North Fork Holston River Watershed Implementation Plan (Bacteria and Temperature TMDL) Technical Report

Prepared for:
Virginia Department of Environmental Quality
Submitted June 24, 2013

New River-Highlands RC&D

Submitted by:
MapTech, Inc., 3154 State Street, Blacksburg VA 24060

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ACKNOWLEDGMENTS

Virginia Department of Environmental Quality (VADEQ)

VADEQ, Southwest Regional Office

Virginia Department of Conservation and Recreation (VADCR)

Natural Resources Conservation Service

Big Walker Soil and Water Conservation District

Clinch Valley Soil and Water Conservation District

Scott County Soil and Water Conservation District

Evergreen Soil and Water Conservation District

Tazewell Soil and Water Conservation District

Holston River Soil and Water Conservation District

Virginia Department of Health

New River Highlands RC&D

MapTech, Inc. of Blacksburg, conducted this study
through funding provided by the
Virginia Department of Environmental Quality Grant Agreement 15029

EXECUTIVE SUMMARY

The North Fork Holston watershed included in this project is approximately 464,840 acres and drains parts of Scott, Washington, Smyth, Russell, Bland, & Tazewell Counties in Virginia. Thirty-five (35) segments of the North Fork Holston River and its Tributaries are listed for bacteria impairments, including segments of these twenty-three (23) different streams: North Fork Holston River, Laurel Creek, Brumley Creek, Logan Creek, Toole Creek, Tumbling Creek, Abrams Creek, Cove Creek, Little Moccasin Creek, Big Moccasin Creek, Nordyke Creek, Smith Creek, Blue Springs Branch, Dowell Branch, Hilton Creek, Possum Creek, Locust Cove Creek, Robertson Branch, Turkey Run Creek, Beaver Creek, Wolf Creek, Lick Creek and North Fork Holston River Unnamed Tributary. In addition to its bacteria impairment, Laurel Creek fails to meet the temperature standard for stockable trout waters.

As a result of the listings, a total maximum daily load (TMDL) report was developed (*TMDL Development North Fork Holston River Watershed,* Virginia) by MapTech, Inc. in September 2012, which established the reduction in loads needed to restore these waters. Virginia law requires that a plan be developed to achieve fully supporting status for impaired waters. In fulfilling the state's requirement for the development of a TMDL Implementation Plan (IP), a framework was established for reducing fecal bacteria and temperature levels to achieve the water quality goals for the impaired streams.

Review of TMDL Development

This TMDL study was conducted because the North Fork Holston River and its Tributaries were not meeting the state water quality standards for the recreation use (swimming) and the stockable trout temperature standards.

Information gathered about the sources of pollutants and the drainage area was entered into computer models to simulate the baseline conditions. After calibration of the models using observed data, the models were used to determine the extent of reductions needed from various loading sources in order to meet the water quality standards. Modeling of bacteria in streams in the TMDL study considered loads in runoff resulting from wildlife (*e.g.*, deer, raccoon, muskrat, beaver, turkey, goose, mallard, and wood duck), livestock

(*e.g.*, beef, dairy and horse), and residential (*e.g.*, failing septic systems, straight pipes, dogs) sources. Direct loads to the stream (including direct deposition from cattle and wildlife), uncontrolled discharges (failing septic systems and straight pipes), and permitted sources were also modeled.

In order to meet the water quality goals established by the TMDL study, the geometric mean must be equal to or less than 126 colony forming units per 100 milliliters (cfu/100mL). As for temperature, the maximum temperature in stockable trout waters shall not exceed 21°C.

The North Fork Holston River watershed TMDL shows that in order to meet the water quality standard for *E. coli* the following reductions shown in **Table ES. 1** must be achieved in the listed watershed. These are grouped into sets for modeling purposes, called Nested TDML Units (NTUs).

Table ES. 1 Fecal bacteria TMDL reduction scenarios for the North Fork Holston River Watershed.

		Percent Reductions to Existing Bacteria Loads			
NTU	**Area**	**Livestock Direct**	**Crop and Pasture**	**Straight Pipes**	**Residential/ Commercial**
240	Upper North Fork Holston River	100	0	100	35
241	Big Moccasin Creek	100	33	100	33
242	Abrams Creek	2	0	100	0
243	Possum Creek	43	0	100	0
239	Lower North Fork Holston River	100	32	100	32

Public Participation

The actions and commitments described in this document were drawn together through input from local citizens, local government representatives, Virginia Departments of Conservation and Recreation (VADCR), Environmental Quality (VADEQ), and Health (VDH), Virginia Cooperative Extension (VCE), Natural Resources Conservation Service (NRCS), the local Soil & Water Conservation Districts (SWCDs), MapTech, Inc and other organizations. Every citizen and interested party in the watershed is encouraged to

become involved in implementing the plan to help restore the health of the North Fork Holston River watershed.

Public meetings were conducted to distribute information and gain feedback from the community. Active participation was solicited in smaller forums called working groups. These groups were comprised of stakeholders with similar concerns (*e.g.*, agricultural and residential). 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, a major emphasis was placed on discussing best management practices (BMPs), BMP specifications, locations of control measures, education, technical assistance, and funding.

Opinions were voiced throughout the public participation meetings regarding what should be included in the implementation plan. Most members of the working groups agreed that the cornerstone of the implementation plan should be cultivating public involvement and education, and encouraging commitment and partnerships between the citizens in the watershed and government agencies in order to improve water quality.

Assessment of Implementation Action Needs

The quantity or extent of pollution control measures, or BMPs, required during implementation was determined through spatial analyses of land use and stream-networks, along with regionally appropriate data archived in the VADCR Agricultural BMP Database. Additionally, input from local agency representatives and community members was used to verify the analyses. Overall, the needs to meet the TMDL for the 15-year implementation period were identified and are shown in **Table ES. 2**

Table ES. 2 Agricultural and residential BMPs needed in the North Fork Holston River Watershed.

Control Measure	Unit	Stage I & Stage II				
		NTU 239	NTU 240	NTU 241	NTU 242	NTU 243
Agricultural						
LE-1T >100 acres Livestock Exclusion	System[1]	32	65	39	0	9
LE-1T<100 acres Livestock Exclusion	System[1]	179	369	221	1	52
LE-2T >100 acres Livestock Exclusion	System[1]	31	65	39	0	9
LE-2T <100 acres Livestock Exclusion	System[1]	179	369	221	0	52
WP-2T Livestock Exclusion	System[1]	4	9	7	0	1
SL-6 Livestock Exclusion	System[1]	23	47	28	0	7
Livestock Exclusion Maintenance	Feet	59,662	123,582	74,133	198	17,292
Conservation Tillage	Acres	155	0	115	0	0
Improved Pasture Management	Acres	6,711	0	11,235	0	0
Residential						
Septic-System Pump-Out (RB-1)	Pump-out	2,728	5,250	2,338	654	622
Connection to Public Sewer (RB-2)	System	2	4	2	0	0
Septic System Repair (RB-3)	System	121	239	104	32	29
Septic System Installation/Replacement (RB-4)	System	248	670	243	76	96
Alternative Waste Treatment System Installation (RB-5)	System	113	277	106	33	38
Community Pet Waste Education Program	Program	0	0	1	0	0

Cost/Benefit Analysis

The costs of the above control measures were determined based on the cost of control measures previously installed through the Virginia Cost-Share Program in the North Fork Holston River watershed, and discussions with local agency representatives and working groups. The cost of technical assistance needed to implement the control measures was determined based upon discussions with working group members and technical assistance costs from both ongoing and previous implementation plans in similar watersheds. The estimated total cost to install agricultural and residential control measures in the North

Fork Holston River watershed impairments is $71.9 million and $22.4 million respectively, excluding technical assistance. The estimated total cost to provide technical assistance during implementation for North Fork Holston River watershed impairments is expected to be $1.8 million. The total cost estimated for fifteen years of implementation in the North Fork Holston River watershed is $96 million.

The primary benefit of implementation is the reduction of fecal bacteria and temperature in the impacted streams. With the completion of this IP, the risk of fecal bacteria illness through swimming in and ingestion of stream water will decrease. The reduced temperatures will provide a healthier environment for fish. Streambank protection, provided through exclusion of livestock from streams, will lead to improved aquatic habitat. The practices recommended in this document will provide economic benefits to landowners in addition to the anticipated environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, and intensive pasture management will improve profitability of farms.

Measurable Goals and Milestones for Attaining Water Quality Standards

The end goals of implementation are restored water quality of North Fork Holston River and tributaries and the removal of these streams from Virginia's dirty waters list. Progress toward end goals will be assessed during implementation through tracking of BMP installations and continued water quality monitoring.

Potential funding sources available during implementation were identified during plan development. Sources may include, but are not limited to:

- Federal Clean Water Act Section 319 Incremental 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

Implementation is divided into two stages. Stage I concentrates on implementing the most cost-effective BMPs, meaning those with the largest impact on water quality. Following Stage I implementation, the steering committee will evaluate water quality improvements and determine how to proceed to complete implementation of Stage II. Stage II continues towards achieving the TMDL allocations by implementing the remaining BMPs needed to meet the TMDL allocations for those stream segments which remain impaired following Stage I implementation.

Stakeholders and Their Role in Implementation

Implementation progress success will be determined by water quality monitoring conducted by VADEQ through the agency's monitoring program.

It was recognized during public meetings that implementation efforts need to be locally driven. To this end, it is anticipated that the local SWCDs will take a lead role in encouraging participation and seeking alternative funding sources. Additionally, the SWCDs will be in charge of initiating contact with home and land owners in the impaired watersheds to encourage the installation of agricultural and residential BMPs. This one-on-one contact will facilitate communication of the water quality problems and the corrective actions needed. The SWCD staff should conduct a number of outreach activities in the watershed to promote participation and community support to reach the implementation milestones and to make the community aware of the TMDL requirements. Such activities will include information exchange through newsletters, mailings, field days, organizational meetings, etc. The SWCD staff will work with appropriate organizations 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, Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Mines, Minerals, and Energy (DMME), and VDH.

Achieving the goals of this IP (*i.e.*, improving water quality and removing these waters from the Section 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. Local citizens can become involved by picking up after their pets, properly maintaining their septic systems, becoming water quality monitoring volunteers and volunteering to distribute information and educate others at public events.

1. INTRODUCTION

1.1 Background

Clean water is essential to all forms of life. In cases where water has been impacted by contaminants or worsening environmental conditions, the adverse effects must be noted and counteracted. The current implementation plan builds on a total maximum daily load (TMDL) study conducted for the North Fork Holston and tributaries to address bacteria and temperature issues.

The detrimental effects of bacteria in food and water supplies have been documented repeatedly. On August 8, 1994, the Virginia Department of Health (VDH) was notified that campers and counselors at a Shenandoah Valley summer camp developed severe gastrointestinal illness. It was confirmed that *E. coli* 0157:H7, a type of fecal coliform bacteria commonly found in the intestines of humans and animals, 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 fecal coliform (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.

The temperature standard is meant to protect conditions for stocked trout species. The primary practice for restoring lower temperatures for these native species is shade from streamside (riparian) vegetation. Riparian vegetation also helps to stabilize stream banks and filter runoff water as it passes to the stream, which, in turn, helps in correcting both impairments.

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

When streams fail to meet standards, Section 303(d) of the CWA and the U.S. Environmental Protection Agency's (EPA) Water Quality Management and Planning Regulation (40 CFR Part 130) both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a stream. That is, it sets limits on the amount of pollution that a stream can tolerate and still maintain water quality standards. In order to develop a TMDL, background concentrations, point source loadings, and non-point source loadings are considered. A TMDL accounts for seasonal variations and must include a margin of safety. Through the TMDL process, states establish water-quality based controls to reduce pollution and meet water quality standards.

Once a TMDL is developed and approved by the State Water Control Board (SWCB) and EPA, measures must be taken to reduce pollution levels in the stream. 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". The TMDL Implementation Plan (IP) describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in a staged process.

The study area contains thirty-five (35) bacteria impaired segments and one temperature impairment in the stream segments of these twenty-three (23) different streams: North Fork Holston River, Laurel Creek, Brumley Creek, Logan Creek, Toole Creek, Tumbling Creek, Abrams Creek, Cove Creek, Little Moccasin Creek, Big Moccasin Creek, Nordyke Creek, Smith Creek, Blue Springs Branch, Dowell Branch, Hilton Creek, Possum Creek, Locust Cove Creek, Robertson Branch, Turkey Run Creek, Beaver Creek, Wolf Creek, Lick Creek and North Fork Holston River Unnamed Tributary. **Table 1.1** shows descriptive information for each impaired segment. A map of the impairments, sub-watersheds, and Nested TMDL Unit (NTU) modeling groups is shown in **Figure 1.1**. The NTUs are outlined and labeled in blue.

Table 1.1 Descriptive information for fecal bacteria impairments in the North Fork Holston River Watershed.

Stream Name Impairment ID	**Impairment(s)**	**Impairment Location Description**	**2010 River Miles**
North Fork Holston River VAS-O09R_NFH01A02	*E. coli*	Mainstem from Lick Creek confluence downstream to Crewey Branch confluence.	13.65
North Fork Holston River VAS-O09R_NFH01C02	*E. coli*	Mainstem from headwaters downstream through Ceres, to Lick Branch confluence.	11.07
Laurel Creek VAS-O10R_LAE01A02	*E. coli*	Headwaters within Jefferson National Forest upstream of the Roaring Fork confluence through Poor Valley.	2.56
Laurel Creek VAS-O10R_LAE02A02	Temperature *E. coli*	From Little Tumbling Creek confluence at Tannersville downstream to confluence with North Fork Holston River.	6.39
Laurel Creek VAS-O10R_LAE02B02	*E. coli*	From Rt. 16 bridge through Freestone Valley to Little Tumbling Creek confluence at Tannersville.	7.47
Laurel Creek VAS-O10R_LAE02C04	*E. coli*	From Roaring Fork downstream to Rt 16 bridge in Freestone Valley.	3.61
North Fork Holston River VAS-O10R_NFH01A94	*E. coli*	From river mile 85.40 at Broady Bottom above Saltville to Robertson Branch confluence.	1.83
North Fork Holston River VAS-O10R_NFH02A00	*E. coli*	From Laurel Creek confluence downstream to 85.4.	8.44
North Fork Holston River VAS-O11R_NFH03A94	*E. coli*	From confluence of Robertson Branch near Allison Gap, downstream to confluence of Tumbling Creek.	4.83
North Fork Holston River VAS-O13R_NFH01A94	*E. coli*	Mainstem from confluence of Big Moccasin Creek downstream to Tennessee state line.	5.30
Brumley Creek VAS-O11R_BRU01B04	*E. coli*	This segment includes the mainstem from the confluence with the North Fork Holston River upstream approximately 4 miles.	4.23

Table 1.1 Descriptive information for fecal bacteria impairments in the North Fork Holston River Watershed (cont.).

Stream Name Impairment ID	Impairment(s)	Impairment Location Description	2010 River Miles
Logan Creek VAS-O11R_LOG01A02	*E. coli*	This segment includes the mainstem from the headwaters to the North Fork Holston confluence.	5.43
Toole Creek VAS-O11R_TOO01A98	*E. coli*	This segment includes the mainstem from the headwaters to North Fork Holston confluence.	5.99
Tumbling Creek VAS-O11R_TUM01A00	*E. coli*	The Tumbling Creek segment extends from the North Fork Holston River confluence upstream 1.58 miles.	1.57
Abrams Creek VAS-O12R_ABR01A00	*E. coli*	This segment includes the mainstem from the headwaters to the North Fork Holston River confluence.	11.37
Cove Creek VAS-O12R_COV01A00	*E. coli*	This segment includes the mainstem from the headwaters to the North Fork Holston River confluence.	12.69
Little Moccasin Creek VAS-O12R_LMC01A02	*E. coli*	This segment includes the mainstem from the headwaters to the North Fork Holston River confluence.	4.85
Nordyke Creek VAS-O12R_NOR01A02	*E. coli*	This segment includes the mainstem from the headwaters to the North Fork Holston River confluence.	5.98
Dowell Branch VAS-O13R_DOW01A08	*E. coli*	A NF Holston River tributary that flows flows through Dowell Gap between Blue Springs Branch and Hilton Creek.	1.73
Smith Creek VAS-O12R_SMI01A02	*E. coli*	This segment includes the mainstem from the headwaters to the North Fork Holston River confluence.	7.86
Blue Springs Branch VAS-O13R_BLU01A08	*E. coli*	A NF Holston River tributary at Maces Spring, flows through Eddington Gap.	3.44
Hilton Creek VAS-O13R_HIL01A08	*E. coli*	From water intake downstream through Hilton community to North Fork Holston confluence.	1.75
NF Holston River X-Trib. VAS-O13R_XBV01A08	*E. coli*	Unnamed tributary at Owen Corner Tributary from north confluences with North Fork Holston River at Brickyard Gap downstream of Hiltons Creek.	1.31
Possum Creek VAS-O13R_PSM01A02	*E. coli*	From Jones Branch confluence south of Kermit to North Fork Holston River confluence near Tennessee state line.	15.53
Big Moccasin Creek VAS-O14R_BMC04A00	*E. coli*	From Middle Fork Moccasin Creek and South Fork Moccasin Creek confluence downstream 7.87 miles to Lick Skillet Hollow.	7.86
Big Moccasin Creek VAS-O14R_BMC05A02	*E. coli*	Upstream of Snowflake and downstream of Dean Branch confluence south of Nickelsville.	10.42
Big Moccasin Creek VAS-O14R_BMC06A02	*E. coli*	Segment is approximately half in Scott County and half in Russell County upstream at Fugues Hill and ends at Dean Branch confluence.	9.49

Table 1.1 Descriptive information for fecal bacteria impairments in the North Fork Holston River Watershed (cont.).

