.

Table 5.21 High estimated costs to install streamside fencing BMPs.

Impairment	SL6 Systems	WP2T Systems	Hardened Crossings	High Estimated Cost[1]
Raccoon Creek	23	0	21	$272,000
Big Hounds Creek	7	0	6	$93,500
Nottoway River	11	0	15	$840,000
Little Nottoway River	41	0	41	$2,952,000
Beaverpond Creek	11	0	9	$525,500
Nottoway Subtotal	*70*	*0*	*71*	$4,411,000
High Estimate Total	**93**	**0**	**92**	**$4,683,000**

[1] Rounded to the nearest $100.

Table 5.22 Low estimated costs to install streamside fencing BMPs.

Impairment	SL6 Systems	WP2T Systems	Hardened Crossings	High Estimated Cost[1]
Raccoon Creek	0	23	0	$69,000
Big Hounds Creek	0	7	0	$27,300
Nottoway River	0	11	0	$504,900
Little Nottoway River	0	41	0	$1,881,900
Beaverpond Creek	0	11	0	$32,500
Nottoway Subtotal	*0*	*70*	*0*	*$2,446,600*
High Estimate Total	**0**	**93**	**0**	**$2,515,600**

[1] Rounded to the nearest $100.

The average costs associated with the required industrial NPS BMPs are shown in Table 5.23. The individual cost estimations for the Blackwater/Raccoon and Upper Nottoway areas are shown in table 5.24 and 5.25, respectively. The average total cost estimation for NPS industrial BMPs is $6.99 million, excluding technical assistance.

Table 5.23 Cost per system of industrial NPS BMPs in the Chowan Study Area.

Composting Facilities ($/system)	Waste Storage Facilities ($/system)	Improved Pasture Management ($/acre)	Manure/biosolids Incorporation/injection ($/acre)	Vegetated Buffer ($/acre)
$4,100	$20,000	$170	$18.00	$700

Table 5.24 Costs of industrial NPS BMPs for the Blackwater/Raccoon Study Area.

Impairment	Composting Facilities ($)	Waste Storage Facilities ($)	Improved Pasture Management ($)	Manure/biosolids Incorporation/injection ($)	Vegetated Buffer ($)	Total ($)
Cypress Swamp	$0	$0	$289,796	$42,354	$18,014	$350,164
Mill Swamp	$4,100	$0	$382,133	$30,780	$21,332	$438,346
Rattlesnake (Creek) Swamp	$0	$0	$349,190	$9,126	$11,419	$369,735
Raccoon Creek	$12,300	$20,000	$451,264	$78,534	$15,351	$577,449
Total	*$16,400*	*$20,000*	*$1,472,383*	*$160,794*	*$66,117*	**$1,735,693**

Table 5.25 Costs of industrial NPS BMPs for the Upper Nottoway impairments.

Impairment	Composting Facilities ($)	Waste Storage Facilities ($)	Improved Pasture Management ($)	Manure/biosolids Incorporation/injection ($)	Vegetated Buffer ($)	Total ($)
Big Hounds Creek	$0	$0	$321,470	$15,894	$0	$337,364
Nottoway River	$8,200	$40,000	$632,569	$38,862	$54	$719,685
Little Nottoway River	$16,400	$60,000	$1,848,750	$108,720	$1,527	$2,035,397
Beaverpond Creek	$4,100	$0	$281,860	$12,834	$794	$299,588
Total	*$28,700*	*$100,000*	*$3,084,649*	*$176,310*	*$2,375*	**$3,392,035**

5.4.1.2 Costs of Non-Industrial Control Measures

Cost estimations of the required non-industrial BMPs were based on installing new septic systems, alternative waste treatment systems, dog kennel BMPs, stormwater control BMPs. Local VDH representatives estimated the costs for standard septic systems and alternative waste treatment systems. Costs of infiltration trenches and retention ponds were determined from the EPA document *Effluent Guidelines for the Construction and Development Industry* (1999).

Table 5.26 Costs for industrial NPS BMPs in the Chowan Study Area.

Failing Septic System Repairs	Standard Septic Systems	Alternative Waste Treatment Systems	Compost Bins	Septic Systems with filters	Infiltration Trenches	Retention Ponds
($/system)	($/system)	($/system)	($/system)	($/system)	($/acre)	($/acre)
$3,000	$3,000	$15,000	$250	$4,000	$9,000	$2,000

The Blackwater/Raccoon and Nottoway Steering Committees both decided to include an education component to the non-industrial implementation. The $8,750 total cost for one residential education program was estimated based on $750 per year for education ($3,750) plus $5,000 for a demonstration project.

A high cost estimate was based on replacing all straight pipes with an alternative waste treatment system, while replacing all straight pipes with new septic systems would result in the lowest estimate. As shown in Tables 5.27 and 5.28, an estimated total cost between $8.65 million and $12.26 million will be needed to implement the non-industrial BMPs required in the Chowan Study Area, excluding technical assistance.

Table 5.27 High estimated costs to implement the non-industrial BMPs and education.

Impairment	Residential Waste Treatment Systems			Dog Kennel BMPs	Stormwater Control BMPs				
	Failing Septic System Repairs	Standard Septic Systems	Alternative Waste Treatment Systems	Compost Bins	Septic Systems with filters	Infiltration Trenches	Retention Ponds	Residential Education Program	High Estimated Cost
Blackwater/Raccoon:									
Cypress Swamp	$276,000	$0	$615,000	$0	$84,000	$0	$0	$2,187	$977,187
Mill Swamp	$231,000	$0	$495,000	$0	$56,000	$0	$62,000	$2,188	$846,188
Rattlesnake (Creek) Swamp	$261,000	$0	$495,000	$0	$32,000	$478,800	$6,000	$2,188	$1,274,988
Raccoon Creek	$234,000	$0	$510,000	$0	$56,000	$462,600	$0	$2,187	$1,264,787
Blackwater/Raccoon Subtotal	*$1,002,000*	*$0*	*$2,115,000*	*$0*	*$228,000*	*$941,400*	*$68,000*	*$8,750*	*$4,363,150*
Nottoway:									
Big Hounds Creek	$435,000	$0	$585,000	$0	$20,000	$0	$580,000	$2,187	$1,622,187
Nottoway River	$297,000	$0	$255,000	$0	$52,000	$1,278,000	$111,000	$2,188	$1,995,188
Little Nottoway River	$888,000	$0	$1,050,000	$0	$52,000	$0	$2,071,000	$2,188	$4,063,188
Beaverpond Creek	$87,000	$0	$60,000	$0	$24,000	$18,900	$22,000	$2,187	*$214,087*
Nottoway Subtotal	*$1,707,000*	*$0*	*$1,950,000*	*$0*	*$148,000*	*$1,296,900*	*$2,784,000*	*$8,750*	$7,894,650
High Estimate Total	**$2,709,000**	**$0**	**$4,065,000**	**$0**	**$376,000**	**$2,238,300**	**$2,852,000**	**$17,500**	**$12,257,800**

Table 5.28 Low estimated costs to implement the non-industrial BMPs and education.

Impairment	Residential Waste Treatment Systems			Dog Kennel BMPs		Stormwater Control BMPs			
	Failing Septic System Repairs	Standard Septic Systems	Alternative Waste Treatment Systems	Compost Bins	Septic Systems with filters	Infiltration Trenches (ac)	Retention Ponds (ac)	Residential Education Program	Low Estimated Cost
Blackwater/Raccoon:									
Cypress Swamp	$276,000	$123,000	$0	$5,250	$0	$0	$0	$2,187	$406,437
Mill Swamp	$231,000	$99,000	$0	$3,500	$0	$0	$62,000	$2,188	$397,688
Rattlesnake (Creek) Swamp	$261,000	$99,000	$0	$2,000	$0	$478,800	$6,000	$2,188	$848,988
Raccoon Creek	$234,000	$102,000	$0	$3,500	$0	$462,600	$0	$2,187	$804,287
Blackwater/Raccoon Subtotal	*$1,002,000*	*$423,000*	*$0*	*$14,250*	*$0*	*$941,400*	*$68,000*	*$8,750*	*$2,457,400*
Nottoway:									
Big Hounds Creek	$435,000	$117,000	$0	$1,250	$0	$0	$580,000	$2,187	$1,135,437
Nottoway River	$297,000	$51,000	$0	$3,250	$0	$1,278,000	$111,000	$2,188	$1,742,438
Little Nottoway River	$888,000	$210,000	$0	$3,250	$0	$0	$2,071,000	$2,188	$3,174,438
Beaverpond Creek	$87,000	$12,000	$0	$1,500	$0	$18,900	$22,000	$2,187	$143,587
Nottoway Subtotal	*$1,707,000*	*$390,000*	*$0*	*$9,250*	*$0*	*$1,296,900*	*$2,784,000*	*$8,750*	*$6,195,900*
Low Estimate Total	**$2,709,000**	**$813,000**	**$0**	**$23,500**	**$0**	**$2,238,300**	**$2,852,000**	**$17,500**	**$8,653,300**

5.4.1.3 Technical Assistance

It was determined by the SWCDs that $30,000 would be required to support the salary, benefits, travel, and training of one FTE. With quantification analysis yielding a need for two non-industrial FTEs and 6.0 industrial FTEs per year, the total cost to provide technical assistance during the five year implementation is expected to be $1.20 million total. Because the industrial FTEs will be handled by the individual SWCD based on the TMDL IP BMP need in their districts, the amount of funds going to each SWCD is presented in Table 5.29. The non-industrial FTE costs are also broken up by SWCD, although it is anticipated that one SWCD in each Study Area will house the FTEs for their area.

Table 5.29 The estimated cost of technical FTE per SWCD for the Non-Industrial and Industrial programs.

SWCD	Impairment(s)	Non-Industrial FTE Total Cost	Industrial FTE Total Cost
Blackwater/Raccoon:			
Chowan	Raccoon Creek	$37,500	$150,000
Peanut	Cypress, Mill, and Rattlesnake (Creek) Swamps	$112,500	$150,000
Subtotal		*$150,000*	*$300,000*
Nottoway:			
Appomattox River	Beaverpond Creek	$37,500	$22,500
Piedmont	Nottoway River and Little Nottoway River	$56,250	$225,000
Southside	Nottoway River and Big Hounds Creek	$56,250	$52,500
Subtotal		*$150,000*	*$300,000*
FTE Total		**$300,000**	**$600,000**

5.4.2 Benefit Analysis

The primary benefit of implementation is cleaner waters in Virginia. Specifically, fecal contamination in the Upper Blackwater and Upper Nottoway Rivers will be reduced to meet water quality standards. It is hard 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 reduced considerably. Additionally, because of streambank protection that will be provided through exclusion of livestock from streams and restoration of the riparian area through anticipated implementation of the CREP in some areas, the aquatic habitat will be improved in these waters. The established vegetated buffers will also serve to reduce sediment and nutrient transport to the stream from upland locations. In areas where pasture management is improved through implementation of grazing-land-protection BMPs, soil and nutrient losses should decrease, 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 cattle from streams, intensive pasture management, and private sewage system maintenance will each provide economic benefits. Additionally, money spent by landowners and state agencies in the process of implementing this plan will stimulate the local economy.

A clean water source has been shown to improve weight gain and milk production in cattle. Fresh clean water is the primary nutrient for livestock with healthy cattle consuming, 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 VCE (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. Installation 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 instigate 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. Feed costs are typically responsible for 70 - 80% of the cost of growing or maintaining an animal. Pastures provide feed at a cost of 0.01 to 0.02 cents/lb of total digestible nutrients (TDN) compared to 0.04 to 0.06 cents/lb TDN for hay. Therefore, 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. Another benefit is that cattle are closely confined, allowing for quicker examination and

handling. In general, many of the agricultural BMPs recommended in this document will provide both environmental benefits and economic benefits to the farmer.

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. In terms of economic benefits to homeowners, an improved understanding of on-site sewage treatment systems (OSTS), 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 to 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 an entire system. Additionally, the repair/replacement cost-share programs will benefit owners of private sewage (*e.g.*, septic) systems, particularly low-income homeowners, by sharing the cost of required maintenance.

In addition to the benefits to individual landowners, the economy of the local community will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside the impaired areas. Building contractors and material suppliers who deal with septic system pump-outs, private sewage system repair and installation, fencing, and water system installation can expect to see an increase in business during implementation. Additionally, income from maintenance of these systems should continue long after implementation is complete. As will be discussed in greater detail in Section 6.1, a large portion of the funding for implementation can be expected to come from state and federal sources. This portion of funding represents money that is new to the area and will stimulate the local economy. In general, implementation will provide not only environmental benefits to the community, but economic benefits as well, which, in turn, will allow for individual landowners to participate in implementation.

6. MEASURABLE GOALS AND MILESTONES FOR ATTAINING WATER QUALITY STANDARDS

Tasks expected to be completed during implementation are detailed in Section 6.3 of this document. Full implementation is expected in five years, with de-listing from the Virginia Section 305(b)/303(d) list within 10 years. Described in this section are funding sources, identification of milestones, timeline for implementation, targeting of control measures, and the roles of stakeholders during the process.

6.1 Funding

The following practices are acceptable for the Chowan Study Area IP: SL-6 (Grazing Land Protection), WP-2 (Stream Protection), RB-4 (Septic Tank System Installation/Replacement), RB-5 (Alternative On-site Waste Treatment System), RB-3 (Septic System Repair), FR-3 (Woodland Buffer Filter Area), WP-4 (Animal Waste Control Facilities), WP-1 and WP-5 (Sediment Retention, Erosion, or Water Control Structures, WP-7 Surface Water Runoff Impoundment for Water Quality), and Dog kennel BMPs (composting, landfilling, septic systems with filters). Potential funding sources available during implementation were identified during IP development. A brief description of the programs and their requirements is provided in this chapter. (Detailed descriptions can be obtained from SWCDs, VADCR, NRCS, and VCE). Each of the funding sources has specific requirements and benefits that will vary in applicability to specific circumstances. It is recommended that participants discuss funding options with experienced personnel at their local SWCD in order to choose the best option. Information on program description and requirements was provided from fact sheets prepared by Virginia State Technical Advisory Committee, VADEQ, VADCR, and Southeast Rural Community Assistance Project, Inc.

Federal Clean Water Act 319 Incremental Funds

Through Section 319 of the Federal Clean Water Act, Virginia is awarded grant funds to implement the nonpoint source programs. VADCR administers the money in coordination with the Nonpoint Source Advisory Committee (NPSAC) to fund watershed projects, demonstration and educational programs, nonpoint source pollution control program development, and technical and program staff. VADCR reports annually to the EPA on the

progress made in nonpoint source pollution prevention and control. A 319 application will be written upon completion of the IP to request funding for the technical assistance required (FTEs).

Virginia Agricultural Best Management Practices Cost-Share Program

The cost-share program is funded with state and federal monies through local SWCDs. SWCDs administer the program to encourage farmers and landowners to use BMPs on their land to better control sediment, nutrient loss, and transportation of pollutants into our waters due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Program participants are recruited by SWCDs based upon those factors, which have a great impact on water quality. The objective is to solve water quality problems by fixing the worst problems first. Cost-share is typically 75% of the actual cost, not to exceed the local maximum.

Virginia Agricultural Best Management Practices Tax Credit Program

For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, shall be allowed a credit against the tax imposed by Section 58.1-320 of an amount equaling 25% of the first $70,000 expended for agricultural best management practices by the individual. "Agricultural best management practices" are approved measures that will provide a significant improvement to water quality in the state's streams and rivers, and is consistent with other state and federal programs that address agricultural nonpoint source pollution management. Any practice approved by the local SWCD Board shall be completed within the taxable year in which the credit is claimed. The credit shall be allowed only for expenditures made by the taxpayer from funds of his/her own sources. The amount of such credit shall not exceed $17,500 or the total amount of the tax imposed by this program, whichever is less, in the year the project was completed, as certified by the Board. If the amount of the credit exceeds the taxpayer's liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. This program can be used independently or in conjunction with other cost-share programs on the stakeholder's portion of BMP costs. It is also approved for use in supplementing the cost of repairs to streamside fencing.