Stream Name Impairment ID	Impairment(s)	Impairment Location Description	2010 River Miles
Big Moccasin Creek VAS-O14R_BMC07A02	*E. coli*	From end of PWS segment upstream 8.01 miles to Lick Skillet Hollow.	8.03
Locust Cove Creek VAS-O10R_LOC01A02	*E. coli*	A North Fork Holston River tributary near Rich Valley High School from headwaters on Brushy Mountain in the Jefferson National Forest.	8.15
Beaver Creek VAS-O10R_BVR01A02	*E. coli*	From headwaters on Walker Mountain downstream to mile 2.8 near Oak Grove.	1.89
Robertson Branch VAS-O10R_RRB01A02	*E. coli*	From headwaters at Redrock Mountain downstream through Allison Gap to North Fork Holston River confluence.	3.22
Turkey Run Creek VAS-O10R_TUR01A10	*E. coli*	A North Fork Holston River tributary from Whiterock Mountain to confluence at McCready.	3.71
Wolf Creek VAS-O11R_WOL01A02	*E. coli*	From its headwaters downstream to the North Fork Holston River confluence.	0.88
Lick Creek VAS-O09R_LIB01A02	*E. coli*	Lynn Camp confluence downstream to the North Fork Holston River confluence.	5.63

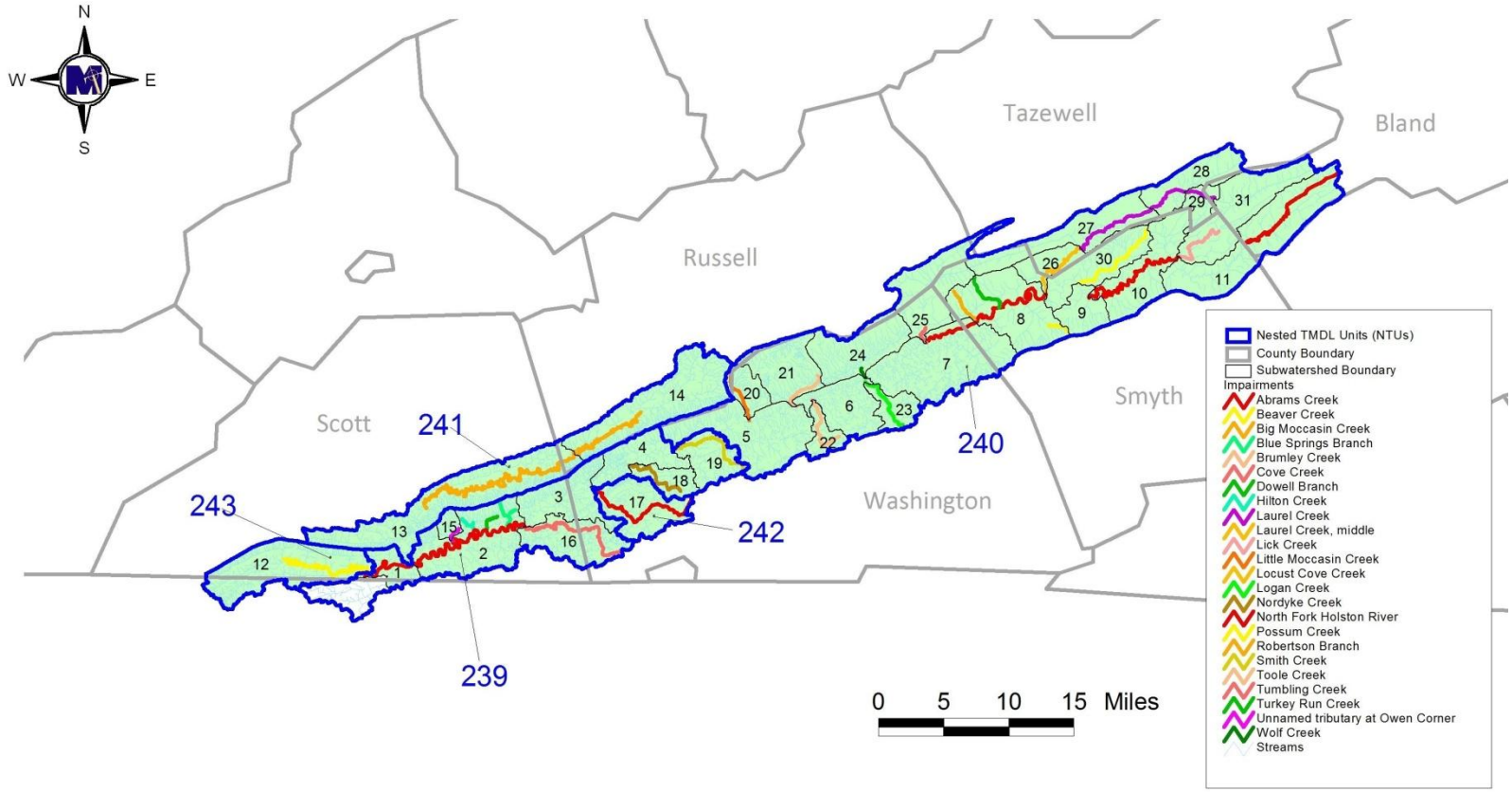

Figure 1.1 Location of impaired segments and NTUs in the North Fork Holston River Watershed.

Land use information for the North Fork Holston River watershed is shown in **Table 1.2** and **Figure 1.2**.

Table 1.2 Spatial distribution of land use for the North Fork Holston River Watershed.

Landuse	NTU 239	NTU 240	NTU 241	NTU 242	NTU 243	Total
Water	267	469	6	0	0	**742**
Developed	3,932	7,361	3,985	654	1,005	**16,938**
Commercial	6	13	27	0	10	**56**
Barren	35	409	31	10	28	**512**
Forest	61,611	196,473	32,952	10,068	14,605	**315,709**
Pasture	15,697	66,832	22,416	3,612	7,627	**116,185**
LAX[2]	851	1,976	858	111	372	**4,169**
Cropland	409	1,098	300	54	235	**2,097**
Wetlands	42	310	9	0	7	**367**
Total	**82,850**	**274,942**	**60,586**	**14,510**	**23,888**	**456,776**

All figures are in acres and rounded off to the nearest whole number.

[1] Barren - Areas of bedrock, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

[2] LAX - Livestock pasture access near flowing streams.

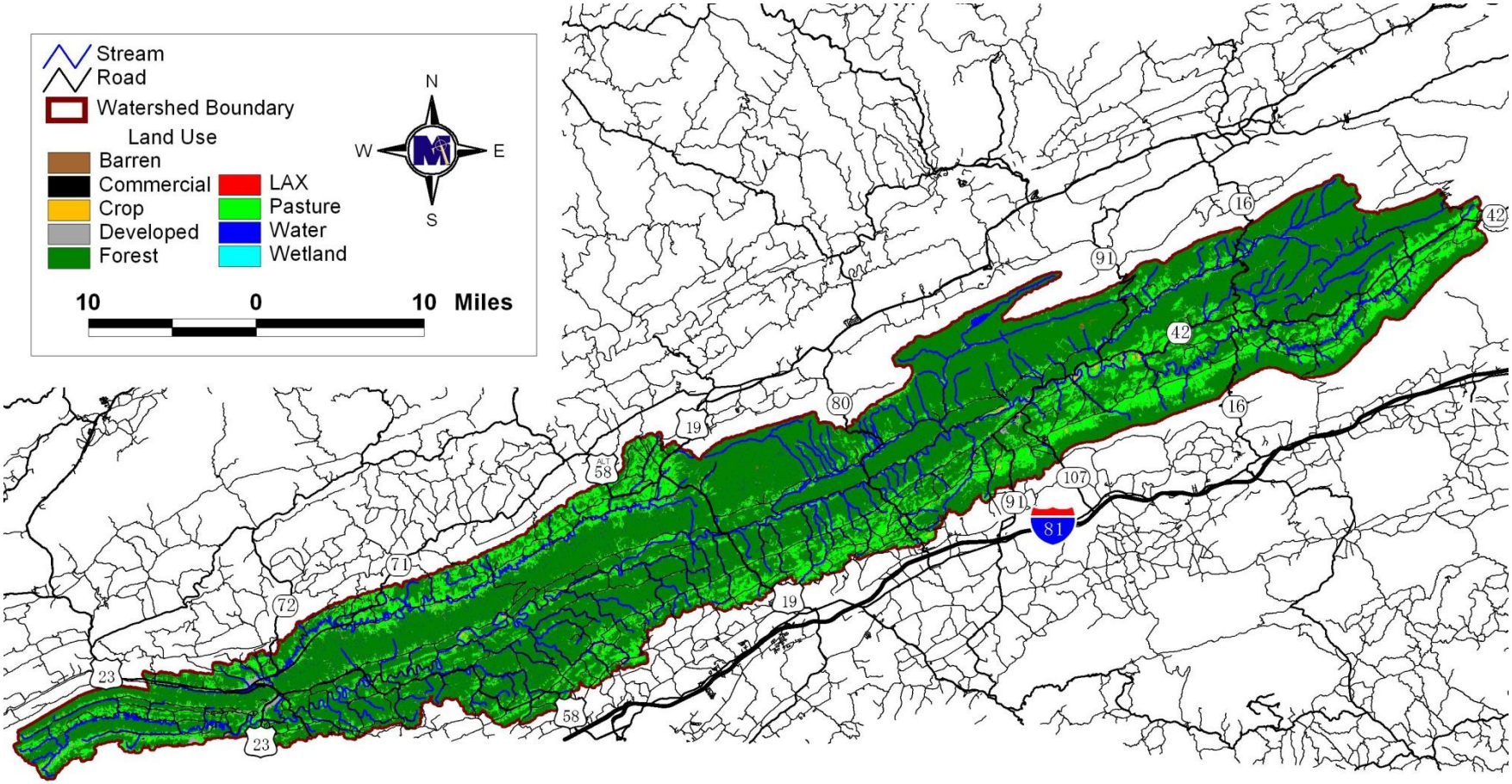

Figure 1.2 Land uses in the North Fork Holston River Watershed.

In developing this IP, elements from both state and federal guidance were incorporated and the recommended guidelines from Virginia's *Guidance Manual for Total Maximum Daily Load Implementation Plans* were followed. Specific state and federal requirements of an IP are described in chapter 2 of this document.

Once developed, the Virginia Department of Environmental Quality (VADEQ) will take TMDL implementation plans to the 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.

1.2 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 *E. coli* bacteria standard is described in 9 VAC 25-260-170 and in Section 1.3 of this report. 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 recreational use for secondary contact in cases of: 1) natural contamination by wildlife, 2) small stream size, and 3) lack of accessibility to children, in combination with widespread socio-economic impacts resulting from the cost of improving a stream to a "swimmable" status.

The re-designation of the current recreational use in a stream, if deemed necessary, will require the completion of a Use Attainability Analysis (UAA). A 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.

1.3 Applicable Water Quality Standards

According to Virginia Water Quality Standard 9 VAC 25-260-5, 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 (§62.1-44.2 et seq. of the Code of Virginia) and the federal Clean Water Act (33 USC §1251 et seq.)."

Virginia Water Quality Standard 9 VAC 25-260-10 (Designation of uses.) states:

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.

⬩

G. The [State Water Quality Control] board may remove a designated use which is not an existing use, or establish subcategories of a use, if the board can demonstrate that attaining the designated use is not feasible because:

1. *Naturally occurring pollutant concentrations prevent the attainment of the use;*

2. *Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state water conservation requirements to enable uses to be met;*

3. *Controls more stringent than those required by §§301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact.*

At the time stream segments in the North Fork Holston River watershed were first designated as impaired, TMDLs were developed for *E. coli* bacteria based on the *E. coli* State water quality criterion. For a non-shellfish supporting waterbody to be in compliance with Virginia *E. coli* standard for contact recreational use, VADEQ specified the following criteria (Virginia Water Quality Standard 9 VAC 25-260-170):

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.

If the waterbody exceeded either criterion more than 10.5% of the time, the waterbody was classified as impaired and a TMDL was developed and implemented to bring the waterbody into compliance with the water quality criterion. Based on the sampling frequency, only one criterion was applied to a particular datum or data set (Virginia Water Quality Standard 9 VAC 25-260-170). If the sampling frequency was one sample or less per 30 days, the instantaneous criterion was applied; for a higher sampling frequency, the geometric criterion was applied.

Most of the VADEQ's ambient water quality monitoring is done on a monthly or bi-monthly basis. This sampling frequency does not provide the two or more samples within 30 days needed for use of the geometric mean part of the standard. Prior to the 2006 305(b)/303(d) integrated reports the fecal coliform bacteria standard was used to determine compliance with the recreational use. A five-year time span was used for the 2002 - 2006 assessment periods. The 2008 and 2010 305(b)/303(d) integrated reports were based on a six-year assessment time span and the *E. coli* bacteria standard was used to determine compliance with the recreational use.

1.4 Applicable Criterion for Temperature Impairments

The criteria which were used in developing the temperature TMDL in this study are outlined in Section 9VAC25-260-50 (Numerical criteria for dissolved oxygen, pH, and maximum temperature). According to this section, the maximum temperature in stockable trout waters shall not exceed 21°C.

1.5 Project Methodology

The overall goal of this project was to begin the process of restoring water quality in the North Fork Holston River watershed impaired stream segments. The key components of the staged implementation plan are discussed in detail in the following sections: State and Federal Requirements for Implementation Plans, Review of TMDL Development, Process

for Public Participation, Assessment of Needs, Measurable Goals and Milestones, and Implementation.

In fulfilling the state's requirement for the development of a TMDL IP, a framework has been established for reducing *E. coli* levels and temperature levels and achieving the water quality goals for the North Fork Holston River watershed impaired segments for which TMDL allocations were developed. With successful completion of the IP, 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 the localities' 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 what they are 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 a) the requirements outlined by the WQMIRA that must be met in order to produce an IP that is acceptable and approvable by the Commonwealth, b) the EPA recommended elements of IPs, and c) the required components of an IP in accordance with 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), or WQMIRA. WQMIRA directs the SWCB to "develop and implement a plan to achieve fully supporting status for impaired waters." In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. WQMIRA requires that IPs include the following:

- date of expected achievement of water quality objectives,
- measurable goals,
- necessary corrective actions, and
- associated costs, benefits, and environmental impact of addressing the impairment.

2.2 Federal Recommendations

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. The EPA does, however, outline the minimum elements of an approvable IP in its 1999 *Guidance for Water Quality-Based Decisions: The TMDL Process.*

The listed elements include:

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

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

2.3 Requirements for Section 319 Fund Eligibility

The EPA develops guidelines that describe the process and criteria 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 elements that must be included in the IP to meet the 319 requirements:

1. Identify the causes and sources or 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 if progress is being made towards attaining water quality standards; if not, identify the criteria for determining if the watershed-based plan needs to be revised; and
9. Establish a monitoring component to evaluate the effectiveness of the implementation efforts.

3. REVIEW OF TMDL DEVELOPMENT

MapTech, Inc. was contracted to develop an *E. coli* bacteria TMDL for the North Fork Holston River watershed. The TMDL was completed in September 2012 and is posted at www.deq.virginia.gov. The *E. coli* load reductions called for in the TMDL study were reviewed to determine the water quality goals and associated pollutant reductions that would need to be addressed through the development of the implementation plan.

3.1 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. Appropriate modeling frameworks were selected for bacteria and temperature.

3.1.1 Fecal Bacteria Modeling

The USGS Hydrologic Simulation Program - Fortran (HSPF) water quality model was used as the modeling framework to simulate hydrology and fecal coliform fate and transport for the bacteria TMDL allocations. The water quality endpoint used for determining the necessary reduction to *E. coli* loads was the 30-day geometric mean standard (126 cfu/100 mL), with an implicit margin of safety.

Potential sources of *E. coli* considered in the TMDL development included both point source and nonpoint source contributions. Permitted point sources that discharge fecal bacteria are shown in **Table 3.1**.

Table 3.1 Permitted point sources in North Fork Holston River Watershed.

Permit	Facility Name	Design Flow (MGD[1])	Permitted for *E. coli* Control
VA0029688	North Fork Holston River	Smyth County Public Schools - Northwood Middle	Y
VA0026808	Holston River, North Fork	Saltville Town - WWTP	Y
VA0063673	Canoe Branch	Washington County Public Schools - Greendale Elem	Y
VA0026786	Fleenor Branch of Cove Creek	Washington County Public Schools -Valley Institute	Y
VA0021083	Hilton Creek	Scott County Schools - Hilton Elementary	Y
VA0029084	Hiltons Creek	Bellamy Manufacturing and Repair Company	Y
VA0067351	Holston River, North Fork	Scott County PSA - Holston Regional WWTP	Y
VA0078531	UT, North Fork of Holston River	Pine Ridge Trailer Park STP	Y
59 Domestic Discharges	Domestic	0.001	Y

[1]MGD – million gallons per day

At the time that the TMDL was created, permitted point discharges that may contain pathogens associated with fecal matter were required to maintain an *E. coli* concentration below 126 cfu/100 mL. One method for achieving this goal is chlorination. Chlorine is added to the discharge stream at levels intended to kill off any pathogens. The monitoring method for ensuring the goal is to measure the concentration of total residual chlorine (TRC) in the effluent. If the concentration is high enough, pathogen concentrations, including *E. coli* concentrations, are considered reduced to acceptable levels. Typically, if minimum TRC levels are met, *E. coli* concentrations are reduced to levels well below the 126 cfu/100 mL limit.

Both urban and rural nonpoint sources of *E. coli* bacteria were considered in water quality modeling. Sources included residential sewage treatment systems, land application of waste, livestock, wildlife, and domestic pets. Loads were represented either as land-based loads (where they were deposited on land and susceptible to 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 the stream, straight pipes). These sources are modeled similarly to point sources, as they do not require a runoff event for delivery to the stream.

3.1.2 *E. coli* Model Allocations

Several model runs were made investigating scenarios that would meet the 30-day geometric mean TMDL goal of 126 cfu/100mL (includes an implicit margin of safety). The final load allocations are shown in **Table 3.2**. The final allocation scenarios call for a 100% reduction of human straight pipes (failed septic systems are also considered to have a 100% reduction because they are illegal).

Table 3.2 Load reductions allocated during fecal bacteria TMDL development for the North Fork Holston River Watershed.

		Percent Reductions to Existing Bacteria Loads			
NTU	**Area**	**Livestock Direct**	**Crop and Pasture**	**Straight Pipes**	**Residential/ Commercial**
240	Upper North Fork Holston River	100	0	100	35
241	Big Moccasin Creek	100	33	100	33
242	Abrams Creek	2	0	100	0
243	Possum Creek	43	0	100	0
239	Lower North Fork Holston River	100	32	100	32

3.1.3 Temperature Modeling

The USGS Stream Segment Temperature Model (SSTEMP) Version 2.0 (Bartholow, 2002) was used to model temperature in Laurel Creek. The model predicts the minimum, maximum, and average temperatures for a single segment for any given day of the year. The model simulates different heat flux processes including convection, conduction, evaporation, short and long wave radiation, and radiation back from the water. The model requires various inputs describing hydrology, channel geometry, and meteorology in addition to optional shade parameters.

3.1.4 Temperature Allocations

Using the calibrated model, an allocation was run for the temperature impairment in Laurel Creek. An implicit margin of safety (MOS) was implemented in this study. This was achieved by using July and August average flows as input to the model. July/August average flows are lower than the average annual flow and using the summer flow is considered conservative and protective of water quality. In addition to using the summer flow, the simulation date in the model was set, during the allocation stage, to July 20 which is the day with the hottest average daily temperature in the year.

The percent shade was increased in the model until the water quality standards were met, yielding the final allocation. To achieve the extra shading needed for meeting the temperature standards, a total of approximately 27,700 ft of forested riparian buffer is deemed necessary. Since some livestock exclusion practices such as the CREP program include tree-cover. The length of these systems will count towards the total needed forested riparian buffer. For the purposes of BMP quantification in Section 5.2, the 27,000 ft estimate of forested riparian buffer was reduced, as it was assumed that the livestock exclusion systems implemented along Laurel Creek would include tree-cover, such as that offered by the CREP program. If these livestock exclusion systems do not feature tree-cover, additional streambank adjacent to Laurel Creek will need to be converted to forested riparian buffers, until a total of 27,700 feet of new tree-cover is established.

3.2 Implications of TMDL and Modeling Procedure on Implementation Plan Development

The major implication in the development of this TMDL is that reductions in bacteria loadings are required to achieve the water quality standard. All uncontrolled discharges and failing septic systems must be identified and corrected, most of the livestock must be excluded from streams and some residential and rural nonpoint sources of fecal bacteria must be reduced. Additional shading from tree-cover is needed along Laurel Creek.

However, 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.

These TMDLs included straight pipes and failing septic systems in the total bacteria load to the streams. Using the 1990, 2000 and 2010 U.S. Census the number of straight pipes (1,671) and failing septic systems (758) were estimated. In instances where currently available data was different than data in the TMDL report, the best available data was used to quantify corrective actions and develop cost estimates.

4. PUBLIC PARTICIPATION

Public participation was an integral part of the TMDL Implementation Plan development, and is critical to promote reasonable assurances that the implementation activities will occur. Attendance was encouraged through email, phone calls and notices sent to the Bristol Herald Courier and the Scott County Star.

4.1 Public Meetings for the North Fork Holston River Watershed

Three sets of public meetings were held throughout the development of the Implementation Plan. The IP Kickoff meeting was planned to follow directly after the final TMDL meeting. There were two of these combined final TMDL/IP Kickoff Meetings held due to the size of the watershed. Those kickoff meetings took place on 7/17/2012 at the Hiltons Volunteer Fire Department in Hiltons, VA and 7/19/2012 at the Friends Community Church in Saltville, VA. The purpose of the meeting was to review the bacteria and temperature TMDLs developed for the North Fork Holston River and tributaries and to lay out the course of work for the development of the Implementation Plan. The meetings were publicized in the Bristol Herald Courier and the Scott County Star and were attended by 14 people, including citizens and government representatives. Information delivered to the public at the meeting included a general description of the TMDL process, a more detailed description of TMDL development and IP development, and a solicitation for participation in working groups.

The final public meeting for North Fork Holston River watershed was held on April 18, 2013 at the Virginia Department of Environmental Quality's Southwest Regional Office in Abingdon, VA. The primary purpose of this meeting was to present the final TMDL Implementation Plan. A presentation was given describing the implementation plan using these major components as an outline: Review of TMDL development, public participation, assessment of needs, cost/benefit analysis, and implementation.

In addition to the public meetings, a steering committee and three specialized working groups (agricultural, residential and governmental) were assembled from communities of people with common concerns regarding the TMDL process. The working groups served as the primary arena for seeking public input on implementation actions to be included in the plan, associated costs and outreach methods. The steering committee reviewed reports from each

of the working groups and helped to guide the overall development of the implementation plan. A representative of the Virginia Department of Environmental Quality (VADEQ) attended each working group and steering committee meeting in order to facilitate the process and integrate information collected from the various communities. The minutes from each of the working groups and the steering committee are included in Appendix A.

The role of the Agricultural Working Group (AWG) was to review implementation from an agricultural perspective, identify any obstacles (and solutions) related to BMP implementation, review conservation practices and outreach strategies, and provide estimates on the type, number, and costs of BMPs. The primary role of the Residential Working Group (RWG) was to discuss methods needed to reduce human and pet sources of bacteria in the watershed, recommend methods to identify and correct or replace failing septic systems and straight pipes, and provide input on the BMPs to include in the plan. The goals of the Government Working Group (GWG) were to identify regulatory controls currently in place in the watersheds that may help to improve water quality (*e.g.*, livestock stream access and sewer line connections), to identify existing programs and technical resources that may enhance implementation efforts, and to propose additional programs that would support implementation.

All meetings conducted during the course of the TMDL IP development are listed in **Table 4.1**. Individuals on local and state levels representing agricultural, industrial and residential/governmental interests devoted many work-hours to attending meetings.

Table 4.1 Meetings held pertaining to the North Fork Holston River Watershed TMDL Implementation Plan development.

Date	Meeting Type	Location	Attendance
July 17, 2012	IP Kickoff Meeting (following the Final TMDL Meeting #1 at 1st location)	Hiltons Volunteer Fire Department Hiltons, VA	7
	Ag/Res Working Group Meetings #1 at 1st location		7
July 19, 2012	IP Kickoff Meeting (following the Final TMDL Meeting #2 at 2nd location)	Friends Community Church Saltville, VA	7
	Ag/Res Working Group Meetings #2 at 2nd location)		7
Nov 13, 2012	Government Working Group Meeting	DEQ-Southwest Regional Office in Abingdon, VA	5
Feb. 12, 2013	2nd Ag/Res Working Group Meetings	DEQ-Southwest Regional Office, Abingdon, VA	11
April 10, 2013	Steering Committee Meeting	DEQ-Southwest Regional Office, Abingdon, VA	7

4.1.1 Agricultural and Residential Working Group for the North Fork Holston River Watershed

The first meetings took place directly following the IP kickoff meeting. The second set of meetings took place on February 13, 2013. The date, location, and attendance for each of the Agricultural and Residential Working Groups is shown in **Table 4.1**. The members consisted of citizens from the watershed, representatives from the Holston River Soil and Water Conservation District, VADEQ, VDH, and VADCR. Discussion at the first set of meetings focused on the potential BMPs that can be implemented for both residential and agricultural applications and the break-down of those BMPs by type.

During the second set of meetings the group discussed the fencing and residential BMP estimates that had been prepared for North Fork Holston River and the associated cost estimates, the timeline of implementation and the Stages. Feedback was gathered as to how these numbers could be adjusted to better represent cost and needs within the watershed and land based BMP practices.

4.1.2 Government Working Group for the North Fork Holston River Watershed

The Government Working Group (GWG) meeting took place on November 13, 2012 at the DEQ-Southwest Regional Office in Abingdon, VA. It was attended by 5 people representing the following local governments: Holston River SWCD, NRCS, VDH, and DEQ. Discussion focused on the timeline, and adjustments to BMP assumptions and costs. Valuable feedback was gathered regarding adjusting residential and agricultural BMPs. It was mentioned that technical assistance costs have increased to an estimated $80,000 including salary, training, and travel expenses, but it is estimated that only an equivalent of 0.5 technical assistance personnel will be needed in each of Washington, Smyth, and Scott counties. It was mentioned that based on how rural the watershed is, the potential for future sewer connections is low, and should be adjusted to around 1%. Also an increase in the number of alternate septic systems is needed to account for local soil limitations. It was noted that pet waste education should focus on the Towns of Gate City and Weber City. Holston River SWCD noted that they have had a successful pump-out program in the past, within two watersheds (Three Creeks and Beaver/Little Creek), and they are interested in providing a pump-out program should there be available grant funds.

4.2 Steering Committee

The purpose of the Steering Committee was to provide guidance on the content and presentation of the final IP and ensure that the working group recommendations were appropriately incorporated into the plan. The Steering Committee met on April 10, 2013 at the DEQ-Southwest Regional Office in Abingdon, VA. Following the discussion of these reports, the final public meeting presentation was reviewed for input and comment from the committee.

4.3 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 government agencies in the watershed in order to reduce fecal

bacteria pollution. A sense of 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 North Fork Holston River watershed.

5. ASSESSMENT OF IMPLEMENTATION ACTION NEEDS

An important part of the implementation plan is the identification of specific best management practices and associated technical assistance needed to improve water quality in the watersheds. Since this plan is designed to be implemented by landowners on a voluntary basis, it is necessary to identify management practices that are both financially and technically realistic and suitable for this particular community. As part of this process, the costs and benefits of these practices must be examined and weighed. Once the best practices had been identified for implementation, the BMPs needed in order to meet the water quality goals established during the TMDL study were quantified.

5.1 Identification of Control Measures

Potential control measures or best management practices (BMPs), their associated costs and efficiencies, and potential funding sources were identified through review of the TMDL, input from Working Groups, and literature review. Control measures were assessed based on cost, availability of existing funds, reasonable assurance of implementation, and water quality impacts. Some control measures were indicated or implied by the TMDL allocations, while others were selected through a process of stakeholder review and analysis of effectiveness in these watersheds. These measures are discussed in sections 5.1.1 and 5.1.2, respectively.

5.1.1 Control Measures Implied by the TMDL

The reductions in fecal bacteria identified by the TMDL study dictated some of the control measures that must be employed during implementation. In order to meet the reductions in direct bacteria 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 most appropriate management strategy for the fenced pasture are less obvious.

The 100% reduction in loads from straight pipes, failing septic systems, sewer leaks, and sewer overflows is a pre-existing legal requirement as well as a result of this TMDL. This reduction indicates that all illicit discharges (*i.e.*, straight pipes and cross-connections) in the watersheds should be corrected, and that all onsite sewage treatment systems (OSTS) (*e.g.*,

septic systems and alternative waste treatment systems) and sewer infrastructure must be maintained in proper working condition.

Since much of the watershed is utilized for agricultural use, specifically pasture, it is important to focus on implementing management practices which allow for the continued but more environmentally responsible use of agricultural land. These management practices include stream exclusion, pasture management, and responsibly managing urbanization through the procurement of conservation easements within the watershed. There are several programs which can be applied to establish conservation easements such as Grassland Reserve Program (GRP), Farm and Ranch Land Protection Program (FRPP), and localized Purchase of Development Rights (PDR) programs. Washington County has a PDR program through the Holston River Conservation District.

While it is recognized that farmers will want to minimize the cost of fencing and the amount of pasture lost, 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.

An alternative water source will typically be required where pasture is fenced off from streams. The main criterion is that the system be dependable. Water systems alone (*i.e.*, 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 all of the TMDLs. It should be restated here that it is recommended that all fencing, even that which is installed solely at the landowner's expense, be placed at least 35-ft from the stream. The inclusion of a buffer helps to reduce bacteria, as well as sediment loads in runoff. The incorporation of effective buffers could reduce the need for more costly control measures.

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 accelerating erosion of 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 decrease 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. However, given the reductions needed in pollutant (*i.e.*, fecal bacteria) delivery to the stream, a vegetated buffer will be needed. For planning purposes, it was assumed that a vegetated buffer would be established in conjunction with stream fencing.

Along Laurel Creek a healthy riparian buffer with tree-cover is necessary to provide increased shading to address the temperature impairment. The required lengths of stream sides to be buffered were estimated utilizing GIS and aerial photography for the region. The final estimated length will require the installation of either forested riparian buffers or forested livestock exclusion BMPs.

Correction of sewer overflows and leaks is an ongoing effort of the entities charged with the maintenance and operation of these systems. This was not identified as a significant problem by the TMDL at this time. The options identified for correcting illicit discharges and failing septic systems included: repair of an existing septic system, installation of a septic system, connection to a sewer system and installation of an alternative waste treatment system.

5.1.2 Control Measures Selected through Stakeholder Review

In addition to the control measures that were directly indicated by the TMDL, a number of measures were needed to control fecal bacteria from land-based bacteria sources. Various scenarios were developed and presented to Working Groups. All scenarios began with implementation of the measures indicated by the TMDL. Next, specific sources of fecal bacteria were addressed where highly economical practices were identified. For instance, a residential pet waste program was specified in several watersheds to educate citizens on proper disposal of pet wastes.

Beyond this level of control for the pollutants of interest, practices that require the control or treatment of runoff are the primary tools available. One additional BMP considered was improved pasture management. The improved pasture management BMP is considered an enhancement of a grazing land management system. Along with the infrastructure provided by a grazing land management system, improve pasture management includes:

- Maintenance of an adequate forage height (suggested 3-inch minimum grass height) during growing season.
- Application of lime and fertilizer according to soil test results.
- Mowing of pastures to control woody vegetation.
- Distribution of manure through managed rotational grazing.
- Reseeding due to severe drought if necessary.