Virginia Agricultural Best Management Practices Loan Program

Loan requests are accepted through VADEQ. The interest rate is 3% per year and the term of the loan coincides with the life span of the practice. To be eligible for the loan, the BMP must be included in a conservation plan approved by the local SWCD Board. The minimum loan amount is $5,000; there is no maximum limit. Eligible BMPs include 23 structural practices such as animal waste control facilities, loafing lot management systems, and grazing land protection systems. The loans are administered through certain participating lending institutions.

Virginia Small Business Environmental Assistance Fund Loan Program

The Fund, administered through VADEQ, is used to make loans or to guarantee loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural best management practices. The equipment must be needed by the small business to comply with the federal Clean Air Act, or it will allow the small business to implement voluntary pollution prevention measures. The loans are available in amounts up to $50,000 and will carry an interest rate of 3%, with favorable repayment terms based on the borrower's ability to repay and the useful life of the equipment being purchased or the life of the BMP being implemented. There is a $30 non-refundable application processing fee. The Fund will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act.

Virginia Water Quality Improvement Fund

This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible organizations include local governments, Soil and Water Conservation Districts, and individuals. Grants for point sources are administered through VADEQ and grants for nonpoint sources are administered through VADCR. Most WQIF grants provide matching funds on a 50/50 cost-share basis. Successful applications are listed as

draft/public-noticed agreements, and are subjected to a public review period of at least 30 days.

Community Development Block Grant Program

The Department of Housing and Urban Development sponsors this program, intended to develop viable communities by providing decent housing and a suitable living environment and by expanding economic opportunities primarily for persons of low and moderate income. Recipients may initiate activities directed toward neighborhood revitalization, economic development, and provision of improved community facilities and services. Specific activities may include public services, acquisition of real property, relocation and demolition, rehabilitation of structures, and provision of public facilities and improvements, such as new or improved water and sewer facilities.

Conservation Reserve Program (CRP)

Offers are accepted and processed during fixed signup periods that are announced by FSA. All eligible (cropland) offers are ranked using a national ranking process. If accepted, contracts are developed for a minimum of 10 and not more than 15 years. Payments are based on a per-acre soil rental rate. Cost-share assistance is available to establish the conservation cover of tree or herbaceous vegetation. The per-acre rental rate may not exceed the Commodity Credit Corporation's maximum payment amount, but producers may elect to receive an amount less than the maximum payment rate, which can increase the ranking score. To be eligible for consideration, the following criteria must be met: 1) cropland was planted or considered planted in an agricultural commodity two of the five most recent crop years; and 2) cropland is classified as "highly-erodible" by NRCS. Eligible practices include planting these areas to trees and/or herbaceous vegetation. Application evaluation points can be increased if certain tree species, spacing, and seeding mixtures that maximizes wildlife habitats are selected. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. The payment to the participant is up to 50% of the cost for establishing ground cover. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration.

Conservation Reserve Enhancement Program (CREP)

This program is an "enhancement" of the existing USDA CRP Continuous Sign-up. It has been "enhanced" by increasing the cost-share rates from 50% to 75% and 100%, increasing the rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Pasture and cropland (as defined by USDA) adjacent to streams, intermittent streams, seeps, springs, ponds and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, to mixed hardwood trees on pasture, must be established in widths ranging from the minimum of 30% of the floodplain or 35 feet, whichever is greater, to a maximum average of 300 feet. Cost-sharing (75% - 100%) is available to help pay for fencing to exclude livestock from the riparian buffer, watering facilities, hardwood tree planting, filter strip establishment, and wetland restoration. In addition, a 40% incentive payment upon completion is offered and an average rental rate of $70/acre on stream buffer area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area. The statewide goal is 8,000 acres.

The landowner can obtain and complete CREP application forms at the FSA center. The forms are forwarded to local NRCS and SWCD offices while FSA determines land eligibility. If the land is deemed eligible, NRCS and the local SWCD determine and design appropriate conservation practices. A conservation plan is written, and fieldwork is begun, which completes the conservation practice design phase.

FSA then measures CREP acreage, conservation practice contracts are written, and practices are installed. The landowner submits bills for cost-share reimbursement to FSA. Once the landowner completes BMP installation and the practice is approved, FSA and the SWCD make the cost-share payments. The SWCD also pays out the state's one-time, lump sum rental payment. FSA conducts random spot checks throughout the life of the contract, and the agency continues to pay annual rent throughout the contract period.

Environmental Quality Incentives Program (EQIP)

This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource

needs and objectives. This program replaces the Agricultural Conservation Program (ACP) and the Water Quality Incentive Program (WQIP). Approximately 65% of the EQIP funding for the state of Virginia is directed toward "Priority Areas." These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. EQIP offers 5 to 10-year contracts to landowners and farmers to provide 75% cost-share assistance, 25% tax credit, and/or incentive payments to implement conservation practices and address the priority concerns statewide or in the priority area. Eligibility is limited to persons who are engaged in livestock or agricultural production. Eligible land includes cropland, pasture, and other agricultural land in priority areas, or land that has an environmental need that matches one of the statewide concerns.

Wildlife Habitat Incentive Program (WHIP)

WHIP is a voluntary program for landowners and land users who want to develop or improve wildlife habitat on private agriculture-related lands. Participants work with NRCS to prepare a wildlife habitat development plan. This plan describes the landowner's goals for improving wildlife habitat and includes a list of practices and a schedule for installation. A 10-year contract provides cost-share and technical assistance to carry out the plan. In Virginia, these plans will be prepared to address one or more of the following high priority habitat needs: early grassland habitats that are home to game species such as quail and rabbit, as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share assistance up to 75% of the total cost of installation (not to exceed $10,000 per applicant) is available for establishing habitat. Applicants will be competitively ranked within the state and certain areas and practices will receive higher ranking based on their value to wildlife. Types of practices include: disking, prescribed burning, mowing, planting habitat, converting fescue to warm season grasses, establishing riparian buffers, creating habitat for waterfowl, and installing filter strips, field

borders and hedgerows. For cost-share assistance, USDA pays up to 75% of the cost of installing wildlife practices.

Wetland Reserve Program (WRP)

This program is a voluntary program to restore and protect wetlands on private property. The program benefits include providing fish and wildlife habitat, improving water quality, reducing flooding, recharging groundwater, protecting and improving biological diversity, and furnishing recreational and esthetic benefits. Sign-up is on a continuous basis. Landowners who choose to participate in WRP may receive payments for a conservation easement or cost-share assistance for a wetland restoration agreement. The landowner will retain ownership but voluntarily limits future use of the land. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10-year duration. Under the permanent easement option, landowners may receive the agricultural value of the land up to a maximum cap and 100% of the cost of restoring the land. For the 30-year option, a landowner will receive 75% of the easement value and 75% cost-share on the restoration. A ten-year agreement is also available that pays 75% of the restoration cost. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and may lease the land for hunting, fishing, or other undeveloped recreational activities. At any time, a landowner may request that additional activities be added as compatible uses. Land eligibility is dependent on length of ownership, whether the site has been degraded as a result of agriculture, and the land's ability to be restored. Restoration agreement participants must show proof of ownership. Easement participants must have owned the land for at least one year and be able to provide clear title.

Southeast Rural Community Assistance Project (SE/R-CAP)

The mission of this project is to promote, cultivate, and encourage the development of water and wastewater facilities to serve low-income residents at affordable costs and to support other development activities that will improve the quality of life in rural areas. Staff members of other community organizations complement the SE/R-CAP central office staff across the region. They can provide (at no cost to a community): on-site technical assistance and consultation, operation and maintenance/management assistance, training, education,

facilitation, volunteers, and financial assistance. Financial assistance includes $1,500 toward repair/replacement/installation of a septic system and $2,000 toward repair/replacement/installation of an alternative waste treatment system. Funding is only available for families making less than 125% of the federal poverty level. The federal poverty threshold for a family of four is $18,850.

National Fish and Wildlife Foundation

Offers are accepted throughout the year and processed during fixed signup periods. The signup periods are on a year-round, revolving basis, and there are two decision cycles per year. Each cycle consists of a pre-proposal evaluation, full proposal evaluation, and a Board of Directors decision. An approved pre-proposal is a pre-requisite to the submittal of the full proposal. Grants generally range between $10,000 and $150,000. Payments are based on need. Projects are funded in the U.S., and any international areas that host migratory wildlife from the U.S., marine animals, or endangered species. Grants are awarded for the purpose of conserving fish, wildlife, plants, and their habitats. Special grant programs are listed and described on the NFWF website (http://www.nfwf.org). If the project does not fall into the criteria of any special grant programs, the proposal may be submitted as a general grant if it falls under the following guidelines: 1) it promotes fish, wildlife and habitat conservation, 2) it involves other conservation and community interests, 3) leverages available funding, and 4) evaluates project outcomes. A pre-proposal that is not accepted by a special grant program may be deferred to the general grant program.

Clean Water State Revolving Fund

EPA awards grants to states to capitalize their Clean Water State Revolving Funds (CWSRFs). The states, through the CWSRF, make loans for high-priority water quality activities. As loan recipients make payments back into the fund, money is available for new loans to be issued to other recipients. Eligible projects include point source, nonpoint source and estuary protection projects. Point source projects typically include building wastewater treatment facilities, combined sewer overflow and sanitary sewer overflow correction, urban stormwater control, and water quality aspects of landfill projects. Nonpoint source projects include agricultural, silviculture, rural, and some urban runoff control; on-site wastewater disposal systems (septic tanks); land conservation and riparian buffers; leaking underground

storage tank remediation, etc. Estuary protection projects include all of the above point and nonpoint source projects, as well as habitat restoration and other unique estuary projects.

6.1.1 Possible Funding Scenario

The funding sources that are expected to play the largest role in implementation are the 319 Incremental Funds and the Virginia Agricultural BMP Cost-Share Program. It is anticipated that the 319 Incremental Funds will be used to fund the technical assistance required for both the industrial and non-industrial programs. Based on these funding sources, a possible scenario for funding for a year is presented in Tables 6.1 and 6.2. This scenario represents 5% installation of required BMPs and technical FTEs.

Table 6.1 Blackwater/Raccoon impairments - One possible scenario for funding in the first year (5% implementation).

	Landowner	Cost-Share	Total
Industrial BMPs	$84,869	$13,912	$98,781
Incentives	-$945	$945	$0
Non-industrial BMPs	$199,708	$0	$199,708
Dog Kennel BMPs	$3,420	$0	$3,420
FTEs	$0	$90,000	$90,000
Total	*$287,052*	*$104,857*	*$391,909*

Table 6.2 Upper Nottoway River impairments - One possible scenario for funding in the first year (5% implementation).

	Landowner	Cost-Share	Total
Industrial BMPs	$210,738	$217,141	$427,879
Incentives	-$40	$40	$0
Non-industrial BMPs	$313,083	$0	$313,083
Dog Kennel BMPs	$2,220	$0	$2,220
FTEs	$0	$90,000	$90,000
Total	*$526,001*	*$307,181*	*$833,182*

6.2 Milestones Identification

The end goals of implementation are restored water quality of the impaired waters and subsequent de-listing of the waters from the Commonwealth of Virginia's Section 305(b)/303(d) list within 10 years. Progress toward end goals will be assessed during implementation through tracking of control measure installations and continued water quality monitoring. Agricultural control measures will be tracked through the Virginia Agricultural Cost-Share Program.

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the percentage of control measures installed within certain timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. The milestones described here are intended to achieve full implementation within five years, leaving five years to assess water quality for de-listing. These goals are the basis for two of the milestones (*i.e.*, full implementation at the 5-year mark, and de-listing at the 10-year mark).

Implementation is suggested to begin in July 2006 after which five milestones need to be met over the next five years (Tables 6.5 and 6.6). 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 reductions in violations of the instantaneous *E. coli* water quality standard. After five years from the start of implementation, 100% of the industrial BMPs and 100% of non-industrial BMPs will be installed, resulting in compliance with the *E. coli* standards. The final milestone will be de-listing of the impaired segments from the Section 303(d) list, which is anticipated by 2016.

Following the idea of a staged implementation approach it is suggested to concentrated resources and finances on streamside fencing, straight pipe corrections and dog kennel BMP installations. With the installation of streamside fencing (SL-6 and WP-2 systems) direct livestock fecal loads are reduced 100% and buffers are established between fencing and the stream. These buffers further reduce fecal bacteria from entering streams by filtering runoff from adjacent land uses. Correcting straight pipes is an important component of this IP due

to the health risks associated with contacting pathogens from human wastes. The bacterial source tracking (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 with less cost to landowners. Waste storage facilities, infiltration trenches, and retention ponds are more difficult to implement as they require more technical assistance and can be expensive. This does not mean if funding is available they cannot be addressed earlier during implementation.

6.3 Timeline

Based on meeting the above milestones, a five-year implementation plan timeline was formulated for the Blackwater/Raccoon and Nottoway areas. The timelines describe the annual needs for implementation in terms of completion of the industrial and non-industrial control measures. Table 6.3 shows the annual implementation needs for agricultural and residential control measures, and technical assistance. The percentages shown for BMP implementation are per year, not cumulative. Table 6.4 shows it will cost an average $4.15 million to implement the IP each year. Over the five years of implementation, it will cost an estimated $20.8 million.

Table 6.3 Percentage of BMPs to be installed and amount of technical assistance needed per year in the Chowan Study Area.

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

Table 6.4 Total estimated cost to implement the Chowan Study Area IP.

Year	Industrial BMPs ($)	Non-Industrial BMPs ($)	Technical Assistance ($)	Estimated Total Cost Per Year ($)
1	475,000	518,500	180,000	1,173,500
2	1,425,000	1,555,500	180,000	3,160,500
3	3,325,000	3,629,500	180,000	7,134,500
4	2,375,000	2,592,500	180,000	5,147,500
5	1,900,000	2,074,000	180,000	4,154,000
Total	**$9,500,000**	**$10,370,000**	**$900,000**	**$20,770,000**

Table 6.5 Implementation and water quality milestones (*i.e.*, estimation of fecal bacteria instantaneous water quality standard exceedances) in the Upper Blackwater/Raccoon impairments.

		Industrial Implementation Milestones		Non-Industrial Implementation Milestones		Water Quality Milestone: *E. coli* instantaneous water quality exceedances in			
Milestone	**Date**	**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

Table 6.6 Implementation and water quality milestones (*i.e.*, estimation of fecal bacteria instantaneous water quality standard exceedances) in the Upper Nottoway River impairments.

		Industrial Implementation Milestones		Non-Industrial Implementation Milestones		Water Quality Milestone: *E. coli* instantaneous water quality exceedances in			
Milestone	**Date**	**Livestock Exclusion Systems**	**NPS**	**Straight Pipes Corrected**	**NPS**	**Beaverpond Creek (%)**	**Nottoway River (%)**	**Big Hounds Creek (%)**	**Little Nottoway River (%)**
Existing	8/1/2006	Implementation Begins				28.1	14.3	13.6	21.6
1	8/1/2007	5%	5%	5%	5%	27.78	13.81	11.51	20.60
2	8/1/2008	20%	20%	20%	20%	26.03	11.78	9.64	17.81
3	8/1/2009	55%	55%	55%	55%	20.82	8.66	6.30	11.07
4	8/1/2010	80%	80%	80%	80%	17.81	6.41	5.04	8.11
5	8/1/2011	100%	100%	100%	100%	15.40	5.53	4.22	5.81
6	8/1/2016	De-listing from 303(d) List				0	0	0	0

6.4 Targeting

Implicit in the process of a staged implementation is targeting of control measures. Targeting ensures optimum utilization of resources. Targeting of critical areas for BMP installation was accomplished through analysis of land use, farm boundaries, and stream network GIS layers. For each subwatershed, the livestock population and the fencing requirements were determined. The subwatersheds were then ranked in descending order based on the ratio of animals per fence length. If feasible, effort should be made to prioritize resources in the following order of subwatersheds in Table 6.7. The subwatersheds ranked by this ratio are shown in Figures 6.3 through 6.5. Modeling was performed to evaluate improvements in water quality based on localized implementation of control measures (Tables 6.8).

Table 6.7 Targeting subwatershed order for streamside fencing.

Impairment	Streamside Fencing Targeting Subwatershed Order
Raccoon Creek (RC)	21, 25, 18, 19, 23, 20, 24, 22, 26
Big Hounds Creek (BH)	36, 37, 35, 32, 34, 33
Nottoway River (NR)	16, 4, 18, 1, 3, 17, 2, 5, 14, 15, 6
Little Nottoway River (LN)	29, 19, 26, 21, 30, 23, 31, 25, 20, 28, 24, 22, 27
Beaverpond Creek (BC)	39, 38, 40

Table 6.8 Example of targeting subwatersheds to maximize implementation efforts and finances.

BMPs Installed	Targeting vs. Not Targeting	Water Quality Milestone: *E. coli* instantaneous water quality exceedances in				
		Raccoon Creek (%)	Beaverpond Creek (%)	Nottoway River (%)	Big Hounds Creek (%)	Little Nottoway River (%)
55% Stream Fencing Installed, 100% Straight Pipes corrected	**Not** Targeted (55% reductions for all subwatersheds)	14.49	26.36	14.25	12.88	20.93
55% Stream Fencing Installed,	**Targeted**	14.38	25.32	14.25	12.88	20.88

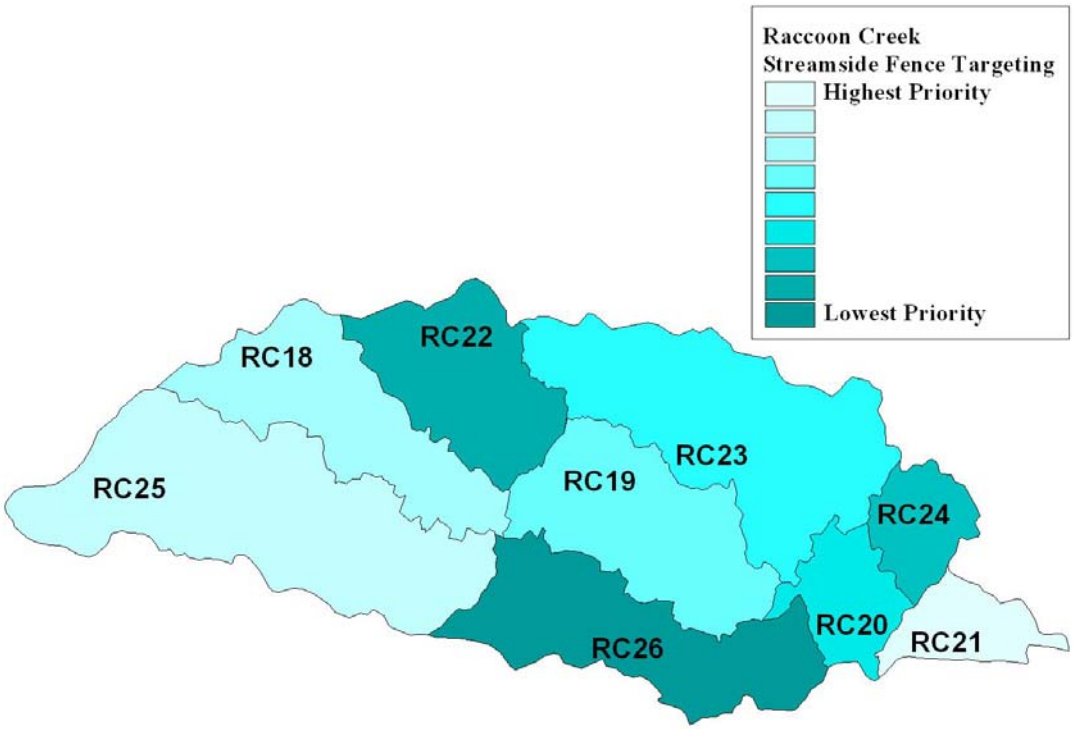

Figure 6.1 Raccoon Creek (RC) subwatersheds ranked by stream fence implementation priority.

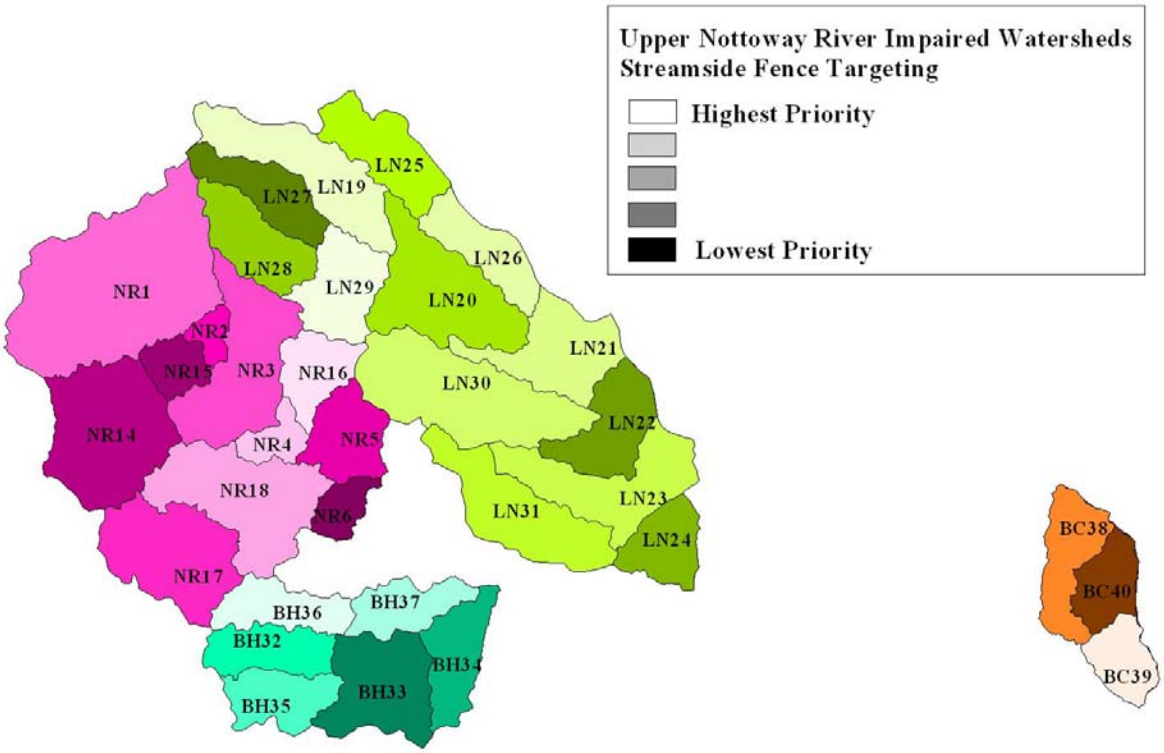

Figure 6.2 The Upper Nottoway River impaired subwatersheds ranked by stream fence implementation priority.

Subwatersheds were also ranked in descending order based the number of potential straight pipes present. If feasible, effort should be made to prioritize resources in the following order of subwatersheds in Table 6.9. The subwatershed order is shown in Figures 6.5, 6.6, and 6.7.

Table 6.9 Targeting subwatershed order for straight pipes.

Impairment	Straight Pipe Correction Targeting Subwatershed Order
Raccoon Creek (RC)	23, 19, 25, 18, 22, 26, 24, 20, 21
Cypress Swamp (CS)	19, 12, 13, 15, 18, 20, 14, 17, 16
Mill Swamp (MS)	27, 26, 24, 21, 25, 23, 28, 22
Rattlesnake (Creek) Swamp (RS)	35, 30, 36, 33, 34, 29, 31, 32
Big Hounds Creek (BH)	32, 33, 35, 34
Nottoway River (NR)	1, 3, 17, 5, 18, 14, 16, 6, 2, 4, 15
Little Nottoway River (LN)	25, 20, 26, 30, 19, 21, 28, 29, 22, 23, 31, 27, 24
Beaverpond Creek (BC)	38, 40, 39

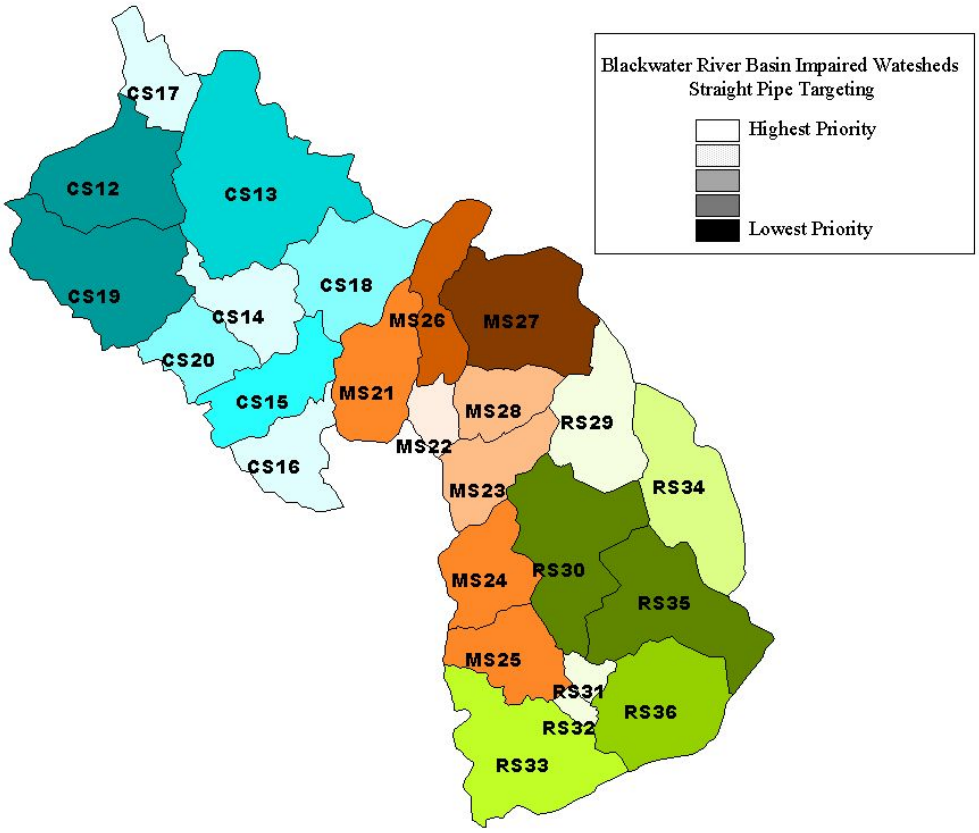

Figure 6.3 The Blackwater River impaired subwatersheds ranked by number of potential straight pipes.

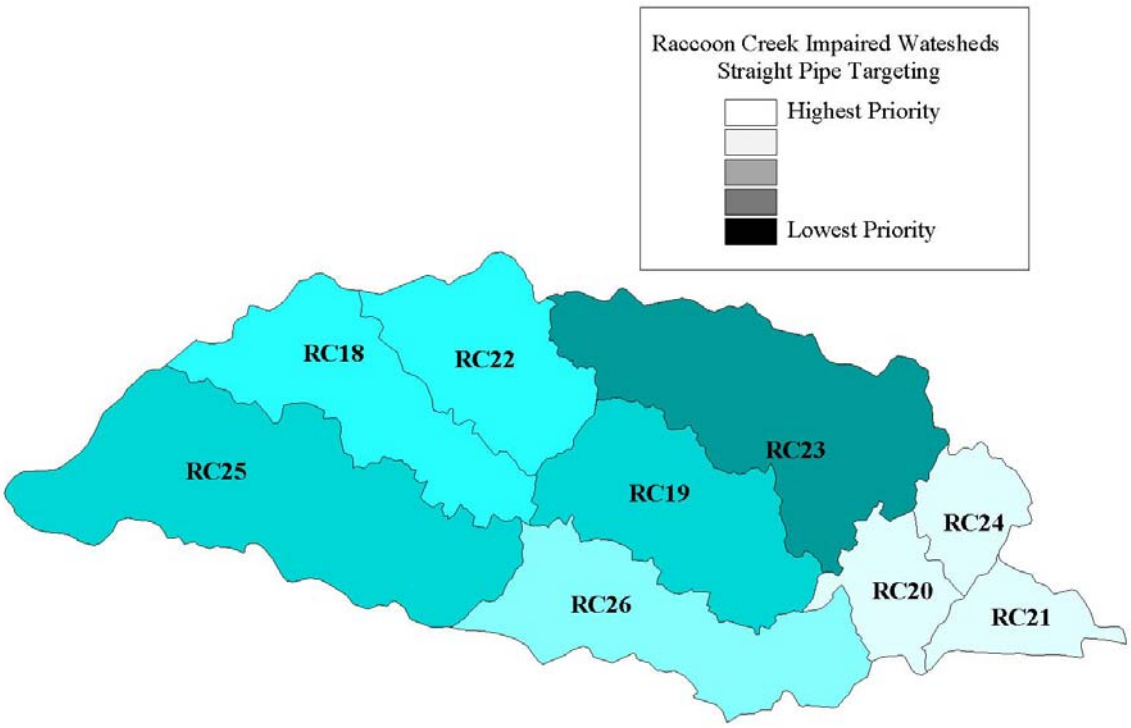

Figure 6.4 Raccoon Creek impaired subwatersheds ranked by number of potential straight pipes.

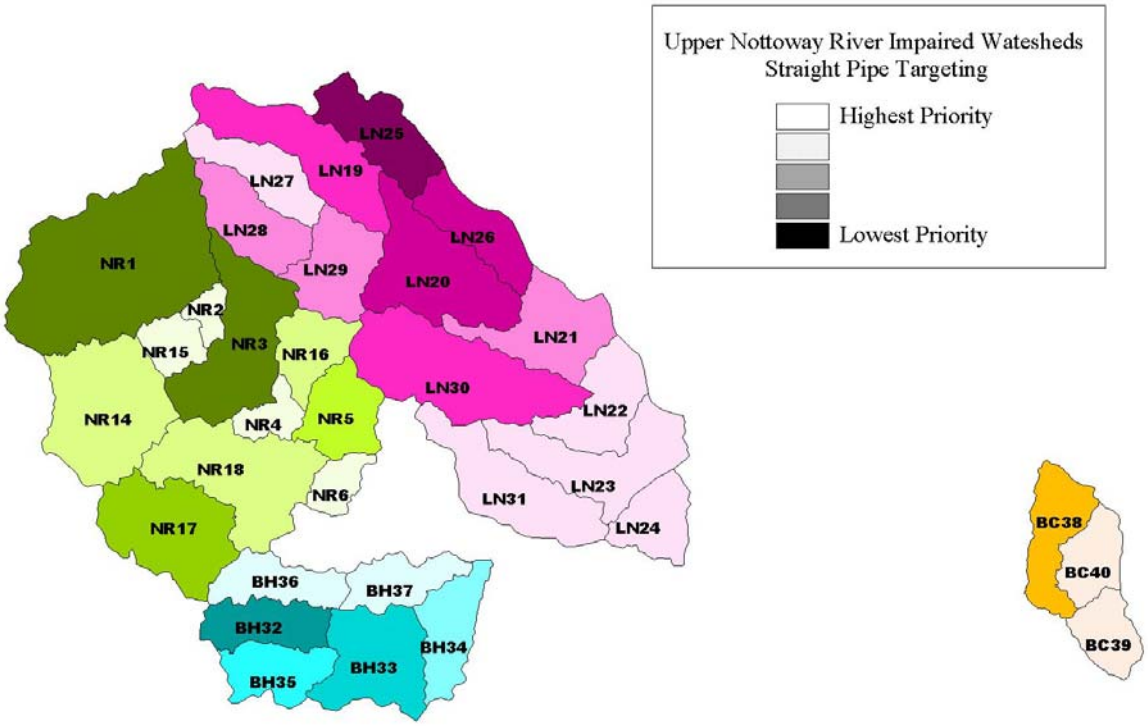

Figure 6.5 The Upper Nottoway River impaired subwatersheds ranked by number of potential straight pipes.