As for temperature, the only proposed measure is the riparian forested buffer. This measure provides shading to segments of the stream which do not currently have a forested riparian buffer.

Currently, improved pasture management is not a standalone BMP available through the Virginia Agricultural BMP Cost-Share program. However, it is eligible for funding when used in conjunction with the LE-1T or LE-2T grazing land protection practice and is considered an enhancement of this practice. Employing the pasture management practices listed above can produce significant economic gains to producers at a very low investment cost. The final set of control measures identified and the efficiencies used in this study to estimate needs are listed in **Table 5.1**. “Direct Reductions” are those that reduce the load of pollutant from a specific source to the stream itself or to the land. “Buffer” practices control

pollutants through both a land conversion and treatment of runoff from an upstream area. "Runoff Treatment" measures are those that either treat runoff from a given land area (*e.g.*, retention ponds) or treat runoff based on changing the runoff-producing characteristics of the land (*e.g.*, improved pasture management).

Table 5.1 Potential control measure costs and efficiencies in removing *E. coli*.

BMP Type	Control Measure	Bacteria Removal Efficiency	Temperature Efficiency	Reference
	Direct Reduction Efficiency			
Ag	Livestock Exclusion System (>100-acres)	100%	0%	1
Ag	Livestock Exclusion System (<100-acres)	100%	0%	1
Ag	Livestock Exclusion System (WP-2T)	100%	0%	1
Ag	Livestock Exclusion System (SL-6)	100%	0%	1
Ag	Agricultural Sinkhole Protection (WQ-11)	100%	0%	1
Ag	Waste Storage Facilities (WP-4)	85%	0%	5
	Buffer Efficiency			
Ag	Forested Riparian Buffer	35%	100%	7
	Runoff Treatment Efficiency			
Ag	Improved Pasture Management	50%	0%	2
Ag	Loafing Lot Management (WP-4B)	60%	0%	4
Ag	Retention Ponds	70%	0%	3
Ag	Conservation Tillage (SL-15)	61%	0%	2,6
	Preventative Maintenance			
Res	Septic Tank Pump-out			*
	Direct Reduction Efficiency			
Res	Corrected Straight-pipe / Septic System Install	100%	0%	1
Res	Repaired Septic System	100%	0%	1
Res	Sewer Hook-Up	100%	0%	1
Res	Alternative Waste Treatment System	100%	0%	1
Res	Pet Waste Education Program	75%	0%	8

1 Removal efficiency is defined by the practice.
2 Commonwealth of Virginia. 2005. Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the James River, Lynnhaven, and Poquoson Coastal Basins. http://www.richmondregional.org/Publications/Reports_and_Documents/Planning/2005_james_river_tributary_strategy.pdf
3 Center for Watershed Protection. 2007. National Pollutant Removal Performance Database Version
4 Barnett, J. R., R. C. Warner, and C. T. Agouridis. "The effectiveness of a combination weep berm-grass filter riparian control system for reducing fecal bacteria and nutrients from grazed pastures." Web.
5 Based on measurements of bacteria density as excreted and after storage.
6 Bacteria removal efficiency estimated based on sediment and nutrient removal efficiency.
7 Estimated through modeling.
8 Swann, C. 1999. A survey of residential nutrient behaviors in the Chesapeake Bay. Widener Burrows, Inc. Chesapeake Bay Research Consortium. Center for Watershed Protection. Ellicott City, MD. 112pp. http://www.stormwatercenter.net/Pollution_Prevention_Factsheets/AnimalWasteCollection.htm
* There is no explicit bacteria removal efficiency associated Septic Tank Pump-outs, as they are a preventative maintenance practice to prolong the life of septic systems and prevent failures.

5.2 Quantification of Control Measures

The quantity of control measures recommended during implementation was determined through spatial analyses, modeling alternative implementation scenarios, as well as requests from Working Group members. Spatial analyses included the processing of data that included land use, census data, stream networks, and elevation, along with data archived in the VADCR Agricultural BMP Database and TMDL development documents. The map layers and archived data were combined to establish the number of control measures recommended overall, in each watershed, and in each subwatershed, where appropriate. Estimates of the amount of on-site treatment systems, sewer connections, streamside fencing and number of full livestock exclusion systems were made through these analyses. The quantities of additional control measures were determined through modeling alternative scenarios and applying the related reduction efficiencies to their associated loads.

Implicit in the TMDL is the need to avoid increased delivery of pollutants from sources that have not been identified as needing a reduction, and from sources that may develop over time, as implementation proceeds. One potential for additional sources of the pollutants identified is future residential development. Care should be taken to monitor development and its impacts on water quality. Where residential development occurs, there is potential for additional pollutant loads from pet waste, failing septic systems, sewer line overflows and leaks.

5.2.1 Agricultural Control Measures

5.2.1.1 Livestock Exclusion BMPs

To estimate fencing requirements, the stream network was overlaid with land use. Stream segments that flowed through or adjacent to land use areas that had a potential for supporting cattle (*e.g.*, improved pasture) were identified. If the stream segment flowed through the land-use area, it was assumed that fencing was required on both sides of the stream, while if a stream segment flowed adjacent to the land-use area; it was assumed that fencing was required on only one side of the stream. These assumptions were further refined to examine size of resultant pasture and existing BMPs. Typically stream fencing estimates include only perennial (flowing all-year) stream channels. The estimated amount of livestock fencing for

the North Fork Holston watershed includes both perennial and intermittent streams because the National Hydrography Dataset used to develop the stream fencing estimate for this watershed does not distinguish between perennial and intermittent streams. As a result, the amount of fencing for the North Fork Holston River watershed is overestimated and the number may be adjusted after implementation of the plan begins, as better information becomes available. Not every land-use area 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. A map of potential streamside fencing required for the North Fork Holston River watershed is shown in **Figure 5.1**.

According to data in the Virginia DCR Agricultural BMP and CREP Database, 694,507 feet of livestock exclusion BMPs have already been installed within the watershed. To completely exclude cattle from the streams in the watershed, and taking into consideration the fencing already installed, an estimated 4,140,714 feet of streamside fence would be required. The actual amount streamside fence required to meet the allocated bacteria load reductions is less than the total estimate, as some of the Nested TMDL Unit (NTU) modeling groups require less than 100% exclusion to meet the standard. The prescribed length of fence to be implemented in order to meet the allocated bacteria load reductions is 3,705,880 feet of streamside fence. There was discussion at the Working Group meeting indicating that much of the main stem of the North Fork Holston River is inaccessible to livestock so most of the livestock exclusion installation should focus on the tributaries.

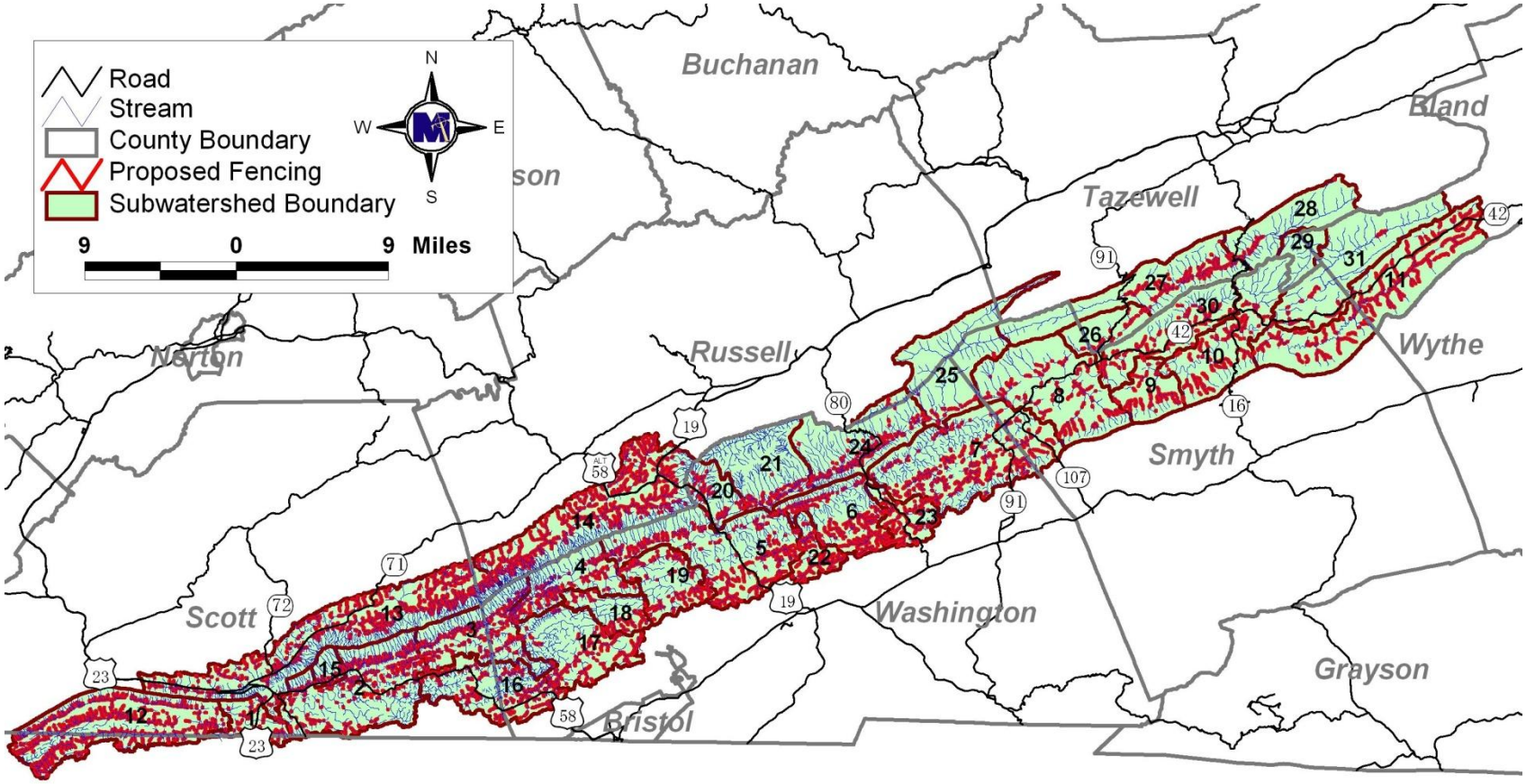

Figure 5.1 Potential streamside fencing for perennial streams in the North Fork Holston River watershed.

The VADCR Agricultural BMP Database was utilized to determine typical characteristics (e.g., streamside fencing length per practice) of full livestock exclusion systems so that the number of different systems needed could be accurately estimated. The database was queried for information on Grazing Land Protection Systems (SL-6, LE-1T and LE-2T) and Stream Protection Systems (WP-2T) installed in the counties of the watershed. The LE-1T system includes streamside fencing, cross fencing, an alternative watering system, and a 35-ft buffer from the stream (the LE-2T system includes the same items as the LE-1T but only requires a 10-ft buffer). It was estimated that 50% of livestock exclusion systems would be accomplished through the installation of LE-1T systems. The (LE-1T) offers 85% cost share and is only available in targeted TMDL watersheds with implementation plans. The LE-2T offers a 50% cost share in TMDL watersheds with implementation plans. The WP-2T systems include streamside fencing, hardened crossings, and a 35-ft buffer from the stream. The WP-2T practice is only available in TMDL targeted implementation areas such as the North Fork Holston River watershed. This practice includes an up-front cost share payment of 50 cents per linear foot of fence installed to assist in covering anticipated fencing maintenance costs. In cases where a watering system already exists, a WP-2T system is a more appropriate choice. Despite the additional payment for maintenance costs, members of the agricultural working group explained that this practice is seldom used because it does not provide cost share for the installation of a well. This was reflected in the number of WP-2 systems noted in the Ag BMP Database. Consequently, it was estimated that only 5% of fencing would be accomplished using the WP-2T practice. Fencing through the Conservation Reserve Enhancement Program (CREP) is an option in the watershed provided a 35-ft setback is used. Implementation of CREP along Laurel Creek is especially beneficial since its buffer area includes tree-cover, which assists in correcting both the bacteria impairment (from exclusion and filtering) as well as the temperature impairment (from shading and cooling). The Conservation Reserve Program (CRP) is another alternative for landowners who do not want to install a 35-ft buffer, but this program does require a 20-ft buffer.

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 (1,785 feet). The breakdown of number of exclusions systems that are expected to be SL-6, LE-1T, LE-2T or WP-2T is

based on historical use of these practices in the North Fork Holston River watershed and input from the agricultural and government working groups. This IP focuses on fencing along both perennial and intermittent streams because the National Hydrography Dataset used to develop the stream fencing estimate does not distinguish between perennial and intermittent streams. As a result, the amount of fencing is overestimated and the number may be adjusted after implementation of the plan begins, as better information becomes available. **Table 5.2** shows the livestock exclusion requirements for the North Fork Holston River watershed.

It was estimated that 7.5 % (274,867 feet) of all fencing length installed would need to be replaced during the length of the project.

Table 5.2 Estimation of streamside fence and number of full exclusion systems required in the North Fork Holston River Watershed subwatersheds.

NTU #	239	240	241	242	243
>100-acres LE-1T	32	65	39	0	9
< 100-acres LE-1T	179	369	221	1	52
>100-acres LE-2T	31	65	39	0	9
< 100-acres LE-2T	179	369	221	0	52
# WP-2 systems	4	9	7	0	1
# of SL-6 systems	23	47	28	0	7
Fence Maintenance (feet)*	59,662	123,582	74,133	198	17,292

*Lengths along the stream where fencing is already installed were not included in this value.

5.2.1.2 Land-Based BMPs

The North Fork Holston River watershed TMDLs recommend reductions to land-based bacteria loads. In order to meet these recommendations, the BMPs in **Table 5.3** must be implemented. Animal waste control facilities (WP-4) and loafing lot management systems (WP-4B) are additional options for achieving land based bacteria reductions should a need for these BMPs be identified throughout implementation. One practice that is expected to have a substantial impact on water quality is improved pasture management.

Table 5.3 Agricultural land-based BMPs for the North Fork Holston River Watershed.

Control Measure	Unit	NTU 239	NTU 240	NTU 241	NTU 242	NTU 243
Conservation Tillage	Acres	155	0	115	0	0
Improved Pasture Management	Acres	6,711	0	11,235	0	0

5.2.2 Residential Control Measures

5.2.2.1 BMPs to Correct Failing Septic Systems and Straight Pipes

All straight pipes and failing septic systems must be identified and corrected during implementation since a 100% load reduction from these sources was deemed necessary to meet the TMDL goal. **Table 5.4** shows the number of failing septic systems and straight pipes for each subwatershed.

The following BMPs have been identified to correct failing septic systems and straight pipes: septic system repairs, new septic system installation, connection to public sewer systems and alternative waste treatment systems. It is estimated that 70% of the failing septic systems can be corrected with repairs ($4,000). It is estimated that 19% can be typical septic systems ($6,000), 10% would require alternative waste treatment systems ($15,000), and a small amount, estimated at about 1%, would be sewered ($5,000). It is estimated that 77% of straight pipes can be corrected with the installation of a septic system, 22% would require alternative waste treatment systems, and 1% would be sewered.

The Holston River SWCD has had a successful pump-out program in the past within two watersheds (Three Creeks and Beaver/Little Creek). Discussion at the Government Working Group from the Holston River and other SWCDs in the watershed indicates they are interested in providing a pump-out program should there be available grant funds.

Table 5.4 Estimated residential waste treatment systems in the North Fork Holston River watershed subwatersheds.

NTU	Impairment Group Name	Houses with Standard Septic Systems	Potential Failing Septic Systems	Potential Straight Pipes
239	Lower North Fork Holston River	2,808	175	309
240	Upper North Fork Holston River	5,250	344	843
241	Big Moccasin Creek	2,337	149	305
242	Abrams Creek	654	46	95
243	Possum Creek	622	41	122
	Total	11,671	755	1,674

Values rounded to nearest integer

5.2.2.2 Land-Based BMPs

The North Fork Holston River watershed TMDL recommends reductions to residential land-based sources, or nonpoint sources (NPS). In order to meet these recommendations, the BMPs in **Table 5.5** should be implemented; however, a staged approach to implementation is described in Chapter 6 of this document. In addition to these control measures, it was recognized that educational efforts would be vital to the successful implementation of these TMDLs. The residential education program includes a program addressing the benefits of cleaning up after pets and maintaining septic systems. The residential education program may also include a combination of educational materials distributed to pet owners, signage describing water quality concerns related to pet waste, and disposal bags and receptacles in areas of high pet traffic. Input gathered from the Government Working Group suggested that pet waste education should be focused on the Towns of Gate City and Weber City since they contain parks with pet traffic. Signage, receptacles, and disposal bags could be located within these parks.