7. STAKEHOLDERS AND THEIR ROLE IN IMPLEMENTATION

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 charged with implementation of control measures and the stakeholders charged with overseeing our nation's human health are key elements of a successful IP. The first step is to acknowledge that a water quality problem exists and realize that needed changes must be made in operations, programs, and legislation to address these pollutants.

The detrimental effects of bacteria in food and water supplies have been documented repeatedly. For example, in May 2000 in Walkerton, Ontario (a town of approximately 5,000 people), there were seven confirmed deaths (with four other deaths under investigation) and more than 2,000 poisonings, all attributed to drinking water polluted by *E. coli* Type 0157:H7 (Raine, 2000; Miller, 2000). *E. coli* is a type of fecal coliform bacteria commonly found in intestines of humans and animals. Financially, the contamination resulted in a $250 million class action lawsuit filed against the Ontario government. According to the Cattleman's Association, the likely source of the pollution was runoff from a feedlot located more than 5 miles from the wells used for the town's water supply. Cattle are the "number one reservoir for this type of *E. coli* " according to veterinarian Gerald Ollis, and 5 to 40 % of cattle shed the bacteria at any given time.

On August 8, 1994, VDH was notified that campers and counselors at a Shenandoah Valley summer camp developed bloody diarrhea. It was confirmed that *E. coli* 0157:H7 was the causative agent (CDC, 1995). In Franklin County, Virginia, a 1997 outbreak of illnesses involving three children was attributed to *E. coli* (0157:H7) in Smith Mountain Lake. The children came in contact with the bacteria while swimming in the lake, and a two-year-old child almost died as a result of the exposure (Roanoke Times, 1997a, 1997b, 1998b). In August 1998, seven children and two adults at a day-care center in rural Floyd County were infected with *E. coli* (0157:H7). Upon investigation, two of the property's wells tested positive for total coliform (Roanoke Times, 1998a, 1998c). On June 6, 2000, Crystal Spring, (Roanoke, Virginia's second largest water source) was shut down by the VDH for *E. coli* contamination (Roanoke Times, 2000).

These are not isolated cases. Throughout the United States, the Centers for Disease Control estimates that at least 73,000 cases of illnesses and 61 deaths per year are caused by *E. coli* 0157:H7 bacteria (CDC, 2001). Other FC pathogens (*e.g., E. coli* 0111) are responsible for similar illnesses. In addition, the presence of other bacterial and viral pathogens is indicated by the presence of FC. Whether the source of contamination is human or livestock waste, the threat of 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.

7.1 Monitoring

Implementation progress success will be determined by monitoring conducted by VADEQ through the agency's monitoring program and citizen monitoring support funded through the Blackwater Nottoway Riverkeeper Program. VADEQ will monitor at four monitoring locations in the Blackwater/Raccoon watershed during the implementation of the IP. The citizen monitoring support will consist of using the BNRP volunteers to sample at the VADEQ stations that VADEQ is not monitoring during implementation. Volunteer monitors will be trained and provided with supplies and equipment to conduct water quality monitoring. Measurements of dissolved oxygen, pH, and temperature will be measured on-site and samples will be collected for bacteria and turbidity. Bacteria enumerations will be determined by using the Coliscan Easygel method. The Blackwater/Nottoway Riverkeepers agreed to monitor eight stations once a month during implementation. The monitoring site descriptions and monitoring schedule are shown in Table 7.1 and Figures 7.1 and 7.2. The citizen monitoring will continue pending annual renewal of funding from VADEQ.

VADEQ will monitor at five monitoring locations in the Upper Nottoway River impaired watersheds during the implementation of the IP. The monitoring site descriptions and monitoring schedule are shown in Table 7.2 and Figure 7.3.

Table 7.1 Monitoring station IDs, station locations, station types, and monitoring schedules for the Blackwater/Raccoon VADEQ stations.

Station ID	Watershed	Stream Name	Analyte	Agency Sampling during IP	Station Location	Monitoring Schedule
5ARCN003.36	Raccoon Creek	Raccoon Creek	*E. coli*	VADEQ	Rt 608, Tower Hill Rd	Monthly 7/2006 through 6/2016
5ASGC004.15	Raccoon Creek	Spring Creek	Coliscan	Riverkeepers	Rt 735, Courthouse Rd	Monthly 7/2005 through 6/2011
5ALTS001.56	Raccoon Creek	Little Swamp	Coliscan	Riverkeepers	Rt 631, Peters Bridge Rd	Monthly 7/2005 through 6/2011
5ACPP003.20	Cypress Swamp	Cypress Swamp	*E. coli*	VADEQ	Rt 31, Hollybush Rd	Monthly 7/2006 through 6/2016
5AHZL000.77	Cypress Swamp	Hazel Swamp	Coliscan	Riverkeepers	Rt 618, Hollybush Rd	Monthly 7/2005 through 6/2011
5AJCH000.73	Cypress Swamp	Johnchecohunk Swamp	Coliscan	Riverkeepers	Rt 630, Spratleys Mill Rd	Monthly 7/2005 through 6/2011
5ARKN006.40	Rattlesnake Swamp	Rattlesnake Swamp	*E. coli*	VADEQ	Rt. 625	Bi-Monthly 7/2011 through 6/2016
5ARKN005.40	Rattlesnake Swamp	Rattlesnake Swamp	Coliscan	Riverkeepers	Rt. 637	Monthly 7/2005 through 6/2011
5ARKN006.82	Rattlesnake Swamp	Rattlesnake Swamp	Coliscan	Riverkeepers	Rt. 681	Monthly 7/2005 through 6/2011
5AMSW006.77	Mill Swamp	Mill Swamp	*E. coli*	VADEQ	Rt. 617, White Marsh Rd.	Bi-Monthly 7/2011 through 6/2016
5AMSW003.16	Mill Swamp	Mill Swamp	Coliscan	Riverkeepers	Rt. 621	Monthly 7/2005 through 6/2011
5AGRN000.81	Mill Swamp	Green Swamp	Coliscan	Riverkeepers	Rt. 616, Golden Hill Rd.	Monthly 7/2005 through 6/2011

Table 7.2 Monitoring station IDs, station locations, station types, and monitoring schedules for the Upper Nottoway River VADEQ stations.

Station ID	Watershed	Stream Name	Analyte	Agency Sampling during IP	Station Location	Monitoring Schedule
5ANTW155.06	Nottoway River	Nottoway River	*E. coli*	VADEQ	Nottoway River @ Rte. 625	Bimonthly July 2001 - December 2012
5ABHC003.73	Big Hounds Creek	Big Hounds Creek	*E. coli*	VADEQ	Big Hounds Creek @ Rte. 653	Bimonthly July 2001 - June 2003 and January 2007 - December 2008
5ALNT004.68	Little Nottoway River	Little Nottoway River	*E. coli*	VADEQ	Little Nottoway River @ Rte. 626	Bimonthly July 2001 - June 2003 and January 2007 - December 2008
5ABPC000.12	Beaver Pond Creek	Beaver Pond Creek	*E. coli*	VADEQ	Beaver Pond Creek @ Rte. 612	Bimonthly July 2003 - June 2005 and January 2009 - December 2010
5AWSN000.48	Little Nottoway River	Whetstone Creek	*E. coli*	VADEQ	Whetstone Creek @ The Grove Rd.	Bimonthly July 2005 - December 2006 and January 2011 - December 2012

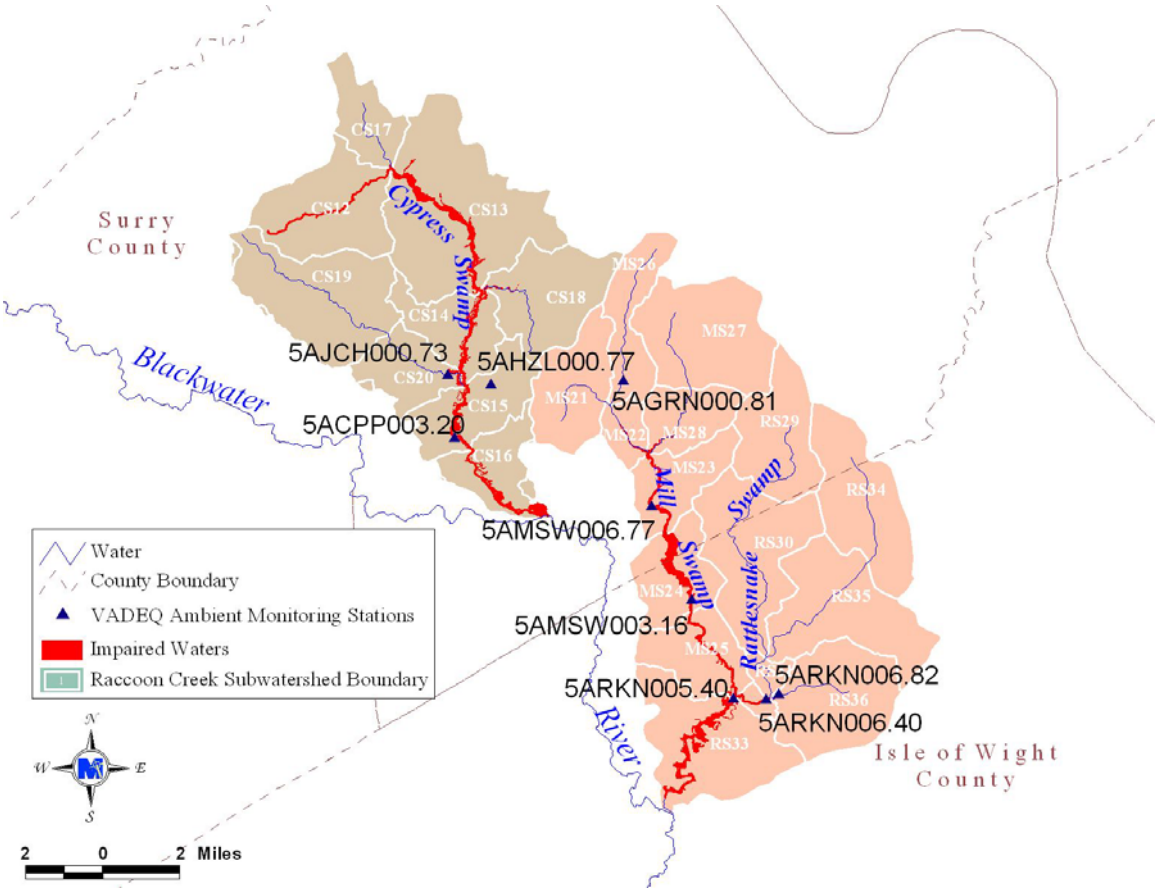

Figure 7.1 Location of VADEQ ambient monitoring stations in the Upper Blackwater River impaired watersheds.

Figure 7.2 Location of VADEQ ambient monitoring stations in the Raccoon Creek watershed.

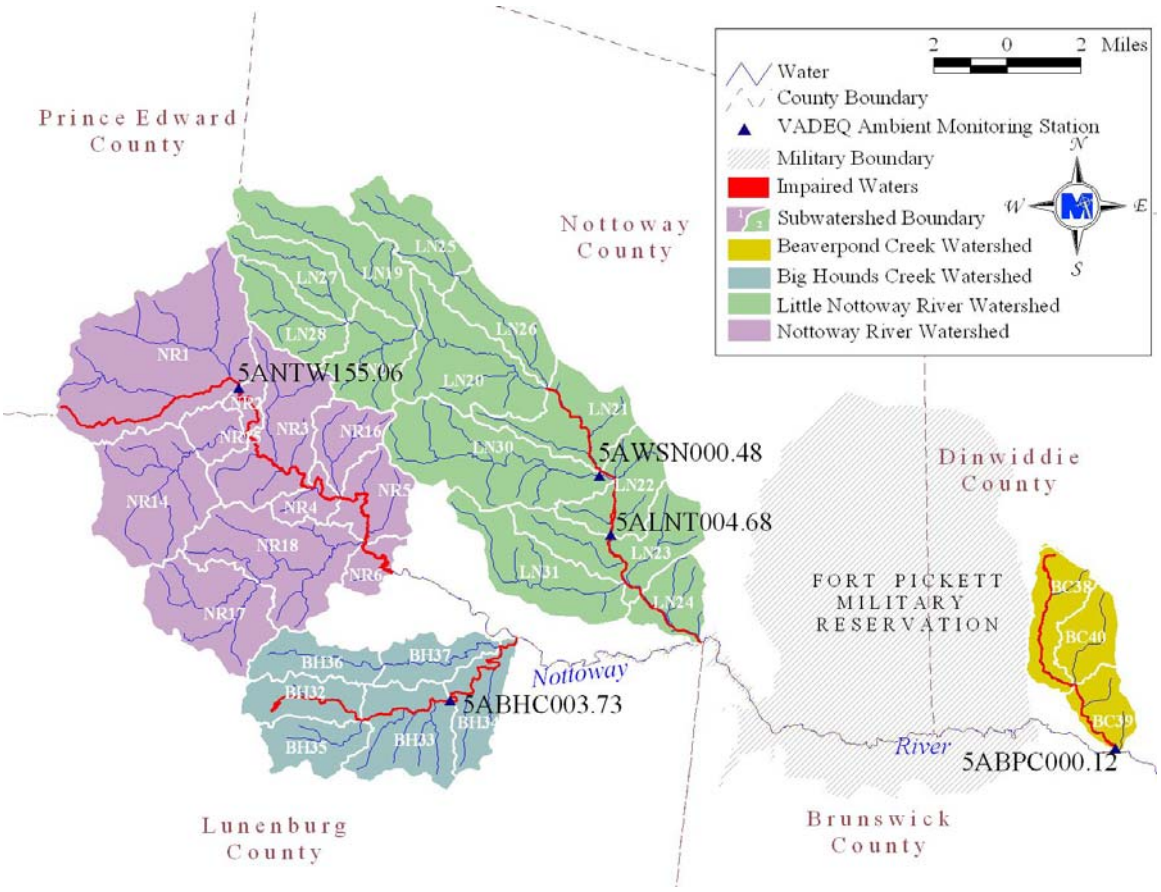

Figure 7.3 Location of VADEQ ambient monitoring stations in the Upper Nottoway River impaired watersheds.

7.2 Education

The SWCDs will be in charge of initiating contact with farmers to encourage the installation of industrial BMPs. This one-on-one contact will facilitate communication of the water quality problems and the corrective action needed. The industrial FTEs will conduct a number of outreach activities in the watershed to promote participation and community support to obtain the industrial program milestones and to make the agricultural 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 appropriate organizations such as Virginia Cooperative Extension to educate the public.

7.3 Legal Authority

The EPA has the responsibility of overseeing the various programs necessary for the success of the CWA. 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 in Virginia. These agencies are VADEQ, VADCR, VDH, and Virginia Department of Agriculture and Consumer Services (VDACS).

VADEQ has responsibility for monitoring 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. 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 surface and 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. Most VADCR programs dealing with agricultural NPS pollution have historically been 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-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 must be reevaluated to account for 100% participation. It should be noted, though, that VADCR does not have regulatory authority over the majority of NPS issues addressed here.