Table 5.5 Residential BMPs recommended to meet the North Fork Holston River Watershed TMDLs.

Residential Control Measure	Unit	NTU 239	NTU 240	NTU 241	NTU 242	NTU 243
Septic Systems Pump-out Program (RB-1)[1]	Pump-out	2,728	5,250	2,338	654	622
Connection to Public Sewer (RB-2)	System	2	4	2	0	0
Septic System Repair (RB-3)	System	121	239	104	32	29
Septic System Installation/Replacement (RB-4)	System	248	670	243	76	96
Alt. Waste Treatment System Install (RB-5)	System	113	277	106	33	38
Community Pet Waste Education Program	Program	0	0	1	0	0

[1]Pump-out numbers are based on all homes on septic systems in the IP area.

5.3 Technical Assistance and Education

Stakeholders agree that technical assistance and education are keys 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. The working groups recommended several education/outreach techniques, which will be utilized during implementation. Outreach at County Fairs has been successful in other watersheds in the past. There are also opportunities for joint events with the Virginia Cooperative Extension Service. It may also be possible to involve the local Ruritan and Rotary clubs. A program should be established to educate septic and alternative waste system installers on the maintenance requirements expected of the homeowner. Many waste system installers are not aware of the maintenance required. In addition a Pet Waste Education program will be developed.

The following tasks associated with agricultural, residential and industrial programs were identified:

Agricultural Programs

1. Make contact with landowners in the watershed to make them aware of implementation goals, cost-share assistance, and voluntary options that are beneficial.
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.*, County Fair, presentations at joint VCE events 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. Identify straight-pipes and failing septic systems (*e.g.*, contact landowners in older homes, septic pump-out program).
2. Handle and track cost-share.
3. Develop educational materials & programs.
4. Organize educational programs (*e.g.*, demonstration septic pump-outs, nutrient management, and pet waste control).
5. Distribute educational materials (*e.g.*, informational pamphlets on TMDL IP and on-site sewage disposal systems).
6. Assess progress toward implementation goals.

The staff needed to implement the agricultural and residential components of the plan was estimated based on discussions with stakeholders and the staffing levels used in similar projects. It has been determined that an equivalent of 0.5 full time technical assistance personnel per year will be needed in Washington, Smyth, and Scott counties throughout implementation, for a total of an of 1.5 equivalent personnel per year throughout the 3 counties. In the three counties where an only a small portion of the watershed exists (Russell, Tazewell, and Bland Counties) it is anticipated that the duties can be taken on by current staff.

5.4 Cost Analysis

5.4.1 Agricultural 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 the SL-6, LE-1T, LE-2T and WP-2T systems were estimated based on the cost of systems already in place in the North Fork Holston River watershed. The cost of an SL-6, LE-1T, or LE-2T system was estimated at $53,000 for farms larger than 100 acres, while the cost for smaller farms was estimated to be $27,500. Through VADCR input, it was assumed

that the costs of hardened crossings and improved pasture management (cross fencing) would be included in the cost of fencing systems (SL-6, LE-1T, and LE-2T).

The total cost of livestock exclusion systems includes not only the costs associated with fence installation, repair, and maintenance; but also the cost of taking land (*e.g.*, 35-ft buffer area) out of production. The cost of fence maintenance was identified as a deterrent to participation. Financial assistance possibilities for maintaining fences include an annual 25% tax credit for fence maintenance and conservation easements where the landowner is paid a percentage of the land value to leave it undisturbed. Additionally, the Streambank Protection (WP-2T) cost-share practice will be available as part of the implementation project and provides an upfront incentive payment to maintain stream fencing. The cost per foot for streamside fence maintenance is estimated at $3.50/ft.

The remaining costs outlined in **Table 5.6** were determined through literature review, analysis of the Virginia Agricultural BMP Database, and discussion with stakeholders. The number and type of practices that have been installed in each watershed were determined through discussions with local personnel and data from the Virginia Agricultural BMP Database.

Table 5.6 Agricultural control measure costs and needs in the North Fork Holston River watershed.

Agricultural Control Measure	Unit	Cost	NTU 239	NTU 240	NTU 241	NTU 242	NTU 243
LE-1T >100 acres Livestock Exclusion	System[1]	$53,000	32	65	39	0	9
LE-1T <100 acres Livestock Exclusion	System[1]	$27,500	179	369	221	1	52
LE-2T >100 acres Livestock Exclusion	System[1]	$53,000	31	65	39	0	9
LE-2T <100 acres Livestock Exclusion	System[1]	$27,500	179	369	221	0	52
WP-2T Livestock Exclusion	System[1]	$3,400	4	9	7	0	1
SL-6 Livestock Exclusion	System[1]	$53,000	23	47	28	0	7
Livestock Exclusion Maintenance	Feet	$3.50	59,662	123,582	74,133	198	17,292
Conservation Tillage	Acres	$135	155	0	115	0	0
Improved Pasture Management	Acres	$270	6,711	0	11,235	0	0

[1] The average fencing system length in the watershed is1,875 ft

5.4.2 Residential Control Measures

The costs for residential control measures are outlined in **Table 5.7** and were determined through literature review and discussion with stakeholders.

Table 5.7 Residential control measure costs and needs in the North Fork Holston River Watershed.

Residential Control Measure	Unit	Cost	NTU 239	NTU 240	NTU 241	NTU 242	NTU 243
Septic-System Pump-Out (RB-1)	Pump-out	$325	2,278	5,250	2,338	654	622
Connection to Public Sewer (RB-2)	System	$5,000	2	4	2	0	0
Septic System Repair (RB-3)	System	$4,000	121	239	104	32	29
Septic System Installation/Replacement (RB-4)	System	$6,000	248	670	243	76	96
Alternative Waste Treatment System Installation (RB-5)	System	$15,000	113	277	106	33	38
Community Pet Waste Education Program	Program	$5,000	0	0	1	0	0

5.4.3 Technical Assistance

It was determined by the working group members that it would require $80,000 to support the salary, benefits, travel, training, and incidentals for education of one technical staff member.

5.4.4 Total Estimated Costs

The total estimated costs for the implementation of BMPs in the North Fork Holston River watershed are shown in **Table 5.8**. The technical assistance cost for 1.5 equivalent personnel for the 15 years of implementation is $1,800,000.

Table 5.8 Total estimated costs to meet the North Fork Holston River Watershed *E. coli* bacteria TMDLs.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance[1] ($)	Total Cost ($)
NTU 239	$16,458,313	$4,563,600	-	$21,021,913
NTU 240	$30,139,137	$10,857,250	-	$41,005,210
NTU 241	$21,105,241	$4,238,850	-	$25,344,091
NTU 242	$28,193	$1,291,550	-	$1,319,744
NTU 243	$4,248,923	$1,464,150	-	$5,713,073
Total	**$71,979,807**	**$22,415,400**	**$1,800,000**	**$96,195,207**

[1]Technical assistance cost is estimated by county, and does not easily break-down into NTUs.

5.5 Benefit Analysis

The primary benefit of implementation is cleaner water in Virginia. Specifically, *E. coli* contamination and elevated temperatures in North Fork Holston River Watershed will be reduced to meet water quality standards. **Table 5.9** indicates the cost efficiencies of the various practices being proposed in this IP. It is hard to gage the impact that reducing *E. coli* 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 *E. coli* sources through contact with surface waters should be reduced considerably. Reducing temperature in segments with elevated levels allows for more favorable conditions for fish and therefore can improve fishing in stockable trout streams.

Table 5.9 Cost efficiencies of bacteria control measures in units removed per $1,000 in the North Fork Holston River watershed.

Control Measure	Bacteria Colonies Removed Per $1,000 spent
Community Pet Waste Education Program	9.06E+13
Conservation Tillage	8.33E+13
Septic System Repair (RB-3)	3.79E+12
Septic System Installation/Replacement (RB-4)	3.13E+12
Improved Pasture Management	2.91E+12
Connection to Public Sewer (RB-2)	2.10E+12
Alternative Waste Treatment System Installation (RB-5)	1.17E+12
Livestock Exclusion	2.32E+11

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, residential and industrial practices recommended in this document will provide economic benefits to the community, as well as the expected environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, improved pasture management, private sewage system maintenance and stream bank stabilization will each provide economic benefits to land owners. Additionally, money spent by landowners and state agencies in the process of implementing this plan will stimulate the local economy.

5.5.1 Agricultural Practices

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 contamination with manure (VCE, 2000). In addition, horses drinking from marshy areas or areas where wildlife or cattle carrying Leptospirosis have access 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 that 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 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 billion to 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 when 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 implement an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40% and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80 % of the cost of growing or maintaining an animal, and pastures providing 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, increasing the amount of time that cattle are fed on pasture is clearly financially beneficial 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.

5.5.2 Residential Practices

The residential programs will play an important role in improving water quality, since human waste can carry with it 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, 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 3 to 5 years. The cost of proper maintenance, as outlined here, is relatively low ($325) in comparison to repairing or replacing an entire system ($4,000 to $15,000).

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 other BMP components 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 Chapter 8, a 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

Given the scope of work involved with implementing these TMDLs, full implementation and de-listing from the Virginia Section 305(b)/303(d) list is expected within 15 years. Described in this section are funding sources, identification of milestones, a timeline for implementation, and the targeting of control measures.

6.1 Milestones Identification

The end goals of implementation are restored water quality of the impaired waters and subsequent de-listing of these impairments from the Commonwealth of Virginia's Section 305(b)/303(d) list within 15 years. Progress toward end goals will be assessed during implementation through tracking of control measure installations and continued water quality monitoring. Agricultural, residential and industrial 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 amount 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 15 years.

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures first. Concentrating on eliminating straight pipes and correcting failing septic systems within the first years may provide the highest return on water quality improvement with less cost to landowners. The Stage I goals for implementation will focus on correcting straight pipes and failing septic systems, implementing a pet waste control program, fencing cattle out of the stream, and improving pasture management. Stage II will allow additional time to implement the BMPs that may be needed for de-listing and to obtain the bacteria source load reductions in the TMDL.

The implementation timeline for the North Fork Holston River watershed is based on attaining two staged milestones over 15 years. **Table 6.1 and Table 6.2** shows the BMPs anticipated to be implemented within the watershed during each stage. The first milestone will be ten years after implementation begins, whereby the more cost-efficient control measures will be installed, with significant reductions in bacteria anticipated. **Table 6.2** Stage II implementation goals for the North Fork Holston River Watershed.

Control Measure	**Unit**	**Stage II**				
		NTU 239	**NTU 240**	**NTU 241**	**NTU 242**	**NTU 243**
Agricultural						
LE-1T >100 acres Livestock Exclusion	System[1]	8	16	0	0	2
LE-1T<100 acres Livestock Exclusion	System[1]	45	92	55	0	13
LE-2T >100 acres Livestock Exclusion	System[1]	8	16	10	0	2
LE-2T <100 acres Livestock Exclusion	System[1]	45	92	55	0	13
WP-2T Livestock Exclusion	System[1]	1	2	2	0	0
SL-6 Livestock Exclusion	System[1]	6	12	7	0	2
Livestock Exclusion Maintenance	Feet	20,285	42,018	25,205	67	5,879
Conservation Tillage	Acres	0	0	0	0	0
Improved Pasture Management	Acres	1,678	0	2,809	0	0
Residential						
Septic-System Pump-Out (RB-1)	Pump-out	928	1,785	795	222	211
Connection to Public Sewer (RB-2)	System	0	1	0	0	0
Septic System Repair (RB-3)	System	41	81	35	11	10
Septic System Installation/Replacement (RB-4)	System	84	228	83	26	33
Alternative Waste Treatment System Installation (RB-5)	System	38	94	36	11	13
Community Pet Waste Education Program	Program	0	0	0	0	0

[1] The average fencing system length in the watershed is1,875 ft

Table 6.**3** presents a breakdown of the costs for Stage I. Following Stage I implementation, the Steering Committee should evaluate water quality improvements and determine how to proceed to complete implementation (Stage II). Costs for Stage II are presented in

Table 6.4**4**. Based on completing both implementation stages, the final milestone would be achieving the bacteria reductions required by the TMDLs.

Table 6.1 Stage I implementation goals for the North Fork Holston River Watershed.

Control Measure	Unit	Stage I				
		NTU 239	NTU 240	NTU 241	NTU 242	NTU 243
Agricultural						
LE-1T >100 acres Livestock Exclusion	System[1]	24	49	29	0	7
LE-1T<100 acres Livestock Exclusion	System[1]	134	277	166	1	39
LE-2T >100 acres Livestock Exclusion	System[1]	23	49	29	0	7
LE-2T <100 acres Livestock Exclusion	System[1]	134	277	166	0	39
WP-2T Livestock Exclusion	System[1]	3	7	5	0	1
SL-6 Livestock Exclusion	System[1]	17	35	21	0	5
Livestock Exclusion Maintenance	Feet	39,377	81,564	48,928	131	11,413
Conservation Tillage	Acres	155	0	115	0	0
Improved Pasture Management	Acres	5,033	0	8,426	0	0
Residential						
Septic-System Pump-Out (RB-1)	Pump-out	1,800	3,465	1,543	432	411
Connection to Public Sewer (RB-2)	System	2	3	2	0	0
Septic System Repair (RB-3)	System	80	158	69	21	19
Septic System Installation/Replacement (RB-4)	System	164	442	160	50	63
Alternative Waste Treatment System Installation (RB-5)	System	75	183	70	22	25
Community Pet Waste Education Program	Program	0	0	1	0	0

[1] The average fencing system length in the watershed is1,875 ft

Table 6.2 Stage II implementation goals for the North Fork Holston River Watershed.

Control Measure	Unit	Stage II				
		NTU 239	NTU 240	NTU 241	NTU 242	NTU 243
Agricultural						
LE-1T >100 acres Livestock Exclusion	System[1]	8	16	0	0	2
LE-1T<100 acres Livestock Exclusion	System[1]	45	92	55	0	13
LE-2T >100 acres Livestock Exclusion	System[1]	8	16	10	0	2
LE-2T <100 acres Livestock Exclusion	System[1]	45	92	55	0	13
WP-2T Livestock Exclusion	System[1]	1	2	2	0	0
SL-6 Livestock Exclusion	System[1]	6	12	7	0	2
Livestock Exclusion Maintenance	Feet	20,285	42,018	25,205	67	5,879

Conservation Tillage	Acres	0	0	0	0	0
Improved Pasture Management	Acres	1,678	0	2,809	0	0
Residential						
Septic-System Pump-Out (RB-1)	Pump-out	928	1,785	795	222	211
Connection to Public Sewer (RB-2)	System	0	1	0	0	0
Septic System Repair (RB-3)	System	41	81	35	11	10
Septic System Installation/Replacement (RB-4)	System	84	228	83	26	33
Alternative Waste Treatment System Installation (RB-5)	System	38	94	36	11	13
Community Pet Waste Education Program	Program	0	0	0	0	0

[1] The average fencing system length in the watershed is1,875 ft

Table 6.3 Costs to implement Stage I (1st 10 years) for the North Fork Holston River Watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance[1] ($)	Total Cost ($)
NTU 239	$12,289,855	$3,024,000	-	$15,313,855
NTU 240	$22,593,274	$7,170,125	-	$29,763,399
NTU 241	$15,795,793	$2,802,475	-	$18,598,268
NTU242	$27,959	$854,400	-	$882,359
NTU 243	$3,195,346	$962,575	-	$4,157,921
Total	**$53,902,226**	**$14,813,575**	**$1,200,000**	**$69,915,801**

[1]Technical assistance cost is estimated by county, and does not easily break-down into NTUs.

Table 6.4 Costs to implement Stage II (last 5 years) for North Fork Holston River Watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total Cost ($)
NTU 239	$4,168,458	$1,539,600	-	$5,708,058
NTU 240	$7,545,863	$3,687,125	-	$11,232,988
NTU 241	$5,309,448	$1,436,375	-	$6,745,823
NTU242	$235	$437,150	-	$437,385
NTU 243	$1,053,577	$501,575	-	$1,555,152
Total	**$18,077,581**	**$7,601,825**	**$600,000**	**$26,279,406**

[1] Technical assistance cost is estimated by county, and does not easily break-down into NTUs.

6.2 Timeline

Based on meeting the above milestones, a 15-year implementation plan timeline was formulated for the North Fork Holston River watershed. **Table 6.5** shows the anticipated percentage of each BMP to be implemented throughout the two stages of the timeline. **Figure 6.1**– **Figure 6.5** show the timeline graph of milestones throughout implementation for each NTU.

Table 6.5 Break-down of BMP implementation by stage in the North Fork Holston River Watershed.

Control Measure	Unit	Stage I	Stage II
Agricultural		**1st 10 years**	**Final 5 years**
LE-1T >100-acres Livestock Exclusion	System	**75%**	**25%**
LE-1T <100-acres Livestock Exclusion	System	**75%**	**25%**
LE-2T >100-acres Livestock Exclusion	System	**75%**	**25%**
LE-2T <100-acres Livestock Exclusion	System	**75%**	**25%**
WP-2T Livestock Exclusion	System	**75%**	**25%**
SL-6 Livestock Exclusion	System	**75%**	**25%**
Livestock Exclusion Maintenance	Feet	**66%**	**34%**
Conservation Tillage	Acres	**100%**	**0%**
Improved Pasture Management	Acres	**75%**	**25%**
Residential			
Septic Systems Pump-out Program (RB-1)	Pump-out	**66%**	**34%**
Connection to Public Sewer (RB-2)	System	**66%**	**34%**
Septic System Repair (RB-3)	System	**66%**	**34%**
Septic System Installation/Replacement (RB-4)	System	**66%**	**34%**
Alternative Waste Treatment System Installation (RB-5)	System	**66%**	**34%**
Community Pet Waste Education Program	Program	**100%**	**0%**

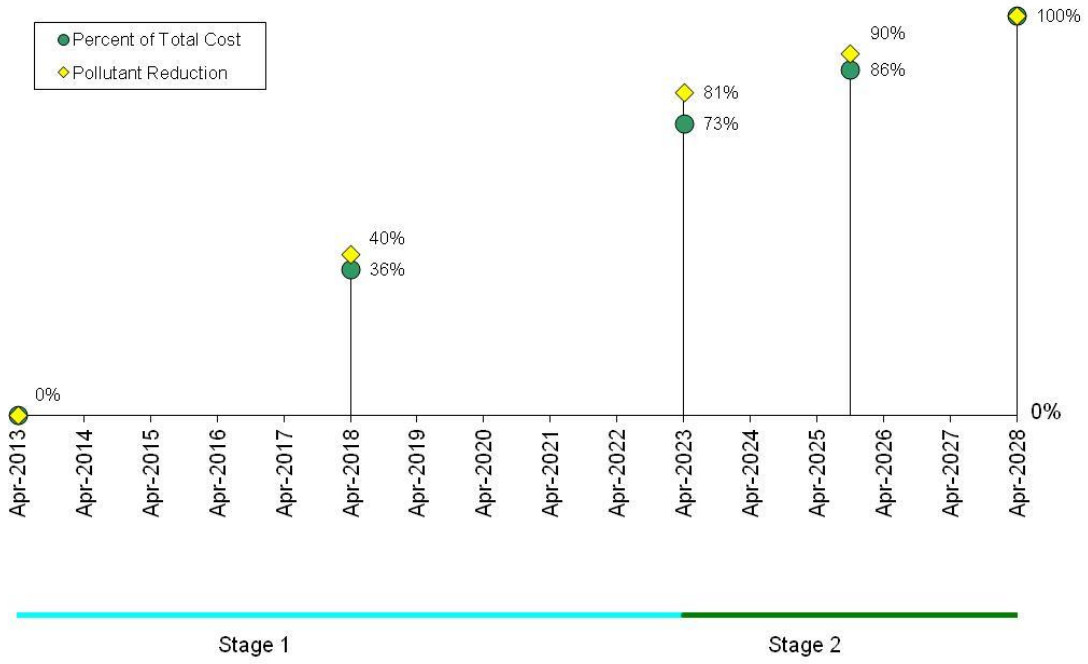

Figure 6.1 Timeline for implementation in the Lower North Fork Holston River impaired segment group (NTU 239)

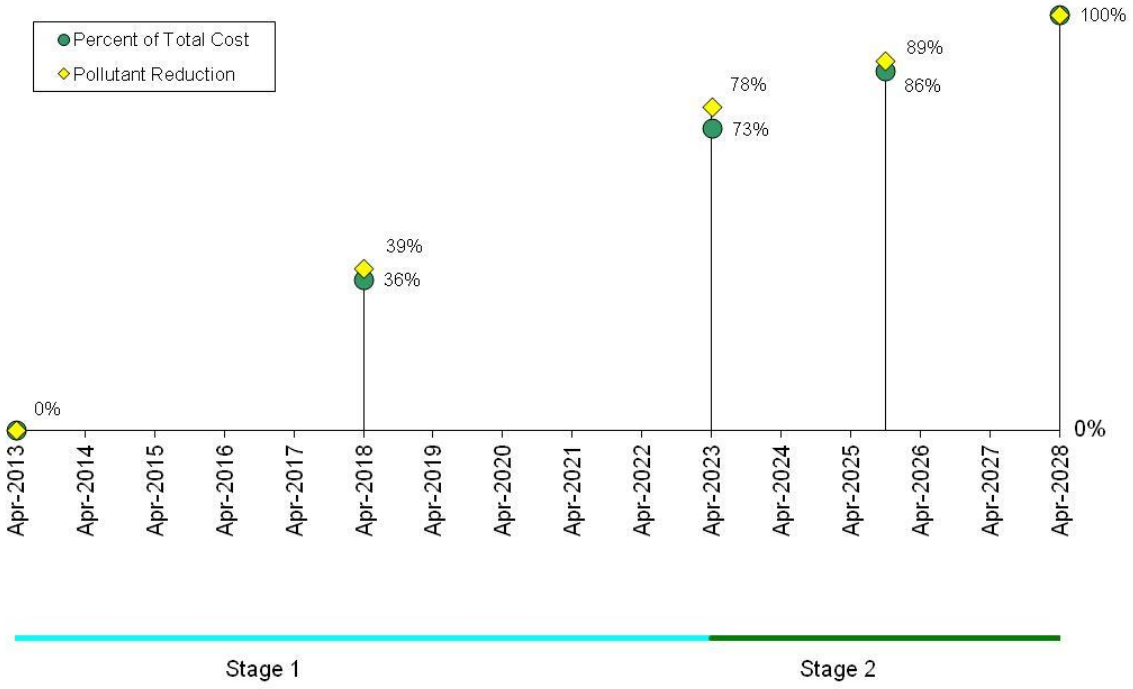

Figure 6.2 Timeline for implementation in the Upper North Fork Holston River impaired segment group (NTU 240)

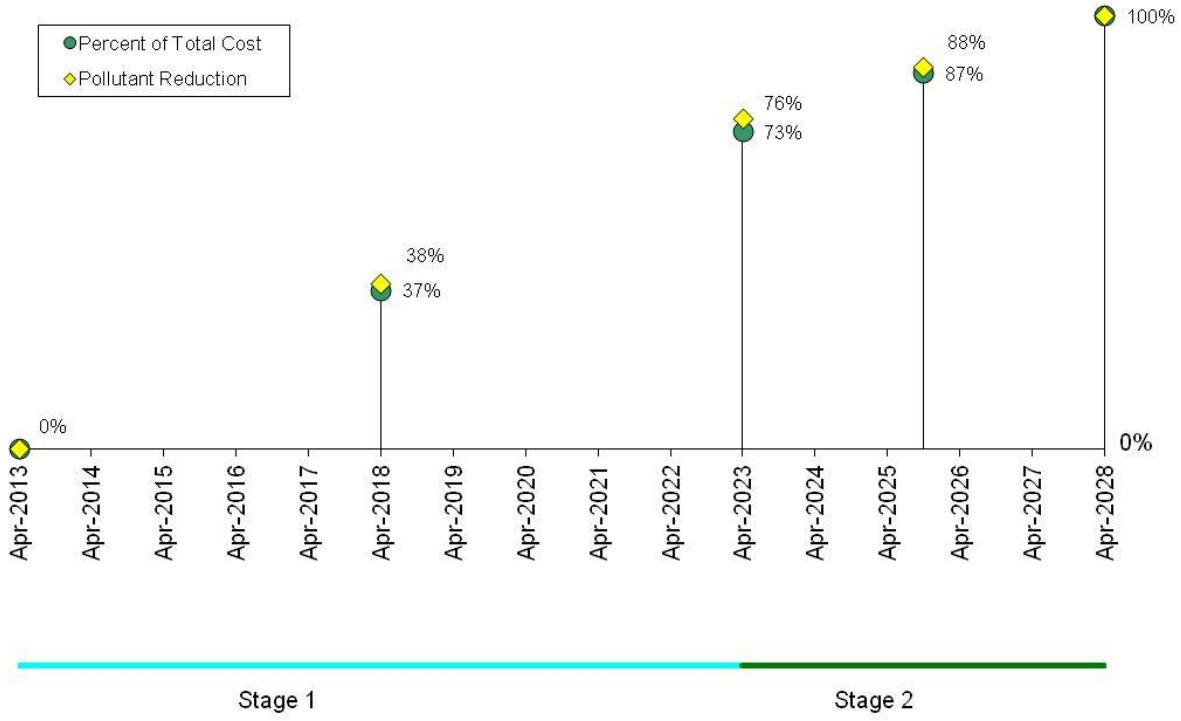

Figure 6.3 Timeline for implementation in the Big Moccasin impaired segment group (NTU 241)

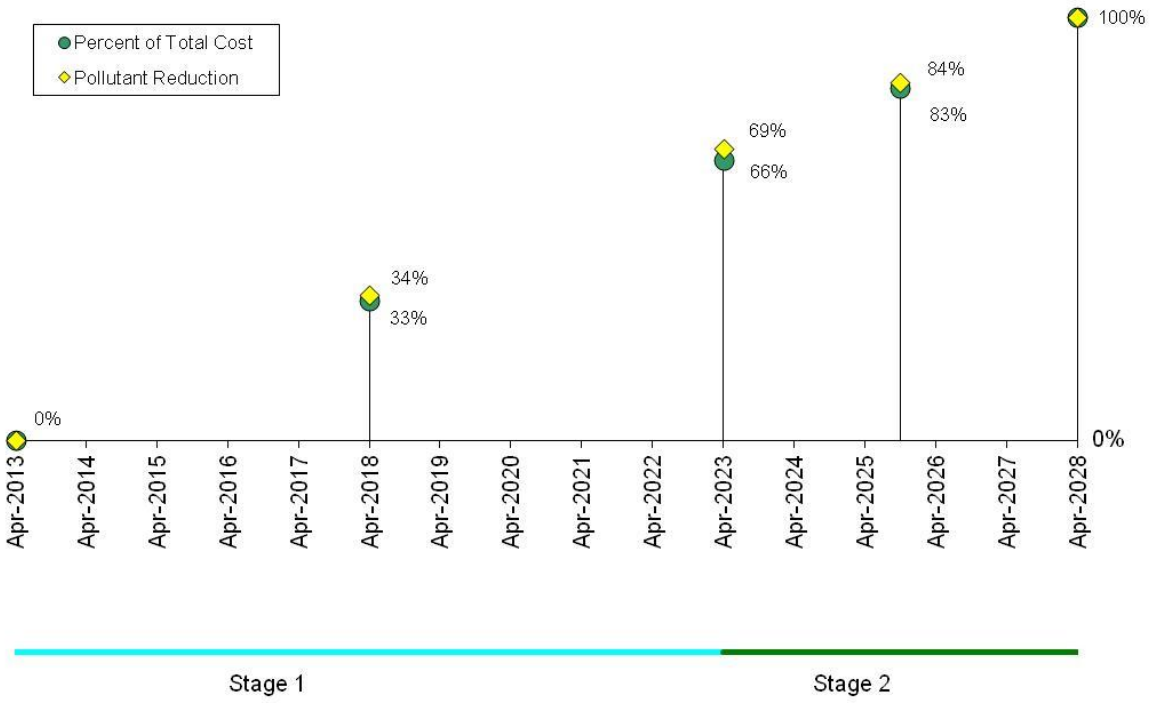

Figure 6.4 Timeline for implementation in Abrams Creek impaired segment group (NTU 242)

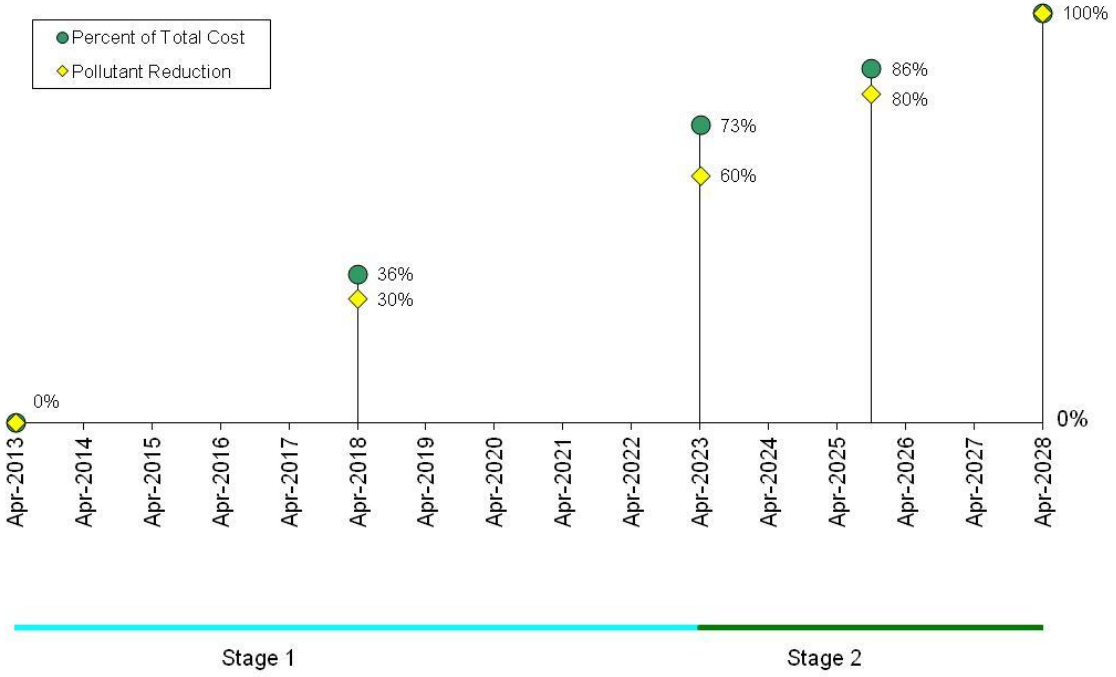

Figure 6.5 Timeline for implementation in Possum Creek impaired segment group (NTU 243)

Table 6.6 shows the anticipated progress toward achieving the bacteria load reduction goals required to meet the TMDL allocated reductions. The first row is the reduction to the bacteria load anticipated to be achieved, shown as a percentage of the total bacteria load reduction needed to meet water quality standards in the NTU. The second row shows the anticipated percent of bacteria violations of the monthly geometric mean standard. The third row shows the percent of the total cost at each milestone. The progress towards achieving the required temperature reductions for Laurel Creek, is shown as a percent of the total reductions needed, in the table for NTU 240.

Table 6.6 Progress toward bacteria load reduction goal for each NTU in the North Fork Holston Watershed.

NTU 239	Existing	Stage I	Stage II
Progress Toward Bacteria Load Reduction Goal	0	81%	100%
Bacteria Violations (126 cfu/100ml)	31%	6%	0%
Cost (% of Total)	0	73%	100%

NTU 240	Existing	Stage I	Stage II
Progress Toward Bacteria Load Reduction Goal	0	78%	100%
Bacteria Violations (126 cfu/100ml)	6%	3%	0%
Progress Towards Temperature Reduction	0%	75%	100%
Cost (% of Total)	0	73%	100

NTU 241	Existing	Stage I	Stage II
Progress Toward Bacteria Load Reduction Goal	0	76%	100%
Bacteria Violations (126 cfu/100ml)	26%	9%	0%
Cost (% of Total)	0	73%	100%

NTU 242	Existing	Stage I	Stage II
Progress Toward Bacteria Load Reduction Goal	0	69%	100%
Bacteria Violations (126 cfu/100ml)	34%	6%	0%
Cost (% of Total)	0	66%	100%

NTU 243	Existing	Stage I	Stage II
Progress Toward Bacteria Load Reduction Goal	0	60%	100%
Bacteria Violations (126 cfu/100ml)	49%	3%	0%
Cost (% of Total)	0	73%	100%

6.3 Targeting

Implicit in the process of a staged implementation is targeting of control measures. Targeting ensures optimum utilization of resources. The North Fork Holston River watershed was divided into 31 subwatersheds (Figure 1.1). Targeting of critical areas for livestock fencing was accomplished through analysis of livestock population and the fencing requirements for each subwatershed (**Figure 6.6**). If feasible, effort should be made to prioritize resources in higher priority subwatersheds. For example, the local SWCDs should initiate participation from farmers in subwatersheds 8, 9, and 10. There was discussion at the working group meeting that much of the mainstem of the North Fork Holston River is inaccessible to livestock and that most of the livestock exclusion installation should focus on the tributaries, so the local SWCDs can take that into consideration when targeting fencing priority. The targeting priority should be used to conduct outreach, promoting the cost-share programs available. Any interested parties should not be turned away if their farm is in a low ranking subwatershed.