Through Virginia's Agricultural Stewardship Act (ASA), the 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. VDACS has only two staff members dedicated to enforcing the Farm Stewardship Act, and very little funding is available to support water quality sampling. The Agricultural Stewardship Act is entirely complaint-driven. In the last year reported (April 1, 2003 through March 31, 2004), more than 150 inquiries, of which 28 became official complaints, had been received statewide. VDH is responsible for maintaining safe drinking water measured by standards set by the EPA. Their duties also include septic system regulation and, historically, regulation of biosolids land application on permitted farmland sites. Additionally, VDH has the responsibility of conducting shoreline surveys to determine potential sources of contamination and for monitoring the waters for FC bacteria impairment of shellfish waters. Like VDACS, VDH's actions are 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 TMDLs, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes.

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 shown to be causing some harm to the claimant. The judicial branch of government also plays a significant role in the regulation of activities that impact water quality through hearing the claims of citizens in civil court and the claims of government representatives in criminal court.

7.4 Legal Action

The Clean Water Act Section 303(d) calls for the identification of impaired waters. It also requires that the streams be ranked by the severity of the impairment and a Total Maximum Daily Load be calculated for that stream that would bring it back into compliance with the set water quality standard. Currently, TMDL implementation plans are not required in the Federal Code; however, Virginia State Code does incorporate the development of implementation plans for impaired streams. The nonpoint source section of the Clean Water Act was largely ignored by EPA until citizens began to realize that regulating only point sources was no longer maintaining water quality standards. Beyond the initiation of the CWA, the entire TMDL program has been complaint-driven. Lawsuits from citizens and environmental groups citing EPA for not carrying out the statutes of the CWA began as far back as the 1970s and have continued until the present. In Virginia in 1998, the American Canoe Association and the American Littoral Society filed a complaint against EPA for failure to comply with provisions of §303d. The suit was settled by Consent Decree, which contained a TMDL development schedule through 2010. It is becoming more common for concerned citizens and environmental groups to turn to the courts for the enforcement of water quality issues.

In 1989, concerned residents of Castile, Wyoming County, New York filed suit against Southview Farm. Southview had around 1,400 head of milking cows and 2,000 total head of cattle. Tests on private wells determined that the water was contaminated with nitrates traced to irresponsible handling of animal wastes by Southview. In 1990, Southview was given a notice of violations under the Clean Water Act. Rather than change their farming practices or address the contaminated wells, they ignored the warning. In 1995, after court hearings and an appeal, the case was finally settled. Southview had to donate $15,000 to the Dairy Farms Sustainability Project at Cornell University, pay $210,000 in attorney fees for the plaintiff, and employ best management practices (Knauf, 2001).

On the Eastern Shore of Virginia, an aquaculture operation raising clams and oysters, brought suit against his neighbor, a tomato grower. The aquaculture operation owner claimed that the agricultural runoff created from the plasticulture operation carried

pollutants which were destroying his shellfish beds. The suit was settled out of court in favor of the aquaculture operation owner.

Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role, of course, falls on the landowner. However, local, state and federal agencies also have a stake in establishing that Virginia's waters are clean and provide a healthy environment for its citizens. An important first step in correcting the existing water quality problem is recognizing that there is a problem and that the health of citizens is at stake. Virginia's approach to correcting NPS pollution problems has been, and continues to be, encouragement of participation through education and financial incentives.

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APPENDIX A

Chowan Total Maximum Daily Load (TMDL) Implementation Plan (IP)
Upper Blackwater River and Raccoon Creek Impairments
First Industrial Working Group Meeting Minutes
May 17, 2005 7-9pm
Wakefield, VA

General Discussion

Welcome/Introductions

Chris French welcomed everyone and briefly explained the purpose of the meeting. He apologized for the compressed schedule and thanked everyone for attending. He explained the Virginia State Standards for fecal bacteria. The instantaneous standard is 235 colony forming units (cfu) per 100 mL of *E. coli*. The geometric mean standard is 126 cfu/100mL *E. coli*. These are our final water quality goals.

Review of the Chowan TMDLs:

Jim Kern reviewed the sources of fecal bacteria in the impaired stream segments in this study. He pointed to the handout with the table of final allocation scenarios for each impairment. This table shows the percent reductions of fecal bacteria load to each impaired stream. He mentioned that these reductions are stringent; however, there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

The Bacterial Source Tracking (BST) analysis done during the TMDL development was explained. The predominate source of fecal bacteria to Raccoon Creek is pets. The predominate sources of fecal bacteria to Cypress, Mill, and Rattlesnake Creek Swamps is livestock.

Industrial Group Participants:
Jim Kern – MapTech
Chris French – DEQ
Jennifer Howell – DEQ
Troy Griffin – DCR
Billie Jean Elmer – VCE
Stacey Bradshaw – Chowan SWCD
Sharon Hart - Local Resident

Industrial Working Group (IWG) Discussion

Participation in the IWG included state and local agency representatives (DEQ, DCR, VCE, and Chowan SWCD), one environmental group (Blackwater and Nottoway Riverkeeper Association), and one local stakeholder, none of which were agricultural producers in the watersheds of interest. Because of the lack of participation from

agricultural producers, the first item discussed was "how to encourage participation from local stakeholders." It was noted that this is a bad time of year to try to get farmers to participate, because they are busy with spring planting and hay harvest. Efforts to get additional participation will include notification of stakeholders through SWCDs, VCE, and local civic groups. Additionally, local newspapers (Tidewater News, Daily Press, Smithfield Times, Sussex Surry Dispatch) will be contacted to see if they will run articles describing the TMDL process and how it can impact stakeholders.

Primary roles of Industrial Working Group (IWG)

Jim Kern (MapTech) discussed the primary roles of the IWG which included:

- Identify outreach methods for reaching agricultural producers
- Review implementation strategies from an agricultural perspective
- Identify potential constraints to implementation of agricultural BMPs
- Identify BMPs for biosolids application
- Identify funding sources/partnerships that will promote implementation
- Identify timeline and measurable goals for meeting implementation goals

Discussion:

There was discussion about current animal numbers. Stacy Bradshaw (Chowan SWCD) suggested that in the Raccoon Creek watershed the number of horses reported was low, while the numbers for swine and poultry were probably high. Billie (VCE) reported that she knew of 5 swine operations with approximately 1,000 sows each in the Cypress Swamp watershed. She said that these operations monitor groundwater and surface water in nearby streams on a quarterly basis and report it to DEQ. Chris French (DEQ) agreed to locate this data and report these data.

BMPs for swine facilities were discussed and it was reported that the state cost-share program does not offer cost-share for new lagoons, but will offer cost-share for repairing failing lagoons and composting facilities. The current incentive for composting facilities is a 25% tax credit, but there are efforts underway to make 75% cost-share available for this practice. It was noted that composting poultry litter reduces fecal bacteria counts to near zero.

A question was raised as to whether there was a regulation prohibiting farmers from allowing cattle access to streams. It was reported that there was not and that current efforts focus on encouraging voluntary participation by farmers through incentive programs. It was also noted that imposing such a regulation without offering some assistance to farmers to pay for fencing and water supplies may force some operators out of business.

A question was raised as to the available programs for disseminating information about BMPs and associated incentives. The local SWCDs, VCE, and NRCS make efforts to inform farmers about their options. Often farmers are "repeat" customers, but efforts are made to bring in new participants. While funding has not been available to-date to make

a door-to-door approach feasible, the implementation of the TMDL may require such an approach.

The question was raised as to who controls funding that may become available upon completion of this IP. Within the IP document, a local entity or entities will be identified to disperse funding, track implementation and coordinate the search for additional funding. Often this entity is the local SWCD, however, other entities may be appropriate. For instance in some areas where IPs have been developed the local SWCD handles all of the programs, while in others the local SWCD handles only the agriculturally related programs and the local health department handles the residential issues.

One primary constraint to implementing practices that was identified was the cost of maintenance over the 10-year lifetime of most of the cost-shared BMPs. It was noted that there is a 25% tax credit available for maintenance on some practices.

Possible funding sources were discussed. "319" grant funds are supplied by EPA conforming to section 319 of the Clean Water Act. At a state level, DCR is responsible for grant distribution for non-point source programs. It was acknowledged that the 319 funds would be limited and additional funding sources should be investigated. The VA Water Quality Improvement Fund could be a possible source. The USDA CREP program is currently available as an alternative funding source for streamside fencing in the Raccoon Creek impairment. Additional funding sources for establishing buffers include US Fish and Wildlife Service and Department of Forestry. It was also suggested community foundations should be approached to see if they would be willing to fund BMPs.

Jeff Turner indicated that he would be attending the Steering Committee Meeting and would be willing to present key points from this group, which include:

(1) More participation is needed from agricultural producers in the impaired areas.

(2) Available support for BMP maintenance costs should be addressed in the IP.

(3) Additional funding sources may need to be identified to cover the needs of implementation.

Action items:

ii) DEQ (Chris French and Jennifer Howell) will continue to encourage participation form Peanut SWCD, local government, and other stakeholders, through e-mail and phone calls.

iii) DEQ (Chris French and Jennifer Howell) will contact local newspapers to run articles about the TMDL process.

iv) Chowan SWCD (Stacy Bradshaw), and VCE (Billie) will contact their clients to encourage participation.

v) Blackwater/Nottoway Riverkeeper (Jeff Turner) will contact local civic groups to encourage participation.

Chowan TMDL Implementation Plan (IP) Schedule:

- First Steering Co. meeting May 26, 2005 7pm 4-H Center Wakefield, VA
- Final Non-industrial WG meeting June 7, 2005 7pm location to be determined
- Final Steering Co. meeting June 13, 2005 7pm location to be determined
- Final Public meeting June 27, 2005 7pm location to be determined
- 30-day Public Comment Period begins June 27, 2005
- 30-day Public Comment Period ends July 27, 2005

Contacts

DEQ – Chris French – rcfrench@deq.virginia.gov; 804-527-5124

MapTech – James Kern – jkern@matech-inc.com; 540-961-7864 ext. 404

Chowan Total Maximum Daily Load (TMDL)
Implementation Plan (IP)
Upper Blackwater River and Raccoon Creek Impairments
Second Industrial Working Group Meeting Minutes

June 7, 2005 7-9pm

Zuni, VA

Introduction:

Chris French welcomed everyone and briefly explained the purpose of the meeting. Everyone introduced him/herself.

Review of the Chowan TMDLs:

Jim Kern reviewed the sources of fecal bacteria in the impaired stream segments in this study. He mentioned that the TMDL reductions are stringent; however, there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

He explained the Virginia State Standards for fecal bacteria. The instantaneous standard is 235 colony forming units (cfu) per 100 mL of *E. coli*. The geometric mean standard is 126 cfu/100mL *E. coli*. These are our final water quality goals.

Non-industrial Group Participants:

Jim Kern – MapTech; Chris French – DEQ; Troy Griffin – DCR; Stacy Bradshaw – Chowan Basin SWCD; Chuck Griffin – Peanut SWCD; Jeff Turner – Balckwater/Nottoway Riverkeeper; Jerry Parsons – Sussex/Surry Dispatch; Sharon Hart – Local Resident; Fred Weaver – Local Resident; Elizabeth Zimba – Local Farmer; One Additional Person who did not sign in.

Group Discussion:

Horses were identified as a major fecal bacteria source due to high stocking rates. Isle of Wight County has an ordinance limiting the number of horses per acre. However, no one was certain about the number allowed.

It was suggested at the IWG that there are efforts underway to establish state cost-share funding for composting facilities and pasture management for horses.

- Further investigation of this showed that the composting BMPs are for swine and poultry carcasses and not for horse manure. The SL-6A practice was originally intended to provide cost-share to horse owners for grazing land management, however, it currently provides only a 25% tax credit for horse owners unless they

are also agricultural producers as well, in which case a 75% cost-share is available.

Milestones are the yearly goals of BMP installation over the 5-year project. There was discussion among IWG members as to the best way to approach milestones. Some members suggested that graduated or phased milestones (*e.g.*, 5% in first year, 10% in second year, etc.) would be the most practical as education in the first few years will be a majority of the focus of the FTE. Other IWG members indicated a need to have the milestones graduated downward (*e.g.*, 40% in first year, 20% in second year, etc.) emphasizing the need to make stronger efforts early in the program, allowing time to convince reluctant stakeholders to participate.

There was much discussion of the types of agriculture in the area, attitudes of farmers, the state of current cost-share programs, and the needs for improvement of these programs.

Each of the SWCDs felt they could handle the management of the industrial implementation. The FTE job description handout was distributed for review.

The funding sources identified in the agenda seemed to be the most likely sources. A stakeholder mentioned that another possible funding source is VDGIF.

No-till cover crops were identified as a popular practice in this area due to the $40 per acre Virginia cost-share. This practice could be useful in systems where manure is applied to cropland. The additional ground cover will serve to keep manure on the landscape during storm events.

Another likely BMP for this area will be injection of swine manure on cropland or pasture. While there is no Virginia cost-share available for this practice, it was indicated that EQIP funding could be used to execute a demonstration project.

Chowan TMDL Implementation Plan (IP) Schedule:

Final Steering Co. meeting June 13, 2005 7pm Ruritan Club Zuni, VA
Final Public meeting June 27, 2005 7pm 4-H Center Wakefield, VA
30-day Public Comment Period begins June 27, 2005
30-day Public Comment Period ends July 27, 2005

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MapTech – Jim Kern jkern@maptech-inc.com 540-961-7864 ext. 404

Chowan Total Maximum Daily Load (TMDL)
Implementation Plan (IP)
Upper Blackwater River and Raccoon Creek Impairments
First Non-industrial Working Group Meeting Minutes

May 17, 2005 7-9pm
Wakefield, VA

Introduction:

Chris French welcomed everyone and briefly explained the purpose of the meeting. He apologized for the compressed schedule and thanked everyone for attending. He explained the Virginia State Standards for fecal bacteria. The instantaneous standard is 235 colony forming units (cfu) per 100 mL of *E. coli*. The geometric mean standard is 126 cfu/100mL *E. coli*. These are our final water quality goals.

Review of the Chowan TMDLs:

Jim Kern reviewed the sources of fecal bacteria in the impaired stream segments in this study. He pointed to the handout with the table of final allocation scenarios for each impairment. This table shows the percent reductions of fecal bacteria load to each impaired stream. He mentioned that these reductions are stringent; however, there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

The Bacterial Source Tracking (BST) analysis done during the TMDL development was explained. The predominate source of fecal bacteria to Raccoon Creek is pets. The predominate sources of fecal bacteria to Cypress, Mill, and Rattlesnake Creek Swamps is livestock.

Non-industrial Group Participants:

Frances Geissler – DCR; Kevin Curling – Local Resident; Henry McBurney – local resident ; Megan Laird – MapTech; Mark Alling – DEQ; - Lee Allen - Sussex Co VDH; - Chuck Leonard - Crater VDH District; Curtis Newsome and son - Local Resident; Al Glover - Local Resident

Group Discussion:

The Sussex VDH representative stated that the number of failing septic systems and straight pipes is over estimated in the handout. The Crater VDH District representative stated that the numbers are high for Cypress Swamp also. He said that values of 5% of the total households in the watershed are failing septic systems and 3% of the households have straight pipes. It was agreed that the values and costs would be changed to reflect these numbers.

The high number of failing septic systems could be due to adjustments to account for pit privies in the watershed.

A question was asked: How can you tell if a septic system is failing? VDH answered that there is backup of sewage in the home or the yard is saturated and has an odor.

It was brought up that Hunt Club kennels commonly wash dog feces out of pens and this waste can easily travel to nearby streams. A local stakeholder mentioned that contacting Animal Control, local Game Wardens, and VDGIF might help in locating and initiating contact with these Hunt Clubs. Concern was raised that we should not go to Hunt Clubs with orders that they are required to follow as hostilities toward the IP might develop. Instead, this group should identify appropriate and cost-effective Best Management Practices (BMPs) that would benefit the Hunt Club and the water quality near them. Also, funding sources need to be identified to initiate a cost-share program to help bear the financial costs of the BMPs. Frances Geissler of DCR volunteered to look up funding sources that would be appropriate.

Possible BMPs identified for use in Hunt Clubs were: burying waste, composting waste, landfilling waste, collecting waste washed out of pens into a pond via a grassed waterway, and using sand filters to clean waste water. It was mentioned that there is a need for a BMP to address the disposal of animal carcasses.

The Crater VDH District rep stated that anything we (in the IP) recommend must meet VDH regulations for dealing with pet waste. He agreed to send DEQ and MapTech these regulations and specifications. He also said that it is important to have an idea of the BMPs that we want to implement and funding sources in place before knocking on doors to correct failing septic systems and straight pipes.

The group discussed the need for county-wide programs directed at citizens to pick up pet waste. Mark Alling (DEQ) and Megan Laird (MapTech) agreed to contact local county governments to inquire about sending representatives to meetings and ask about starting such programs.

A question was raised and Mark Alling discussed biosolids applications in the Raccoon Creek watershed. He said that DEQ asks people to contact them when neighbors are applying biosolids. DEQ goes to that farm and takes stream water samples after a rain event. DEQ observed that when a farmer tills the ground and mixes the biosoilds in, there is less fecal bacteria in the stream samples than when farmers do not till.

Kevin Curling volunteered to be the representative on the Steering Committee.

Major Issues to Report to the Steering Committee:

1. The number of failing septic systems and straight pipes has been revised as per information from VDH representatives (new handout for Steering Committee).

2. The NIWG believes dogs used for hunting typically kept at Hunt Clubs are to blame for the high amount of fecal bacteria originating from dogs.

a. Concern was raised that we should not go to Hunt Clubs with orders that they are required to follow as hostilities toward the IP might develop. Instead, this group should identify appropriate and cost-effective Best Management Practices (BMPs) that would benefit the Hunt Club and the water quality near them.

b. Some BMPs identified for Hunt Clubs were: burying waste, composting waste, landfilling waste, collecting waste washed out of pens into a pond via a grassed waterway, and using sand filters to clean waste water.

3. The NIWG would like to see participation from local/county governments in order to implement county-wide dog-waste-pick-up programs.

4. Thoughts from the Steering Committee representative.

Action Items:

VDH reps – Send Megan and Mark information on pet waste regulations and specifications.

Frances Geissler – Determine some appropriate funding sources for: initiating pet waste programs; correcting failing septic systems and straight pipes; and installing waste treatment systems at Hunt Club kennels. Bring this information to Steering Co meeting or next NIWG meeting.

Megan Laird and Mark Alling– Contact local government representatives to encourage participation and find out feasibility of county-wide pet waste management programs.

Megan – Determine the most cost-effective and efficient BMPs to treat Hunt Club kennel waste.

Megan – Assimilate the information from VDH on numbers of failing septic systems and straight pipes. Create a new handout for the Steering Committee.

Chowan TMDL Implementation Plan (IP) Schedule:

First Steering Co. meeting	May 26, 2005 7pm 4-H Center Wakefield, VA
Final Non-industrial WG meeting	June 7, 2005 7pm location to be determined
Final Steering Co. meeting	June 13, 2005 7pm location to be determined
Final Public meeting	June 27, 2005 7pm location to be determined

30-day Public Comment Period begins June 27, 2005
30-day Public Comment Period ends July 27, 2005

Contacts:

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Glossary of Terms:

TMDL – Total Maximum Daily Load – the amount of bacteria a stream can handle and still meet water quality goals (the bacteria standards).

IP – Implementation Plan – the document that lays out the procedure to follow in order to meet the TMDL.

BMP – Best Management Practices – programs, structures or operations that prevent pollutants from reaching streams/rivers/lakes with the purpose to establishing good water quality.

BST – Bacterial Source Tracking – an analysis of fecal bacteria sources (usually wildlife, livestock, pet, and human) that shows the percentage of each source in the bacteria in the stream.

Delist – The removal of a stream from the 303b/305(d) list, which is put together by the Virginia DEQ every 2-4 years and includes all streams that do not meet water quality standards.

Biosolids – Solid waste from a Sewage Treatment Plant.

Chowan Total Maximum Daily Load (TMDL)
Implementation Plan (IP)
Upper Blackwater River and Raccoon Creek Impairments
Second Non-industrial Working Group Meeting Minutes

June 7, 2005 7-9pm

Zuni, VA

Introduction:

Chris French welcomed everyone and briefly explained the purpose of the meeting. Everyone introduced him/herself.

Review of the Chowan TMDLs:

Jim Kern reviewed the sources of fecal bacteria in the impaired stream segments in this study. He mentioned that the TMDL reductions are stringent; however, there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

He explained the Virginia State Standards for fecal bacteria. The instantaneous standard is 235 colony forming units (cfu) per 100 mL of *E. coli*. The geometric mean standard is 126 cfu/100mL *E. coli*. These are our final water quality goals.

Non-industrial Group Participants:

Megan Laird – MapTech; Susan Ridout – DEQ; Frances Geissler – DCR; Larry Griffin - Western Tidewater VDH; Kevin Curling – Local Resident; Curtis Newsome – Local Resident/Riverkeeper Program; Jennifer Howell – DEQ; Jo Weaver – Local Resident

Group Discussion:

At the 1st NIWG the VDH representatives stated that the numbers of failing septics and straight pipe estimates were too high. They gave more realistic numbers. After that meeting Megan Laird (MapTech) learned that the numbers were increased to account for pit privies. At the Steering Committee meeting it was decided that the estimates from the TMDL should be used to stay consistent throughout the project. The NIWG agreed this was the right path.

Milestones are the yearly goals of BMP installation over the 5-year project. The NIWG decided the best approach to this was through phases over the 5 yr period – instead of equal increments – such as 20% ea yr. Graduated or phased milestones (*e.g.*, 5% in first year, 10% in second year) would be the most practical as education in the first few years will be a majority of the focus of the FTE. The milestone goals should be adjusted as the BMPs or plan is implemented.

It was also mentioned that the focus (aka "targeting") should be on the area surrounding the impaired segments and then moving away from there.

Frances Geissler of DCR stated that in her search for costs of BMPs that could be used on dog kennels she found that composting dog waste is more difficult than the NIWG previously thought. Pet waste composting has it drawbacks – 1) the bacteria in the waste persists while composting unless it is exposed to high temperatures, or 2) it will die off as the pile sits for a couple of years. She found that most composting systems need a digester (an enzyme) added to help facilitate the break down of the waste. This digester is based on what the dogs are fed. Dog compost can only be used on ornamental/flower beds. Also, you can not add household wastes to it during composting.

Because of the increasing complexity of composting dog waste, it was agreed that some kind of research on the best BMP for use with the disposal of dog waste is warranted. Susan Ridout agreed to contact local community colleges to see if any professors/students are interested in performing research on this topic. If there is interest, this research could occur during the first year of implementation. If it is appropriate, the research could be used as a demonstration during a field day hosted by Extension Specialists and the FTE. Susan agreed to do some more research (which includes looking into the published literature) on this – to see if there are any case studies or more information about how this practice works (best methods) and the viability of bacteria in pet-waste compost, or for that matter, in the ground supposing the pet wastes are buried.

There was an idea to develop an easy way to rake or shovel the dog waste into bags for owners to dispose of via the county landfill.

The VDH representative stated that many animal shelters have standard septic systems. These have problems because rainwater gets washed into them, they fill up, then back up during storms. Also animal hair does not break down and commonly clogs the system and repairs/pump outs are required more often. He also stated that he is not aware of any regulations regarding the handling of pet waste by VDH (another VDH rep stated there were regulations n pet waste during the first NIWG meeting). DEQ staff will follow up on this by contacting the VDH staff from the first meeting.

The VDH rep stated that there were new laws established in 2004. If land does not perc under the current laws, the residence needs to install an alternative treatment system that can handle the waste.

There is still some question (from the NIWG) as to where the NonIndustrial FTE person will be housed. It was suggested to ask the Hampton Roads Planning District if they would be interested. The FTE would not be an "enforcer", but would work to educate people about residential waste treatment, funding and the likelihood of enforcement down the road.

The handout of the FTE job description was discussed. The NIWG suggested that "Provide information about straight pipes, failing septic systems and the IP" be added.

Instead of "local SWC and NRCS" in the first bullet, the FTE should work with Extension Specialists to determine the most appropriate BMP for each dog kennel.

Potential funding sources were discussed. The State Water Quality Improvement funds are mainly used to decrease nutrient loading to streams and is not appropriate for this residential portion of this IP. Larry Griffin (VDH – Tidewater) said there is a local/county government source - STOP - which is an organization that helps rehabilitates homes, which can include updating waste treatment facilities. Megan agreed to do a little more research on this topic. Additional research on state Cost Share funds (specifically past programs in TMDL areas) needs to be done to see what may available for the residential septic systems.

Chowan TMDL Implementation Plan (IP) Schedule:

Final Steering Co. meeting June 13, 2005 7pm Ruritan Club Zuni, VA
Final Public meeting June 27, 2005 7pm 4-H Center Wakefield, VA
30-day Public Comment Period begins June 27, 2005
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Contacts:

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DEQ – Jennifer Howell - jshowell@deq.virginia.gov; 757- 518-2111
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Chowan Total Maximum Daily Load (TMDL)
Implementation Plan (IP)
Upper Blackwater River and Raccoon Creek Impairments
First Steering Committee Meeting Minutes

May 26, 2005 7-9:30pm
Wakefield, VA

General Discussion

Welcome/Introductions

Chris French welcomed everyone and briefly explained the purpose of the meeting. Everyone introduced himself or herself and signed in.

Steering Committee Participants:

Curtis Newsome – Local Resident/BNRP
Alice Presson - Local Resident
Kevin Curling – Local Resident
Jeff Turner – Blackwater/Nottoway Riverkeeper Program (BNRP)
Stacey Bradshaw – Chowan SWCD
Jon Hartley – Isle of Wight Planning Dept.
Rachel Morris – Isle of Wight County Rural Economic Development
Frances Geissler – DCR Suffolk office
Megan Laird – MapTech
Roger Everton - DEQ
Chris French – DEQ
Susan Ridout – DEQ

Review of the Chowan TMDLs:

Chris French reviewed the sources of fecal bacteria in the impaired stream segments in this study. He pointed to the handout with the table of final allocation scenarios for each impairment. This table shows the percent reductions of fecal bacteria load to each impaired stream. He mentioned that there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

The Bacterial Source Tracking (BST) analysis done during the TMDL development was explained. The predominate source of fecal bacteria to Raccoon Creek is pets. The predominate sources of fecal bacteria to Cypress, Mill, and Rattlesnake Creek Swamps is livestock.

NonIndustrial Working Group (NIWG) Discussion

Types of BMPs to concentrate on:

- New septic systems or alternative treatment systems for failing septic and straight pipe correction.
- Septic tank Pump Out Program
- Alternate on-site domestic waste treatment systems (CBLAD specifications & designs as a possible consideration)

❖ Issue from the Steering Co:

  - Septic programs are difficult to enforce
  - There was a discussion about the role of education and financial assistance. One view was education should have a role, but cost share assistance is more important. After additional discussion, it was recommended a combination of both should be used for future implementation efforts.

- Install septic systems or compost system for kennels.

❖ Issue from the Steering Co:

  - These BMPs will need to be site specific because each kennel is very different
  - Should find a cost range and use the average for IP estimations
  - The technical FTE should have flexibility when designing the kennel BMPs

- Have localities initiate dog pick-up programs

❖ Issue from the Steering Co:

  - These programs are usually by towns
  - The same results could be had from educating instead of issuing county ordinances

How to identify straight pipes and failing systems:

We would rely on educational component of FTE's job to identify houses with need for new treatment systems. Stream walks are not an option due to swampy conditions of the area.

The FTE could:

- Have information at local events: fairs, Community group meetings, etc.

Recommendations for local contractors:

VDH representatives at the NIWG meeting stated that there are regulations on treating pet waste that would have to be followed if kennels are reported to VDH.

❖ It was recommended in the Steering Committee the FTE hired to deal with the NonIndustrial (residential) issues work under an agency other than VDH to facilitate flexibility in the BMPs used to treat waste from kennels.

Concerns of the NIWG:

Getting accurate numbers of dog kennels.

Steering Committee discussion:

- DEQ has since obtained game check station locations and maps of kennels they observed during a watershed tour.
- It was suggested to send Animal Control a map of the watersheds and they could tell how many kennels are present.

Initiating contact with kennel owner/operators in a way that does not induce hostility toward the IP.

- Ideas from the Steering Committee on this were:
  - The FTE would pass out brochure or speak at Hunters Safety classes about IP program
  - Have information at local events: dog trials, fairs…

Stacey Bradshaw (Chowan Basin SWCD) stated there are problems with old agricultural drainage tiles interfering with residential septic drain fields. The agricultural tiles move the residential wastewater before it is completely processed by the soils under the septic drain field. To prevent this, the Department of Health (DOH) has guidelines that old agricultural tiles must be 75 feet from all residential drain fields that need to be followed more closely. A brochure made by the Chowan SWCD will be given to residents in the area educating them about old agricultural drainage tiles. This brochure could be modified and used in these watersheds.

The committee discussed the impacts of feral dogs in these watersheds.

Industrial Working Group (IWG) Discussion

More participation from local agricultural producers is needed:

- Ideas from the Steering Co:
  - Adds in local newspapers
  - Use Extension agents to get the word out

Funding Sources:

The WP2T system has an upfront $0.5 per foot maintenance payment incorporated in it.

- Ideas from the Steering Co:
  - We should initiate contact for corporate funding of BMPs (Smithfield, Murphy-Brown, etc.).

FTE:

Full-Time Employees (FTEs) - Could be employed by the local SWCD, or VDH, or both.

- Ideas from the Steering Co:
  - Because there are 2 SWCDs, the estimated costs of FTE could be given to each SWCD and they can hire FTE that would work with their administration. The agricultural FTE could work with the local SWCD, in the same office, but be employed by a different agency.

Since the first IWG meeting, it was determined that the 5 swine operations mentioned are located outside of the Cypress Swamp watershed.

There are many horses in the watersheds because farmers are boarding horses to get extra money. Consideration needs to be given to horse BMPs.

The handout with Table 3 shows new stream fencing numbers and total costs. The stream fencing analysis was performed using perennial and intermittent streams. (Originally, only perennial streams were considered.) The Steering Co decided this was appropriate. It was decided the SL6, WP2T and hardened crossings cost estimations were accurate.

An updated data layer of land use would be helpful in the future as implementation progresses. (The land use data used in the TMDL was from 1992 MRLC data.)

Funding:

319 money, a large source of past TMDL IP funding, is being spread thin. EPA is guiding DCR to use this money specifically to cover FTE costs. It cannot be used for correcting straight pipes, dealing with Confined Animal Feeding Operations (CAFOs) or VPAs (point sources).

Virginia Cost-share program is getting $4 million to Southern Rivers area, but this money has not been distributed to the Soil & Water Conservation Districts yet.

15% of State Cost-Share can be directed toward FTE.

The goal of the IP is to establish a funding scenario that will provide a set amount of money each year to be used toward installing BMPs and paying the FTEs. We will write the IP with the ideal funding and adjust as implementation progresses.

We can use the final IP to "sell" our need to grant/loan programs to get funding because we will know exactly what we need and how much it will cost.

It was mentioned one possible source of funding could be community foundations.

Action items:

Chowan SWCD and Frances Geissler agreed to look up more accurate costs of NPS agricultural BMPs

Megan Laird to send Chris French watershed boundary GIS shapefiles. Chris will distribute this to interested individuals.