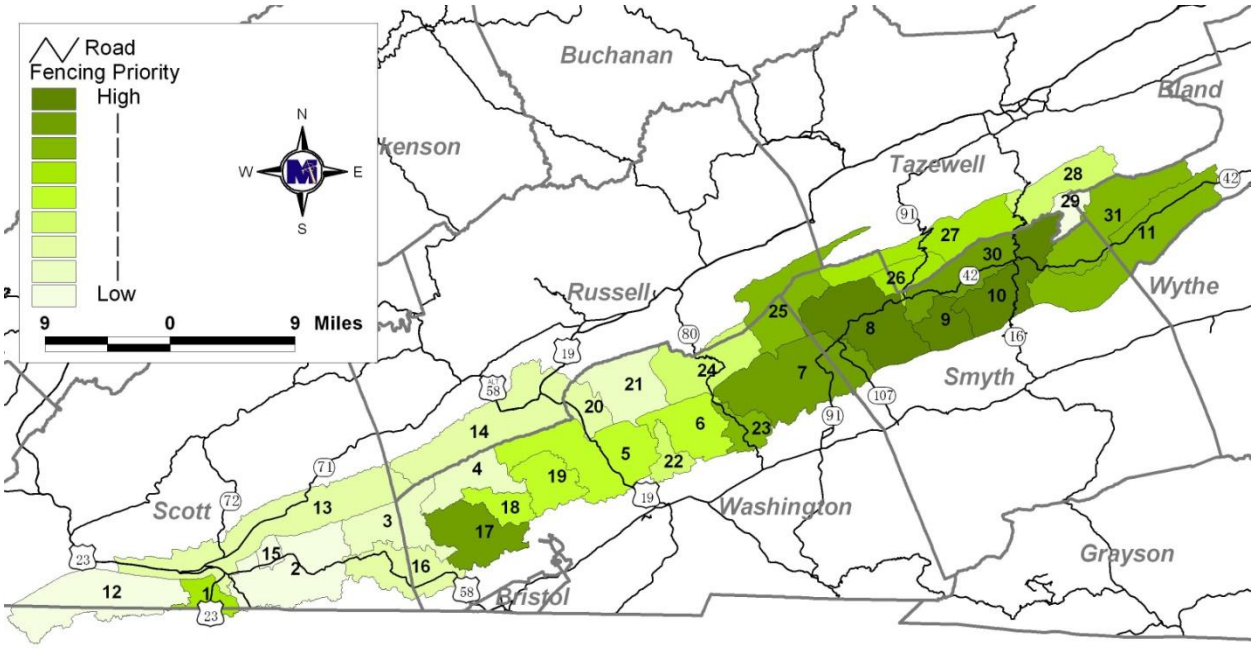

Figure 6.6 Fencing targeting based on the fence length required and cattle population.

Targeting of failing septic systems and straight pipes should be initiated based on the priority shown in **Figure 6.7** and **Figure 6.8**, respectively. These priorities were derived from ranking the number of failing septic systems and straight pipes in each subwatershed.

One method of targeting in agricultural and residential areas involves considering the cost-efficiency of specific practices. **Table 5.9** indicates the cost-efficiencies of the practices proposed in this IP. Practices with high cost-efficiencies, relative to other practices, will provide the greatest benefit per dollar invested.

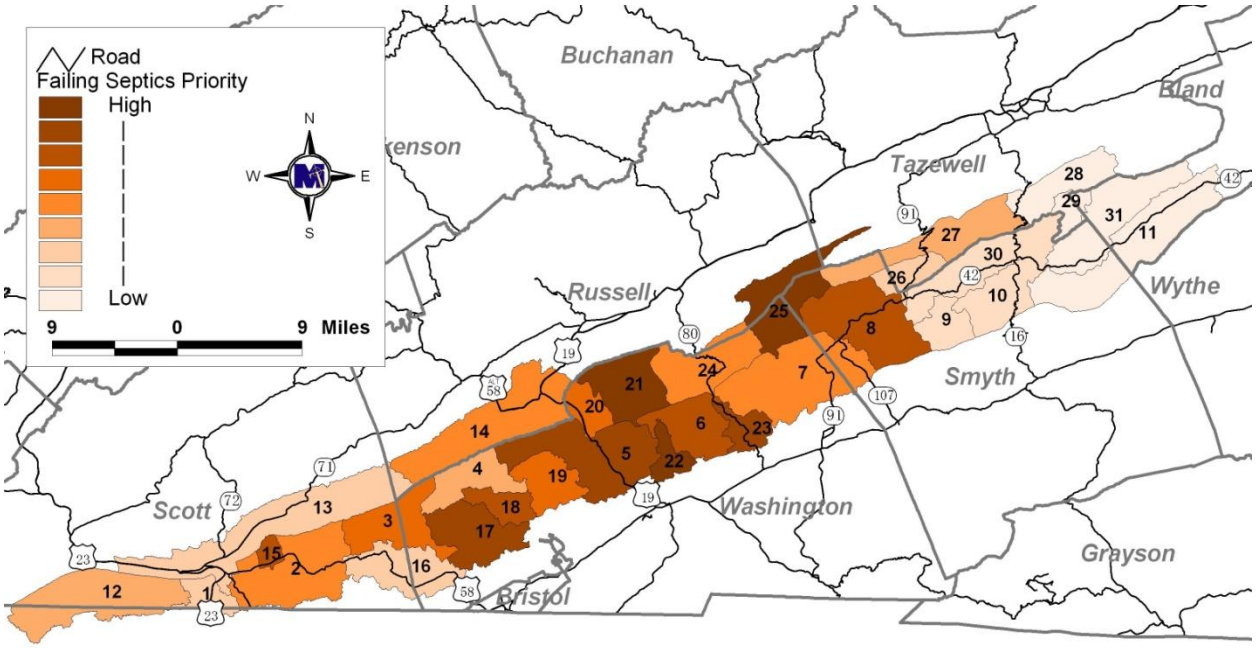

Figure 6.7 Failing septic system targeting based on the number of failing septic systems.

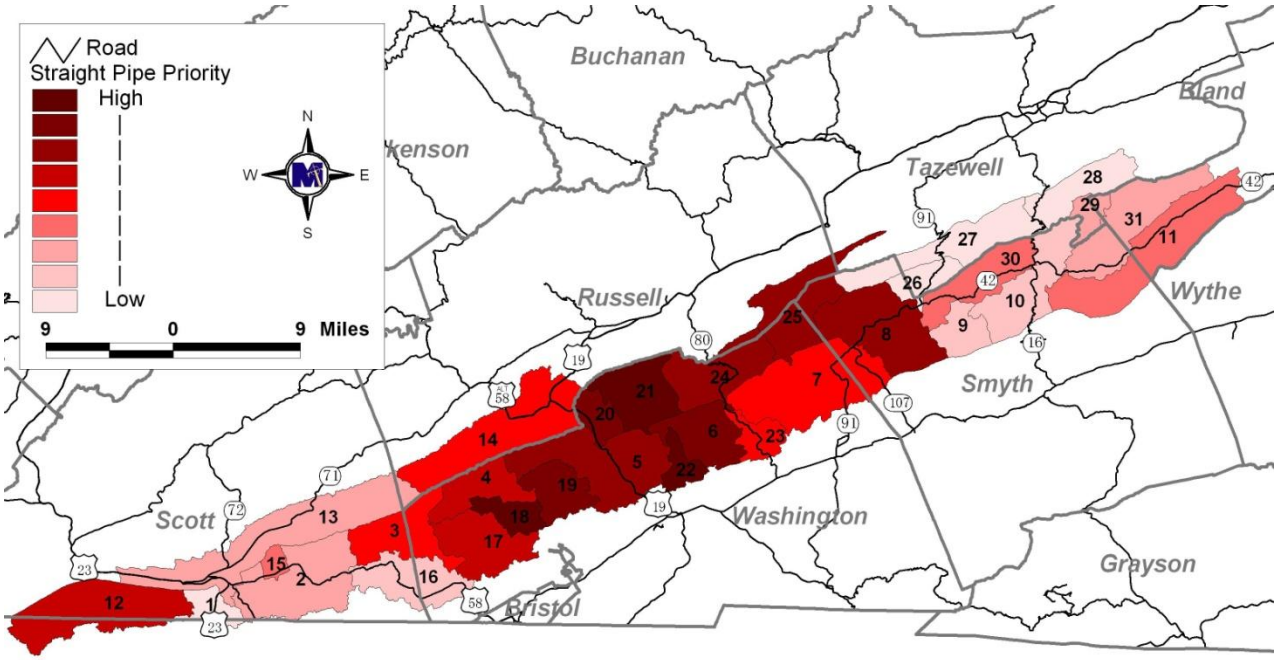

Figure 6.8 Straight pipe targeting based on the number of straight pipes.

7. STAKEHOLDERS AND THEIR ROLE IN IMPLEMENTATION

Reaching the goals of this effort (*i.e.*, improving water quality and removing these waters from the impaired waters list) is dependent upon 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 local SWCDs have agreed to take responsibility for initiating contact to encourage landowners to install the agricultural BMPs and to correct residential onsite wastewater treatment systems in need. VADCR staff will take the responsibility of working with the local SWCDs and other partners in tracking implementation efforts as well as organizing the steering committee for evaluations of implementation progress. The following sections in this chapter describe the responsibilities and expectations for the various components of implementation.

7.1 Integration with Other Watershed Plans

Each watershed in the state is under the jurisdiction of a multitude of individual, yet related, water quality programs and activities, many of which have specific geographic boundaries and goals. These include but are not limited to TMDLs, Roundtables, Water Quality Management Plans, erosion and sediment control regulations, stormwater management, Source Water Protection Program, and local comprehensive plans. A previous TMDL within this same watershed was "*Mercury Total Maximum Daily Load Development for the North Fork Holston River, Virginia*". Coordination of the implementation project with these existing programs could result in additional resources and increased participation.

7.2 Monitoring

Improvements in water quality will be determined in the North Fork Holston River watershed through monitoring conducted by the VADEQ's ambient monitoring program. The monitoring data include bacteria, physical parameters (dissolved oxygen, temperature, pH, and conductivity), nutrients and organic and inorganic solids. The VADEQ uses the data to determine overall water quality status. The water quality status will help gauge the success of

implementation aimed at reducing the amount of bacteria and lower the temperature in the streams of the North Fork Holston River watershed.

Local residents in attendance at the working group meetings expressed interest in beginning to conduct bacteria monitoring on the tributaries where they live. They will be coordinating with VADEQ and VADCR representatives to determine a specific monitoring location and training. Others who are interested in getting involved with citizen monitoring efforts are encouraged to contact their regional VADEQ office for further information.

The VADEQ monitoring stations in the North Fork Holston River watershed are described in **Table 7.1** and shown in **Figure 7.1**. Stations are monitored every other month within the monitoring period listed in **Table 7.1**.

Up-to-date monitoring results are available to residents by requesting the information from the VADEQ.

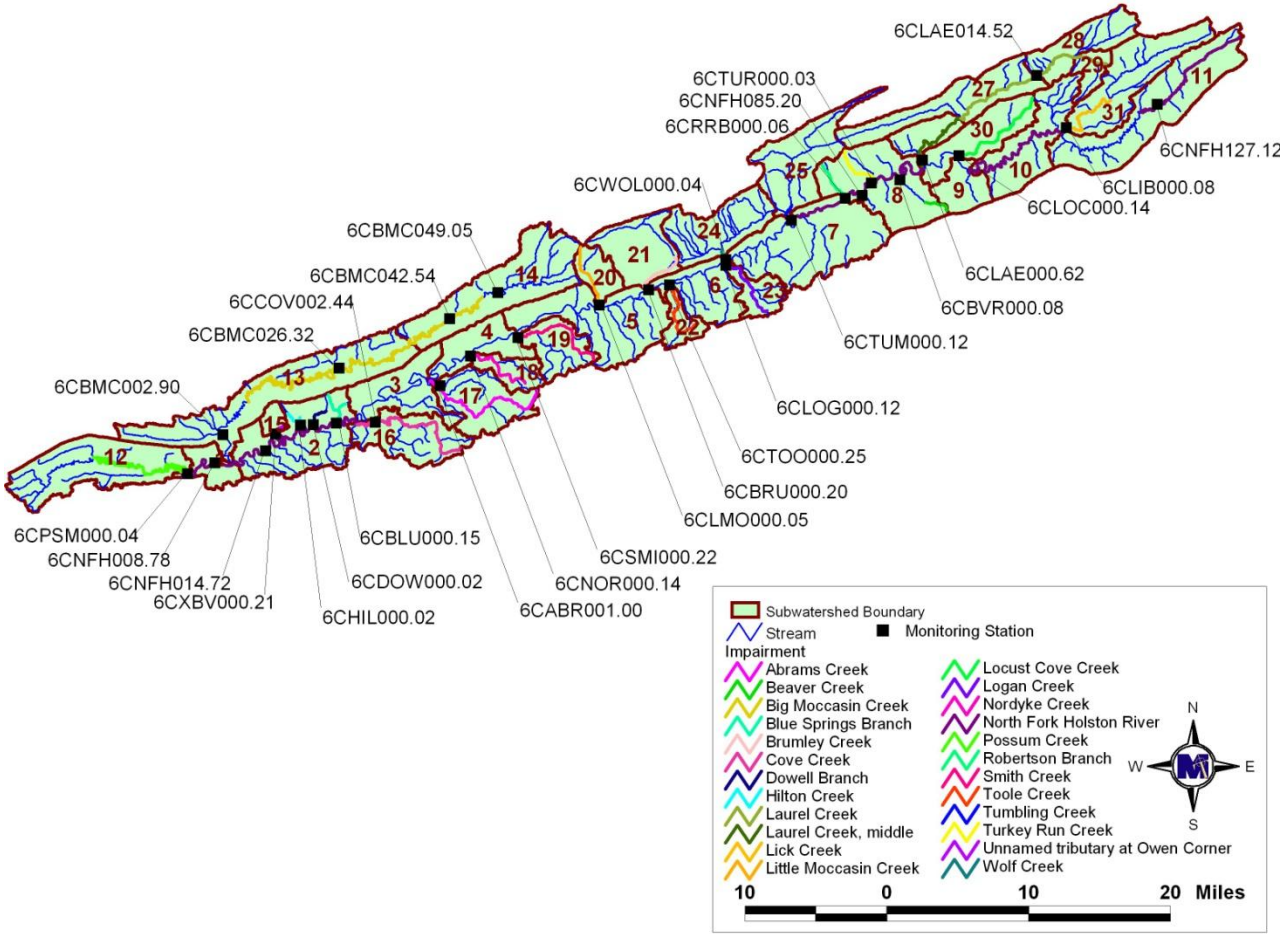

Figure 7.1 Location of monitoring stations in the North Fork Holston River watershed.

Table 7.1 Monitoring station IDs, station locations, station type, and monitoring schedules for the North Fork Holston River watershed VADEQ stations.