Chowan TMDL Implementation Plan (IP) Schedule:

- Final WG meetings June 7, 2005 7pm Ruritan Club Zuni, VA
- Final Steering Co. meeting June 13, 2005 7pm Ruritan Club Zuni, VA
- Final Public meeting June 27, 2005 7pm 4-H Center Wakefield, VA
- 30-day Public Comment Period begins June 27, 2005
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Chowan Total Maximum Daily Load (TMDL) Implementation Plan (IP)
Upper Blackwater River and Raccoon Creek Impairments
Second Steering Committee Meeting Minutes

June 13, 2005, 7-9:30pm
Zuni, VA

Welcome/Introductions

Susan Ridout welcomed everyone and briefly explained the purpose of the meeting. Everyone introduced himself or herself and signed in.

Steering Committee Participants:
Curtis Newsome – Local Resident/Riverkeeper Association
Kevin Curling – Local Resident/Riverkeeper Association
Mark Harrup – Isle of Wight Planning Dept.
Sara Jordan – DCR
Megan Laird – MapTech
Mark Alling - DEQ
Jennifer Howell – DEQ
Susan Ridout – DEQ

Review of the Chowan TMDLs:

Susan Ridout explained the impaired streams are exceeding the fecal bacteria standard and the Implementation Plan is going to outline the efforts to clean up the streams.

NonIndustrial Working Group (NIWG) Discussion

The Agenda Topics:

- Education program – How much in the budget?
    - During the Nottoway Steering Committee meeting (6/13/05), Jason Ericson (DCR) agreed to get a current budget for an ongoing residential education program in SW VA. Megan Laird (MapTech) will take this value and add $5,000 to cover the cost of the demonstration project.
    - The Blackwater/Raccoon Steering Committee agreed to use this value for the Blackwater/Raccoon education program budget also.
- Milestones graduated

- The Steering Committee (SC) decided to use the Milestones:
  - 5, 20, 55, 80, 100 % cumulative completion of BMPs each year

- Technical FTE
  - Decide employer
    - The Steering Committee decided to ask the SWCDs if one of them can house the Residential FTE
    - Depending on their answer the SC will make a decision via email correspondence
  - Number of FTEs
    - The SC decided that 1 FTE can handle the Residential responsibilities for the Blackwater/Raccoon impairments

General Discussion:

- There will be a summary of the final IP report written in booklet form for the Blackwater/Raccoon impairments. An example booklet was passed around at the SC meeting.
- The Steering Committee decided that the BST results should be in the booklet

Industrial Working Group (IWG) Discussion

- Streamside Fencing updates based on existing BMPs
  - At the IWG meeting (6/7/05) MapTech stated that there are no fencing BMPs currently installed in the Raccoon Creek watershed, so there are no updates in the fence estimates.
- Milestones graduated
  - The Steering Committee (SC) decided to use the Milestones:
    - 5, 20, 55, 80, 100 % cumulative completion of BMPs each year
- Technical FTE
  - Decide employer
    - The SC decided that MapTech would estimate the number of FTEs required to install all the Industrial (agricultural) BMPs, however this money would be given to the SWCDs. Whether they hire new technicians or not, they will be held accountable for the BMP installations by DCR.
  - Number of FTEs
    - Estimates of Industrial FTE requirements will be sent to the SC later this week.

Monitoring Plan

- DEQ to supply the monitoring plan for these streams
    - Susan Ridout and Mark Alling (DEQ) will supply MapTech of all DEQ monitoring stations and descriptions that will be sampled during the implementation process
- Other monitoring (Riverkeepers…?)
    - The Blackwater/Nottoway Riverkeeper Association members will ask their group if they want to monitor 8 stations by Coliscan in the TMDL IP watersheds.
    - There will be two Coliscan stations in each of the Raccoon, Cypress, Rattlesnake and Mill Swamp watersheds. DEQ may split fecal coliform/E. coli samples with the Riverkeeper Association Coliscan monitoring to provide data for assessment and possible de-listing.

IP Costs and Funding

- DCR and MapTech to discuss possible funding sources
    - Jason Ericson (DCR) said at the Nottoway Steering Committee (6/13/05) that the Chowan IP could get on the 319 list for 2006
- Committee to discuss and determine entity in charge of funds
    - The SC decided the SWCDs would be in charge of all Ag funds and the SWCD housing the NonIndustrial FTE would be in charge of the NonIndustrial (Residential) funds.

Action items:

DEQ – Create future monitoring plan for Raccoon Creek and the Blackwater tributaries. Provide the plan, stations locations, and descriptions to MapTech

MapTech – Quantify Ag BMPs required and associated costs, Quantify Residential BMPs required and associated costs, send tables to SC, Identify possible funding scenarios for 1 year, perform all modeling required to determine milestone water quality goals, perform all modeling required to determine targeting of BMPs, finish draft report and booklet, create presentation for final meeting, send all this to DEQ for review

Chowan TMDL Implementation Plan (IP) Schedule:

- Final Public meeting June 27, 2005 7pm 4-H Center Wakefield, VA
- 30-day Public Comment Period begins June 27, 2005

- 30-day Public Comment Period ends July 27, 2005

Contacts

DEQ – Chris French rcfrench@deq.virginia.gov; 804-527-5124
DEQ – Mark Alling msalling@deq.virginia.gov; 804-527-5021
DEQ – Jennifer Howell jshowell@deq.virginia.gov; 757-518-2111
DEQ – Susan Ridout saridout@deq.virginia.gov; 804-527-5005
MapTech – Jim Kern jkern@maptech-inc.com; 540-961-7864 ext. 404
MapTech – Megan Laird mlaird@maptech-inc.com; 540-961-7864 ext. 407

Chowan Total Maximum Daily Load (TMDL) Implementation Plan (IP)

Upper Nottoway River Impairments

First Industrial Working Group Meeting Minutes

May 18, 2005 7-9pm

Blackstone, VA

Introduction:

Kelly Wills welcomed everyone and briefly explained the purpose of the meeting. She explained the Virginia State Standards for fecal bacteria. The instantaneous standard is 235 colony forming units (cfu) per 100 mL of *E. coli*. The geometric mean standard is 126 cfu/100mL *E. coli*. These are our final water quality goals.

Review of the Chowan TMDLs:

Jim Kern reviewed the sources of fecal bacteria in the impaired stream segments in this study. He pointed to the handout with the table of final allocation scenarios for each impairment. This table shows the percent reductions of fecal bacteria load to each impaired stream. He mentioned that these reductions are stringent; however, there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

The Bacterial Source Tracking (BST) analysis done during the TMDL development was explained. The predominate source of fecal bacteria to Big Hounds Creek is pets, for the Nottoway River it is livestock, for Little Nottoway River it is wildlife followed closely by pets, and for Beaverpond Creek the predominate source of fecal bacteria is human.

Non-industrial Group Participants:

Bobby Long – VCE; John Fulton – Southside SWCD; Ricky Rash – Piedmont SWCD; Kelly Wills – DEQ; Jim Kern - MapTech

Group Discussion:

Need to contact Dr. Elzay: master gardener, good agricultural contact, very involved.

- 8:00pm meeting may be better attended.
  - Speak at July Farm Bureau picnic 1st Monday
  - Have meeting right before Farm Bureau meeting so go can from one meeting to another
  - Change meeting date to Wednesday June 8 because another meeting is on that Monday (Farm Bureau meeting?)

- Check on hunt clubs and get them involved
- Ricky Rash: Technical assistance is a problem because they need engineering assistance for BMPs
    - There is a 6-month wait for ponds
- Fox pen and dogs in the Nottoway River watershed could be a source
- Martin's hog farm could be a source
- Biosolids
    - Little Nottoway has received a lot, but the biosolids BMPs are supposed to be implemented along the way and won't affect the TMDL or IP
    - Russell Leslie (Nottoway Co. biosolids coordinator) usually observes biosolids applications
    - Want to check accuracy of incorporation
    - Point made that there are strict boundaries and rules for biosolids, but manure can be spread wherever!
- Goal of IP is to get everyone to put in watering systems
- What are the holdups for SL6 and CREP?
    - Ricky: Many farmers in the area farm as a hobby and have less than 50 cows, therefore it isn't economically feasible to fence out cows/ no economic incentive
        - Many producers not vaccinating etc., because the farmers have cattle as a hobby and are doing it as cheaply as possible. They sell the cows we they need a little extra money
    - Jamie: Advertising and education are shortcomings: she farms and personally only knows about these programs from word of mouth
        - People the district knows received direct mailings etc. say they knew nothing about meetings/programs!
    - People don't want the government around
    - Fencing using NRCS specs is too expensive
    - Keyword is Profitability; folks are barely breaking even.
    - Social and cultural issues
    - Jim: What about CREP instead of SL6? That could work but some ponds are near homes and owners don't want to plant trees around the entire pond, which is a CREP requirement.
- Funding Sources
    - CREP
    - Shot at 319 funds ?
    - Maybe in the future there will be nutrient trading money (will come to forefront in upcoming election)
    - State Cost-share money
    - EQIP

  - WRP
  - WHIP
  - Community Foundation Grants? Only if they come from outside of our region (such as Albemarle Sound)
  - Supplemental Environmental Projects (SEPs)
- Issue: horses don't quality for BMP $$. Trying to get some pilot programs going
- Technical Constraints:
  - Engineering assistance needed
  - Limited but adequate contractor availability for BMP installation
  - Need to include hound folks, producers, Farm Bureau
- Fencing Estimates
  - Usually look at perennials in pasture, plus farm tracts from FSA. May need to look at intermittent streams because of the high reductions needed for the TMDL. SWCD says if there's water present, it must be fenced. In winter, there will be water, but in July there isn't. This can kill the practice because there are so many feet of fencing needed for the intermittent streams.
- Steering Committee
  - Ricky suggested that the steering committee meetings be during the day at 1:00pm or 2:00pm. For producers, either feed them at night or have a 7:00am meeting
  - Decided that John Fulton will represent SWCD, Dennis Jones will represent the NRCS in Prince Edward Co., and Bonnie Thompson can delegate who will represent from Appomattox SWCD

Chowan TMDL Implementation Plan (IP) Schedule:

First Steering Co. meeting	May 26, 2005 7pm VT Ag Research Blackstone, VA
Final Non-industrial WG meeting	June 6, 2005 7pm VT Ag Research Blackstone, VA
Final Steering Co. meeting	June 13, 2005 7pm VT Ag Research Blackstone, VA
Final Public meeting	June 27, 2005 7pm VT Ag Research Blackstone, VA
30-day Public Comment Period begins	June 27, 2005
30-day Public Comment Period ends	July 27, 2005

Contacts:

DEQ – Kelly Wills kjwills@deq.virginia.gov; phone (434) 582-5120 ext. 6042
MapTech – Jim Kern jkern@maptech-inc.com; 540-961-7864 ext. 407

Glossary of Terms:

TMDL – Total Maximum Daily Load – the amount of bacteria a stream can handle and still meet water quality goals (the bacteria standards).

IP – implementation Plan – the document that lays out the procedure to follow in order to meet the TMDL

BMP – Best Management Practices – programs, structures or operations that prevent pollutants from reaching streams/rivers/lakes with the purpose to establishing good water quality

BST – Bacterial Source Tracking – an analysis of fecal bacteria sources (usually wildlife, livestock, pet, and human) that shows the percentage of each source in the bacteria in the stream.

Delist – The removal of a stream from the 303b/305(d) list, which is put together by the Virginia DEQ every 2 years and includes all streams that do not meet water quality standards.

Biosolids – Solid waste from a Sewage Treatment Plant.

Chowan Total Maximum Daily Load (TMDL) Implementation Plan (IP)

Upper Nottoway River Impairments

First Non-industrial Working Group Meeting Minutes

May 18, 2005 7-9pm

Blackstone, VA

Introduction:

Kelly Wills welcomed everyone and briefly explained the purpose of the meeting. She explained the Virginia State Standards for fecal bacteria. The instantaneous standard is 235 colony forming units (cfu) per 100 mL of *E. coli*. The geometric mean standard is 126 cfu/100mL *E. coli*. These are our final water quality goals.

Review of the Chowan TMDLs:

Jim Kern reviewed the sources of fecal bacteria in the impaired stream segments in this study. He pointed to the handout with the table of final allocation scenarios for each impairment. This table shows the percent reductions of fecal bacteria load to each impaired stream. He mentioned that these reductions are stringent; however, there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

The Bacterial Source Tracking (BST) analysis done during the TMDL development was explained. The predominate source of fecal bacteria to Big Hounds Creek is pets, for the Nottoway River it is livestock, for Little Nottoway River it is wildlife followed closely by pets, and for Beaverpond Creek the predominate source of fecal bacteria is human.

Non-industrial Group Participants:

Hilton Haynes – Dept. of Forestry; Mike Banta – Dinwiddie Co VDH; Jamie Hawley – Nottoway Co VDH; Megan Laird – MapTech; Amanda Gray – DEQ

Group Discussion:

Mike Banta, Dinwiddie Co VDH representative, stated that the number of failing septic systems and straight pipes is over estimated for Beaverpond Creek in the handout. Failing septic systems should only be 5-10% of all households with septic systems. Jamie Hawley Nottoway Co VDH representative stated that the numbers are high for Little Nottowy River also. It was agreed that the values and costs would be changed to reflect their numbers.

It was brought up that Hunt Club kennels commonly wash dog feces out of pens and this waste can easily travel to nearby streams. It was mentioned to contact Animal Control, local Game Wardens, and VDGIF might help in locating and initiating contact with these Hunt Clubs. Concern was raised that we should not go to Hunt Clubs with orders that

they are required to follow as hostilities toward the IP might develop. Instead, this group should identify appropriate and cost-effective Best Management Practices (BMPs) that would benefit the Hunt Club and the water quality near them. Also, funding sources need to be identified to initiate a cost-share program to help bear the financial costs of the BMPs.

Possible BMPs identified for use in Hunt Clubs were: burying waste, composting waste, landfilling waste, installing septic systems to collect and treat both wet and dry waste.

Ideas for how to educate Hunt Club members about the pet waste problem and possible solutions were discussed. One idea was to incorporate education through Fire Arms Safety classes that are required for hunters to get licenses. Also, requiring Hunt Clubs to be inspected before getting a kennel license would allow for regulations on installing waste treatment systems. There could be monetary incentives given to counties that meet the standards set by the IP regarding waste handling.

Mike suggested that to deal with overflows instead of increasing the capacity of the Victoria STP and other WWTPs in the watershed, we could install neighborhood alternative onsite treatment systems. The town/county government would own these systems and they would be responsible for maintenance and sampling.

There is currently an Indoor Plumbing Grant used in the area to fund plumbing and waste treatment facilities for residents without it. These people currently have outhouses or throw waste on the ground in the woods.

The group discussed the need for county-wide programs directed at citizens to pick up pet waste. This could become an ordinance. Blackstone already has an ordinance that each household can own only 2 dogs within the town limits.

It was discussed that the Full-Time Equivalent (FTE) or technical person hired through funds from the IP should concentrate efforts on education. Going to dog trials with brochures about the IP and local fairs/markets could get participation in both pet waste programs and residential systems maintenance.

Megan and Amanda will be at the Steering committee meeting and can reply the major issues of the NIWG.

Major Issues to Report to the Steering Committee:

5. The number of failing septic systems and straight pipes has been revised as per information from VDH representatives (new handout for Steering Committee).

6. The NIWG believes dogs used for hunting typically kept at Hunt Clubs are to blame for the high amount of fecal bacteria originating from dogs.

   Concern was raised that we should not go to Hunt Clubs with orders that they are required to follow as hostilities toward the IP might develop. Instead, this group should identify appropriate and cost-effective Best Management

Practices (BMPs) that would benefit the Hunt Club and the water quality near them.

Some BMPs identified for Hunt Clubs were: burying waste, composting waste, landfilling waste, installing septic systems to collect and treat both wet and dry waste.

7. The NIWG would like to see participation from local/county governments in order to implement county-wide dog-waste-pick-up programs.

8. Thoughts from the Steering Committee representatives.

Action Items:

Mike Banta – Send Megan information on the in-door plumbing grant program.

Megan Laird and Amanda Gray – Contact local government representatives to encourage participation and find out feasibility of county-wide pet waste management programs.

Amanda – Contact DCR and invite representatives to next meetings.

Megan – Determine the most cost-effective and efficient BMPs to treat Hunt Club kennel waste.

Megan – Assimilate the information from VDH on numbers of failing septic systems and straight pipes. Create a new handout for the Steering Committee.

Chowan TMDL Implementation Plan (IP) Schedule:

First Steering Co. meeting	May 26, 2005 7pm VT Ag Research Blackstone, VA
Final Non-industrial WG meeting	June 6, 2005 7pm VT Ag Research Blackstone, VA
Final Steering Co. meeting	June 13, 2005 7pm VT Ag Research Blackstone, VA
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30-day Public Comment Period begins June 27, 2005

30-day Public Comment Period ends July 27, 2005

Contacts:

DEQ – Amanda Gray abgray@deq.virginia.gov; phone (434) 582-5120 ext. 6027

MapTech – Megan Laird mlaird@maptech-inc.com 540-961-7864 ext. 407

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Biosolids – Solid waste from a Sewage Treatment Plant.

Chowan Total Maximum Daily Load (TMDL) Implementation Plan (IP)

Upper Nottoway River Impairments

2nd Non-industrial and Industrial Working Group Meeting Minutes

June 8, 2005 7-9pm

Blackstone, VA

Introduction:

Kelly Wills welcomed everyone and briefly explained the purpose of the meeting. She explained the Virginia State Standards for fecal bacteria. The instantaneous standard is 235 colony forming units (cfu) per 100 mL of *E. coli*. The geometric mean standard is 126 cfu/100mL *E. coli*. These are our final water quality goals.

Review of the Chowan TMDLs:

Jim Kern reviewed the sources of fecal bacteria in the impaired stream segments in this study. He mentioned that the TMDL reductions are stringent; however, there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

Non-industrial Group Participants:

Lewis Tucker – Ag (cattle) producer; Walter Thompson – Lunenburg Co. Farm Bureau; Dennis Jones - NRCS; Megan Laird – MapTech; Jim Kern – MapTech; Amanda Gray – DEQ; Kelly Wills – DEQ

Group Discussion:

Is there water quality sampling for lakes? Yes, usually the bacteria levels coming into a lake are higher than what comes out.

Is there an annual trend of the bacteria levels? No trends. The unit cfu/100mL was explained. The testing range from 100 – 8,000 cfu/100mL was explained.

Jim Kern replied that this project is not trying to put producers out of business. These programs are voluntary at the moment, but that could change in the future.

Lewis Tucker stated that the cost-share available is not realistic because it does not cover maintenance and operational costs. If there is cost-share that pays money to put land into pine trees ($ per acre) that is flexible as to the feet from the stream, there would be greater participation. CREP requires 35-50 ft from the stream and it is not flexible. The tax credit is not appealing to farmers (most full-time ag producers are exempt from most taxes). If it worked with Virginia County taxes it may be helpful to some. Buyouts may be cheaper than all the BMPs required. 90% of farmers in Southside are not in it for money. Some do a little agriculture to get tax credits. Lewis recommended that farmers

be informed about why hardwoods are used instead of pines, as well the reasons behind the other cost-share rules.

Discussed the struggle to find qualified labor to do farm work.

It is possible that farmers rent the land and could not do BMPs because they do not own it.

Targeting was defined and explained. Targeting is done by subwatershed, not by farm in the IP document. However, the FTE could target farms he/she knows would benefit from (and benefit the water quality the most) during implementation.

Handout: The acreage lost costs are not factored into the average cost of the SL6 and WP2T practices. For Little Nottoway it works out to cost $130 per foot of streambank protected.

Wetland mitigation banking was discussed. Could we sell this to housing developers in the area?

Does the nutrient trading program work for Non Point Source (NPS) practices? There is legislature that makes it possible to trade nutrients from NPS BMPs currently. The issue is quantifying nutrient loads from NPS BMPs. There is no program in place to trade bacteria.

Some ag producers are missing the points that:

- More fertilizer is not always the best
- High stocking rates can hurt production and bottom line
    - You can not participate in certain programs if your stocking rate is too high

Rotational grazing is good for retired people with farms who have the time and money. Most full-time producers can not afford the management.

Discussed the use of lime on the land. Lewis observed when he limed his cattle were less affected by farm viruses, which weaken cattle and make them more susceptible to bacterial infections. More research on this is warranted.

Discussed dragging out cow pies in the fields. If the pies are spread out, they would dry quicker and bacteria would be killed by UV rays. Cost-share could be given per acre to drag the fields. More research on this is warranted.

Virginia Tech has reinstated free soil sampling for ag producers.

Milestones for BMP installation. Agreed that a graduated approach was acceptable.

Lewis requested that the initial cost of livestock exclusion from streams be calculated per foot of stream, which would include alternative water etc.

Chowan TMDL Implementation Plan (IP) Schedule:

Final Steering Co. meeting June 13, 2005 2pm VT Ag Research Blackstone, VA
Final Public meeting June 27, 2005 7pm VT Ag Research Blackstone, VA
30-day Public Comment Period begins June 27, 2005
30-day Public Comment Period ends July 27, 2005

Contacts:

DEQ – Amanda Gray abgray@deq.virginia.gov; phone (434) 582-5120 ext. 6027
MapTech – Megan Laird mlaird@maptech-inc.com; 540-961-7864 ext. 407
DEQ – Kelly Wills kjwills@deq.virginia.gov; phone (434) 582-5120 ext. 6042
MapTech – Jim Kern jkern@maptech-inc.com; 540-961-7864 ext. 407

Chowan Total Maximum Daily Load (TMDL) Implementation Plan (IP)
Upper Nottoway River Impairments
First Steering Committee Meeting Minutes

May 26, 2005 2-4pm
Blackstone, VA

General Discussion

Welcome/Introductions

Kelly Wills welcomed everyone and briefly explained the purpose of the meeting. Everyone introduced himself or herself and signed in.

Industrial Group Participants:

Stuart Ward – NRCS
Bonny Thompson – Appomattox River SWCD
John Fulton – Southside SWCD
Jonathon Pickett – Prince Edward County Planning Commission
Jason Ericson – DCR
Megan Laird – MapTech
Kelly Wills – DEQ
Amanda Gray – DEQ
Kyle Winter - DEQ

Review of the Chowan TMDLs:

Kelly Wills reviewed the sources of fecal bacteria in the impaired stream segments in this study. She pointed to the handout with the table of final allocation scenarios for each impairment. This table shows the percent reductions of fecal bacteria load to each impaired stream. She mentioned that there is a staged approach to the TMDL and as implementation progresses and stream monitoring continues these streams can be delisted when the water quality goals are attained.

The Bacterial Source Tracking (BST) analysis done during the TMDL development was explained. The predominate source of fecal bacteria to Big Hounds Creek is pets, for the Nottoway River it is livestock, for Little Nottoway River it is wildlife followed closely by pets, and for Beaverpond Creek the predominate source of fecal bacteria is human.

NonIndustrial Working Group (NIWG) Discussion

Discussed lifespan of bacteria.

Straight pipes in watershed?

Burkeville resident had straight pipe while septic tank was being repaired.

Straight pipe numbers may be high, but TMDL used these numbers

Question: Were some septic tanks grandfathered that discharge greywater?
No grandfathering: cannot discharge to state waters.

How long to implement plan?
5 years to assess progress
Possible delisting opportunities

Could the bacteria standard change?
Use Attainability Analysis (UAA) discussed

There is extra water getting into STP from infiltration into pipes. Overflows result sometimes.

<u>Types of BMPs to concentrate on:</u>

- New septic systems or alternative treatment systems for failing septic and straight pipe correction.
- Septic tank Pump Out Program
- ❖ Issue from the Steering Co:
  - These programs are difficult to enforce
  - Rely on education instead
- Install septic systems or compost system for kennels.
- ❖ Issue from the Steering Co:
  - These BMPs will need to be site specific because each kennel is very different
  - Should find a cost range and use the average for IP estimations
  - The technical FTE should have flexibility when designing the kennel BMPs
  - Animal Control contacts
  - Concrete pads for dog pens? Mostly dirt?
  - No interest for collection into septic tank and needed pump out
  - Composting dog waste
    - Practical solutions explained in order to get acceptance
    - Study by VT extension to sell idea
    - Composting and digester for dog waste
    - Possible work by grad students to show effectiveness of composting/septic tank
  - Work with VT extension agents to gain trust
- Have counties/town initiate dog pick-up programs
- ❖ Issue from the Steering Co:

- These programs are usually by towns
- The same results could be had from educating instead of issuing county ordinances
- Farmville program to pick up dog litter in place
- Lions Club, Garden Club, programs to do education but are more urban based

Funding:

Funding for BMPs (NPS urban/human)

Commissioner of Revenue – DVM (veterinary) contacts

Quails Unlimited (Clarksville), Deer Hunters, Ducks Unlimited, Houndsmen Association (FTE Education), NWTF

Education:

Radio programs to educated about bacteria watershed problems
Job description needed for FTE (Education)
DEQ: Commissioner of the Revenue (hunt club numbers)
Quails Unlimited (Clarksville), Deer Hunters, Ducks Unlimited, Houndsmen Association (FTE Education), NWTF

Industrial Working Group (NIWG) Discussion

Perennial and intermittent streams calculated into fencing costs

Costshare on alternative water sources only

Fencing out needs to be production driven: safety and health of heard is focus

BMPs have to be practical and cost effective

Cows aren't primary money maker for area farmers: smaller herds may be more interested in alternative water only, not fencing.

More engineering assistance needed – lack of contractors

Farmville area NRCS – new engineer in a few weeks. Engineering assistance not going to be a huge constraint

Monitoring to determine effectiveness of BMPs – targeted practices for water quality

Citizen monitoring for diagnostic purposes (Farmville – Clean VA Waterways; Longwood College, Governors School, local High Schools)

FTE would work with who?
VDH, SWCD
Each year w/VDH

Piedmont Health District/PDC

Education:

Farmers busy with hay this time of year

Farm Bureau picnic (July)

Farm Bureau Meetings-IP meetings

Farm workgroup meetings: 7pm June 8th. Refreshments?

Cattlemen's Conference, Garden Clubs, Kiwanis, Lions Clubs to get the word out.

Possible funding sources:

EPA 319 grant: 2006 has 13 projects. Can apply for funding in 2006 (June).

SWCD have more money than participation (State Cost-Share)

Money not steadily flowing

EQIP and CREP may be good sources for BMPs

Split Ag funding between districts

Action items:

DEQ – Contact VDH for specs on treating dog waste

MapTech – Create a preliminary job description for the Residential and Ag FTEs

MapTech – Send out jpg of Nottoway map

Chowan TMDL Implementation Plan (IP) Schedule

- Final WG meetings June 8, 2005 2pm VT Ag Research Blackstone, VA
- Final Steering Co. meeting June 13, 2005 2pm VT Ag Research Blackstone, VA
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- 30-day Public Comment Period begins June 27, 2005
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MapTech – Megan Laird – mlaird@maptech-inc.com; 540-961-7864 ext. 407

Chowan Total Maximum Daily Load (TMDL) Implementation Plan (IP)
Upper Nottoway River Impairments
Second Steering Committee Meeting Minutes

June 13, 2005 2-4pm
Blackstone, VA

Welcome/Introductions

Kelly Wills welcomed everyone and briefly explained the purpose of the meeting. Everyone introduced himself or herself and signed in.

Steering Committee Participants:
Bonnie Thompson – Appomattox River SWCD
Granville Maitland – Appomattox River SWCD
John Fulton – Southside SWCD
Jonathon Pickett – Prince Edward County Planning Commission
Jason Ericson – DCR
Megan Laird – MapTech
Kelly Wills – DEQ
Amanda Gray – DEQ

Review of the Chowan TMDLs:
Everyone at the meeting had attended a previous TMDL IP meeting so a review was not necessary.

NonIndustrial Working Group (NIWG) Discussion

The Agenda Topics:

- Education program – How much in the budget?
    - Jason Ericson (DCR) agreed to get a current budget for an ongoing residential education program in SW VA. Megan Laird (MapTech) will take this value and add $5,000 to cover the cost of the demonstration project.
- Milestones graduated
    - The Steering Committee (SC) decided to use the Milestones:
        - 5, 20, 55, 80, 100 % cumulative completion of BMPs each year
- Technical FTE

- Decide employer
  - The Steering Committee decided to ask the Piedmont SWCD if they can house the Residential FTE
  - Depending on their answer the SC will make a decision via email correspondence
- Number of FTEs
  - The SC decided that 1 FTE can handle the Residential responsibilities for the Nottoway impairments

General Discussion:

- An Appomattox River SWCD representative spoke with a vet and stated that dog feces are very similar to other animal feces which easily compost and spread on the land
  - He suggested that the VCE be involved in the researching of these projects so local people know science backs up the BMPs
- The Residential FTE should be a local person
  - Some education money could go through someone already respected in the area (pay him for his assistance)
  - The FTE could speak with local residents to assess who a respected person is in the county/area to help with education and contacting kennel owners
- The Steering Committee decided that the BST results should be in the booklet
- Both App River and Southside SWCDs stated that there has been 1 agricultural specialist in their offices in the past 5 years
- DCR is under pressure to submit the amount of water cleaned and the costs to do so to EPA to account for the amount of money given to Virginia

Industrial Working Group (IWG) Discussion

- Streamside Fencing updates based on existing BMPs
  - Handout from IWG meeting
  - The SC decided that the numbers in the IWG handout would be the final estimates
- Milestones graduated
  - The Steering Committee (SC) decided to use the Milestones:
    - 5, 20, 55, 80, 100 % cumulative completion of BMPs each year
- Technical FTE
  - Decide employer

- The SC decided that MapTech would estimate the number of FTEs required to install all the Industrial (agricultural) BMPs, however this money would be given to the SWCDs. Whether they hire new technicians or not, they will be held accountable for the BMP installations by DCR.

- It was suggested that the SWCDs send DCR receipts from completed BMPs in the TMDL IP areas and get reimbursements on labor costs.

- Number of FTEs

  - Estimates of Industrial FTE requirements will be sent to the SC later this week.

Monitoring Plan

- DEQ to supply the monitoring plan for these streams
  - Amanda Gray and Kelly Wills (DEQ) will supply MapTech with all DEQ monitoring stations and descriptions that will be sampled during the implementation process

- Other monitoring (Riverkeepers…?)
  - No environmental groups have been identified to monitor the streams

IP Costs and Funding

- DCR and MapTech to discuss possible funding sources
  - Jason Ericson (DCR) said that the Chowan IP could possibly get on the 319 list for 2006

- Committee to discuss and determine entity in charge of funds
  - The SC decided the SWCDs would be in charge of all Ag funds and the SWCD (Piedmont?) housing the NonIndustrial FTE would be in charge of the NonIndustrial (Residential) funds.

Action items:

DEQ – Get current monitoring plan, stations locations and descriptions to MapTech

DEQ – Contact 2 counties about number of dog kennels, send info to MapTech

DCR – Get average residential educational program cost from existing IP projects, send to MapTech

MapTech – Quantify Ag BMPs required and associated costs, Quantify Residential BMPs required and associated costs, send tables to SC, Identify a possible funding scenarios for 1 year, perform all modeling required to determine milestone water quality goals, perform all modeling required to determine targeting of BMPs, finish

draft report and booklet, create presentation for final meeting, send all this to DEQ for review

Chowan TMDL Implementation Plan (IP) Schedule

- Final Public meeting June 27, 2005 7pm VT Ag Research Blackstone, VA
- 30-day Public Comment Period begins June 27, 2005
- 30-day Public Comment Period ends July 27, 2005

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