Station ID	Stream Name	Station Type	County	Schedule
6CNFH127.12	North Fork Holston River	Ambient	Bland	Every other month for two years, off for four years
6CNFH113.36	North Fork Holston River	Ambient	Smyth	
6CLAE014.52	Laurel Creek	Ambient	Tazewell	
6CLAE000.62	Laurel Creek	Ambient	Smyth	
6CNFH085.20	North Fork Holston River	Trend	Smyth	Every other month
6CNFH008.78	North Fork Holston River	Trend	Scott	Every other month
6CBRU000.02	Brumley Creek	Ambient	Washington	Every other month for two years, off for four years
6CLOG000.12	Logan Creek	Ambient	Washington	
6CTOL000.25	Toole Creek	Ambient	Washington	
6CTUM000.12	Tumbling Creek	Ambient	Washington	
6CABR001.00	Abrams Creek	Ambient	Washington	
6CCOV002.44	Cove Creek	Ambient	Washington	
6CLMO000.05	Little Moccasin Creek	Ambient	Washington	
6CNOR000.14	Nordyke Creek	Ambient	Washington	
6CDMI000.22	Smith Creek	Ambient	Washington	
6CBLU000.15	Blue Springs Branch	Ambient	Scott	
6CDOW000.02	Dowell Branch	Ambient	Scott	
6CHIL000.02	Hilton Creek	Ambient	Scott	
6CXBV000.21	UT to North Fork Holston	Ambient	Scott	
6CPSM000.04	Possum Creek	Ambient	Scott	
6CBMC049.05	Big Moccasin Creek	Ambient	Russell	
6CBMC042.54	Big Moccasin Creek	Ambient	Russell	
6CBMC026.32	Big Moccasin Creek	Ambient	Scott	
6CBMC002.90	Big Moccasin Creek	Ambient	Scott	
6CLOC000.14	Locust Cove Creek	Ambient	Smyth	
6CBVR000.08	Beaver Creek	Ambient	Smyth	
6CRRP000.06	Robertson Branch	Ambient	Smyth	
6CTUR000.03	Turkey Run Creek	Ambient	Smyth	
6CWOL000.04	Wolf Creek	Ambient	Washington	
6CLIB000.08	Lick Creek	Ambient	Smyth	

7.3 Agricultural, Residential and Industrial Education Programs

Education and outreach are significant components of any TMDL implementation project. The local SWCDs will be in charge of initiating contact with residents and farmers to encourage the installation of BMPs. This one-on-one contact will facilitate communication of the water quality problems and the corrective actions needed. The district staff will conduct a number of outreach activities in the watershed to promote participation and community support to attain the IP milestones and to make the community aware of the TMDL requirements. Such activities will include information exchange through newsletters, mailings, field days, demonstrations, organizational meetings, etc. The staff will work with appropriate organizations such as VCE to educate the public. Grazing land/ forage workshops possibly with the Virginia Forage and Grassland Council are venues to distribute agricultural education materials. Specific agricultural and residential outreach ideas are outlined in section 5.3.

A residential education program consisting of educational materials about pet waste will be cost-effective options. If the Master Gardener program was involved, education materials could be handed out through them. The Cooperative Extension and the local SWCDs could also help distribute information on how citizens need to clean up after their pets.

7.3.1 Local Soil & Water Conservation Districts (SWCDs)

SWCDs are local government entities providing soil and water conservation assistance to farmers and residents in the North Fork Holston River watershed. The North Fork Holston and tributaries watershed spans 6 counties and is therefore represented by several Soil & Water Conservation Districts. While these SWCDs may have similar functions and interests, each SWCD serves a specific geographic area, which usually corresponds to a county boundary. **Table 7.2** outlines the SWCD that represents each county in this watershed, and can serve as a starting point for seeking out assistance from the experienced personnel at the local SWCD.

Table 7.2 Soil & Water Conservation Districts and corresponding counties

Virginia County	Soil and Water Conservation District
Bland County	Big Walker SWCD
Russell County	Clinch Valley SWCD
Scott County	Scott County SWCD
Smyth County	Evergreen SWCD
Tazewell County	Tazewell SWCD
Washington County	Holston River SWCD

During the implementation project, the local SWCDs will provide outreach, technical and financial assistance to farmers and homeowners in the North Fork Holston River watershed through the Virginia Agricultural BMP Cost-Share and Tax Credit programs. Their responsibilities will include promoting implementation goals, available funding and the benefits of BMPs and providing assistance in the survey, design, layout, and approval of agricultural and residential BMPs. Education and outreach activities are a significant portion of their responsibilities. Specific education and outreach methods recommended by the working groups are described in section 5.3 of this document. These SWCDs will be eligible for technical assistance funding to support their duties.

7.4 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 five state agencies responsible for regulating activities that impact water quality in Virginia. These agencies are VADEQ, VADCR, VDH, VADMME 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 that

hold 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, the Virginia General Assembly passed legislation in 1999 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). On January 1, 2008 DEQ assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids, as directed by the Virginia General Assembly in 2007. DEQ's Office of Land Application Programs within the Water Quality Division to manages the biosolids program. The biosolids program includes having and following nutrient management plans for all fields receiving biosolids, unannounced inspections of the land application sites, certification of person's land applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied.

VADCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. Historically, most VADCR programs have dealt with agricultural NPS pollution through education and voluntary incentive programs. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the level of participation required by TMDLs (near 100%). To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentive programs are continually reevaluated to account for this level of participation. Although VADCR does not have regulatory authority over the majority of NPS issues addressed here, the department does administer the MS4 stormwater permit program.

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 necessary, 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 Agricultural Stewardship Act, and very little funding is available to support water quality sampling. The Agricultural Stewardship Act is entirely complaint-driven.

The *Emergency Regulations for Alternative Onsite Sewage Systems*, adopted in April, 2010, require that all alternative onsite sewage treatment systems in Virginia be visited at least annually by a licensed operator. However, the Virginia Department of Health (VDH) does not currently have the authority, the mandate or the resources to require or conduct similar surveillance of all conventional onsite sewage treatment (septic) systems in the Commonwealth. (Note that, as resources allow, VDH may conduct or assist with such surveys that target localized areas of specific concern.)

Given the above limitations, VDH generally learns of failed septic systems directly or indirectly from the owners of those systems or through complaints from neighbors or other government agencies. Reports of straight pipes are less-frequently received from either source, since they are generally located in less-populated areas and are typically sited/intended to avoid detection.

When VDH receives a report of a non-compliant system, it performs a site inspection, if necessary, to verify the report. VDH then works with the homeowner to address the issue in an effective, timely and regulatory-compliant manner, generally through installation of a septic or alternative onsite system, repair or replacement of an existing system and/or failed components of that system, connection to a central collection/treatment system, or other appropriate measure(s). In the case of non-cooperative homeowners, VDH initially attempts to achieve compliance through internal enforcement actions and, ultimately, through the court system.

An impasse may be reached when a homeowner is willing, but financially unable to correct the non-compliance. In such situations, VDH assists in attempting to locate funding for the needed corrections.

VADMME seeks to enhance the conservation and development of energy and mineral resources in Virginia. They are responsible for eliminating off-site environmental damages and ensuring the proper restoration of lands used for coal and mineral mining, and gas and oil operations.

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.

The local governments can play a very active role in the implementation process. For example, they could promote a septic system maintenance program. This could be done by handing out literature when individuals apply for a building permit. It is recommended that the counties within the North Fork Holston River watershed adopt a reserve area for land parcels using on-site wastewater treatment of equal size to the approved on-site disposal system for use in the event the on-site disposal system fails. Further, the reserve area shown must be of equal capacity to the primary drainfield using the same technology as the primary system. Nothing shall be constructed within the reserve area. The counties could also play an active role in the proper disposal of pet waste. When licenses for dog kennels are issued the owners should be required to produce a plan for the proper disposal of waste from the facility. Future subdivisions should be developed with sustainable growth practices that minimize or eliminate storm water runoff.

7.5 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 that 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. USEPA largely ignored the nonpoint source section of the Clean Water Act until citizens began to realize that regulating only point sources was no longer maintaining water quality standards. Lawsuits from citizens and environmental groups citing USEPA 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 in 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 owner of the aquaculture operation claimed that the agricultural runoff created from the plasticulture operation carried pollutants that 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 ensuring 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.

8. FUNDING

The following practices are identified as vital to attaining the goals of the North Fork Holston River watershed IP: LE-1T, LE-2T, SL-6 (Grazing Land Protection), WP-2T (Streambank Protection in TMDL areas), RB-1 (Septic Tank Pump-Out), RB-3 (Septic System Repair), RB-4 (Septic Tank System Installation/Replacement), RB-5 (Alternative On-site Waste Treatment System, Residential Pet Waste Education Program). 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 the SWCDs, VADCR, NRCS, and VCE. 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. The Virginia Water Quality Improvement Fund (WQIF) provides funding for this program, which is dependent upon a percentage of state surpluses.

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 are 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 BMPs. The equipment must be needed by the small business to comply with the federal Clean Air Act, or to 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 recipients include local governments, SWCDs, 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 subject to a public review period of at least 30 days. This fund was identified as a potential funding source for the urban stream buffers and pet waste composter program to be included in the implementation plan.

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 the Farm Service Agency (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 for 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 maximize 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 areas 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 Environmental Quality Incentives Program (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 of 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 $25,813.

National Fish and Wildlife Foundation

Applications 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, a 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. 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) it leverages available funding, and 4) project outcomes are evaluated. 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

USEPA 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, silvicultural, 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.

EPA Environmental Education Grant Funding Opportunity

USEPA has recently announced an exciting environmental education grant funding opportunity. The purpose of the grants is to promote environmental stewardship and help develop knowledgeable and responsible students, teachers and citizens. For the full USEPA news release, please visit http://go.usa.gov/4DQ. More information on eligibility and application materials, please visit http://www.epa.gov/enviroed/grants.html.

The project start date in proposals should be no earlier than September 1, 2011. There is a requirement to specify an environmental issue, based on USEPA's current priorities that the proposed project will focus on. There is more emphasis on expanding the conversation on environmentalism by including a variety of audiences in proposed projects. There is a strong emphasis on partner letters this year. Letters will be scored for their clarity and completeness. Incomplete applications will not be reviewed. If applying through grants.gov, make sure to register at least one week ahead of time. Check out the FAQ link for more information: http://www.epa.gov/enviroed/grants_faq.html.

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APPENDIX A

Working Group and Steering Committee Minutes and Reports

North Fork Holston River and Tributaries TMDL Implementation Plan

Government Work Group Meeting

DEQ-Southwest Regional Office, Abingdon, VA
November 13, 2012

Participants
Wayne Turley, Holston River SWCD
Bill Moss, NRCS
Scott Honaker, VDH
Travis Holt, VDH
Martha Chapman, DEQ

Technical Assistance and Timeline
Everyone in the work group agreed technical assistance costs have increased, especially considering training and travel. For the NF Holston River watershed, everyone agreed that one half-time FTE (one in Washington County, one in Smyth County, and one in Scott County) at a cost of $40K each would be adequate. Although Scott County has less of the watershed it includes the most urban and residential areas.

The group also discussed the timeline and agreed a longer timeline, 10 years, for the stage I goals would be necessary. The remainder of the timeline should be devoted to stage II goals. Everyone agreed more resources should be focused on stage I.

Agriculture
The group agreed that both the SL-6T and WP-4 practice should be included. The number of WP-2s should be reduced and a % of the systems be SL-6s.

The cost of a WP-4 system needs to be increased to $70K.

The group agreed that most of the farms in the watershed, approximately 85%, are less than 100 acres.

Residential
Everyone agreed soils in the North Fork Holston watershed indicate a need for more alternate waste treatment systems.

The Holston River SWCD has had a pump-put program for both the Three Creeks and Beaver/Little Creek watersheds that have been extremely successful. Holston River and other SWCDs in the watershed are interested in providing a pump-out program should they find grant funds to support it.

There is very little public sewer available in the North Fork Holston watershed. Much of the watershed is extremely rural except for the portion surrounding Gate City and Weber City in Scott County. The potential for future sewer connections should be adjusted to around 1%.

Since most of the watershed is extremely rural, everyone agreed the best place to focus pet waste education are the Towns of Gate City and Weber City. It is the main urban area in the watershed and does have parks with pet traffic.

Everyone agreed the costs provided in Table 3 seem reasonable for the area.

Monitoring

Most of the monitoring stations in the North Fork Holston River watershed are ambient stations that will fall into the regular ambient monitoring cycle. There are two stations on the mainstem of the North Fork Holston River that are trend stations and will be visited every other month.

North Fork Holston River and Tributaries TMDL Implementation Plan

Agricultural and Residential Work Group Meeting

DEQ-Southwest Regional Office, Abingdon, VA
February 12, 2013

Participants
Wayne Turley, Holston River SWCD
Amy Anderson
Neil Knox
Jane Knox
Patrick Lizon, DCR
Dan Manweiler
Nico Leidig
Laurel Flaccavento
Anthony Flaccavento
Brad Stallard, VDH
Martha Chapman, DEQ

BMP Costs

Residential

The group agreed that the costs for residential BMPs may need to be adjusted. The cost for a septic pumpout should be closer to $325. The price for a septic system install should probably be raised to $6,000.

Conversations with the Washington County Health Department confirm that sewer hook-up in Washington County is around $3, 600. Sewer hook-up will vary depending on County ordinances, but $4,000 to $5,000 should be a safe estimate.

It should also be noted the VDH has a fair bit of latitude for a septic system repair. For example, complete replacement of the drain field and other components is a repair as long as the equipment in the house is not replaced. This means the VDH can treat the majority of septic system problems as repairs. The cost for a septic system repair will need to be adjusted to a higher number than a typical repair.

The repair/hookup/replacement percentages suggests by the VDH are as follows:

Item	Failing Septic Systems	Straight Pipes
repair	75 – 80%	75 – 80%
replacement	2%	2%
alternative system	22 – 17%	22 – 17%
hook up	1%	1%
total	100%	100%

These numbers are specific for Washington, but can be applied to adjacent counties in the North Fork Holston River watershed since soil and topography are similar.

Agriculture

The group agreed that both the SL-6T and WP-4 practice should be included. The number of WP-2s should be reduced and a % of the systems be SL-6s.

The cost listed in Table 2 of the Agriculture handout for livestock exclusion on farms less than 100 acres needs to be increased to $25,000 - $30,000. Even though it may be a smaller farm, the cost for drilling a well or spring development would be the same.

The cost listed in Table 2 of the Agriculture handout for improved pasture management needs to be increased to $270/acre if this is intended to be an SL-1.

Everyone at the meeting agreed much of the mainstem of the North Fork Holston River is inaccessible to livestock and most of the BMP work needs to focus in the tributaries.

Citizen Monitoring

The local residents in attendance at the meeting expressed interest in beginning to conduct bacteria monitoring on the tributaries where they live. They will follow up with Martha Chapman and Patrick Lizon for more specific monitoring location and training information.

Steering Committee Meeting

DEQ Southwest Regional Office
April 10, 2013, 1:00 – 3:00 pm

Attendees: 7

Martha Chapman of DEQ opened the meeting by welcoming everyone and providing some history and information about the Final Public Meeting next week, April 18, 6:00 pm.

General discussion:

Wayne Turley (HRSWCD) indicated that much of the planned fencing generally lasts only a few years beyond the 10-year cost-share payments. Consequently, we may be wasting money by investing in unstable BMPs.

Patrick LIzon (DCR) suggested that concentrated work on the pastures rather than fencing out direct deposition of livestock might be more effective. It leads to better stewardship and possibly longer lasting impact on stream water quality.

Mike Scanlan indicated that the fencing practice does not only limit direct deposition. The growth of vegetation behind the fence is also a buffer that traps pollutants, and the fence barrier permits the stream banks to recover. Practices may target one source but they can and do act on multiple sources.

Patrick L. expressed concern that the money necessary to accomplish implementation would not be available over the 15-year timeline for this watershed.

Mike S. answered that a plan is needed (and required) and we cannot predict whether the money will be available. The best we can do is to develop a good plan, express what it will cost, and hope that at least some of the practices will be installed to serve as a stimulus for others to join in. Even a small change will make a difference to the water quality.

Wayne Turley commented that one thing we could do in the IP to facilitate broad changes is to seek permanent easements on entire farms. This ensures that the property remains farmland and will not be subdivided. He just helped establish a 140 acre easement on a 160 acre farm in Washington Co. in the Middle Fork Holston River watershed. Funding is available through FRPP, Virginia Outdoor Foundation, VDAC, and private sources. Local matching funds are very important.

We discussed the large investment in the “Three Creeks” IP area (which is physically contained in the Middle Fork Holston R. waterwhed. Water quality still does not meet standards despite the investment. Part of that has to do with the poor stream habitat for microorganisms.

Martha Chapman is working on a public document to be a companion to the technical document.

A VDH representative asked if pump-outs were credited for reducing the bacteria load. M. Scanlan of MapTech said it was not.

Preview of the presentation for the final meeting:

Mike S. began with a discussion of NTUs (Nested TMDL Units) that are a foundation for the technical document and the presentation. NTUs are groups of watersheds that have similar land use that may therefore be

expected to have the same pollution problems. They provide a basis upon which TMDLs can be developed. They also can be used to accommodate future, similar pollution problems.

The 5 slides of impairments will be summarized in one slide if possible.

The list of acronyms will be deleted.

Wayne T. promoted youth programs such as farm field days or in-school programs. They are the best way of getting education about septic systems to the farm and home owners of the future.