Little River Total Maximum Daily Load Implementation Plan Technical Report

(Bacteria, Sediment, and Temperature)

Prepared for:
Virginia Department of Environmental Quality
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Town of Floyd, Virginia

Government of Floyd County, Virginia

Natural Resources Conservation Service (NRCS)

Local citizens and stakeholders in the Little River watershed

New River Highlands Resource Conservation and Development

Skyline Soil & Water Conservation District (Skyline SWCD)

Virginia Department of Conservation and Recreation (VDCR)

Virginia Department of Environmental Quality (VDEQ)

Jessie Peterman Memorial Library ,Floyd, VA

Virginia Department of Forestry (VDOF)

Virginia Cooperative Extension (VCE)

Virginia Department of Health (VDH)

Steering Committee Members

Working Group Members

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EXECUTIVE SUMMARY

The Little River drainage area included in this project is approximately 200,000 acres and drains parts of Floyd, Pulaski, and Montgomery counties and the Town of Floyd in Virginia. The drainage area is predominantly forested (57%). Agricultural lands account for approximately 37% (mostly pastureland) of the drainage area and developed lands account for approximately 4%. Sixteen stream segments on the Little River and its tributaries are listed for bacteria impairments. In addition to bacteria impairments, three segments do not meet the General Standard and eight segments do not meet the temperature standards.

As a result of the listings, total maximum daily load (TMDL) reports were developed (*Bacteria, Benthic, and Temperature Total Maximum Daily Loads in the Little River Watershed of Floyd, Montgomery and Pulaski Counties*, Virginia, MapTech, Inc., April 2011) 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, sediment, and temperature levels to achieve the water quality goals for the impaired streams.

Review of TMDL Development

Little River is part of the New River basin and is located within USGS hydrologic unit 05050001. In 2011, the estimated human population within the Little River watershed was 15,120. The major land uses in this watershed are forest and pasture lands. The watershed size is approximately 225,000 acres.

This TMDL study was conducted because the Little River was not meeting the state water quality standards for the recreation use (swimming) and the General Standard (aquatic life) in addition to the natural trout and 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.

In order to meet the water quality goals established by the TMDL study, the geometric mean of four or more weekly *E. coli* samples taken in a calendar month must be equal to or less than 126 colony forming units per 100 milliliters (cfu/100mL). Sediment load reductions to meet the TMDL were estimated by comparing sediment loads from the Little River with a stream that was unimpaired for aquatic life (Big Reed Island Creek, VA). As for temperature, the maximum temperature in natural trout streams shall not exceed 20°C and shall not exceed 21°C in stockable trout waters.

The reductions called for to address the bacteria impairments were mostly dealing with direct sources to streams such as straight pipes and livestock direct deposition. The bacteria TMDL calls for eliminating all straight pipes and reducing livestock direct deposition by 73% (Table ES.1)

Table ES.1 Load reductions allocated during bacteria TMDL development.

Impairment	Direct Livestock	Direct Human
Little River watershed	73%	100%

The sources of sediment in the Little River come from erosion from land areas, streambanks, straight pipes, and point sources. Land uses used in the analyses are Cropland, Forest, Disturbed Forest, Pasture, Residential, Commercial, Barren, Wetland, and Water. The sediment reductions recommended in the Little River watershed are shown in Table ES.2. The Waste Load Allocation includes all permited sources of TSS. The Load Allocation is the remaining sources of TSS, including all other land uses and straight pipes.

Table ES.2 Final sediment TMDL allocation scenario for the Little River watershed.

Sediment Source	Existing Loads t/yr	Scenario 1 Reductions (Final) (%)	Scenario 1 Allocated Loads t/yr
Barren	300.14	**17.77%**	246.81
Commercial	2.81		2.81
High Tillage	61.56	**17.77%**	50.62
Low Tillage	206.53		206.53
Developed	185.60		185.60
Forest	626.28		626.28
Disturbed Forest	1,089.33	**17.77%**	895.76
Hay	152.96		152.96
Cattle-Grazed Pasture	1,092.52		1,092.52
Unimproved Pasture	2,517.24	**17.77%**	2,069.93
Water	0.00		0.00
Wetland	1.49		1.49
Impervious Area:			
Barren	1.23		1.23
Commercial	6.42		6.42
Developed	188.76		188.76
Direct Sources:			
Streambank Erosion	2,824.54	**17.77%**	2,322.62
Straight Pipes	15.26	**100.00%**	0.00
Permitted Sources:			
DEQ Permits	26.65		26.65
Future Growth			89.84
Margin of Safety			907.46
Watershed Total	**9,299.32**	**12.18%**	**9,074.47**

Using the calibrated model, allocations were run for the eight temperature impairments. Upland segments were allocated first and the allocated output from those segments was then used during the allocation of downstream segments. Allocation was conducted until all eight impaired segments met the water quality standards. To achieve the extra shading needed for meeting the temperature standards, a total of approximately 297,000 ft of forested riparian buffer is deemed necessary.

Public Participation

The actions and commitments described in this document are drawn together through input from citizens of the watershed, County government, Virginia Department of Environmental Quality (VDEQ), Virginia Department of Conservation and Recreation (VDCR), Virginia Department of Health (VDH), Virginia Department of Forestry (VDOF), New River Highlands Resource Conservation and Development (NR HRC&D), Virginia Cooperative Extension (VCE), Natural Resources Conservation Service (NRCS), the Skyline Soil and Water Conservation District (Skyline SWCD), MapTech, Inc. and other organizations. Every citizen and interested party in the watershed is encouraged to become involved in implementing the IP to help restore the health of the streams.

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

Varied opinions were voiced throughout the public meetings regarding the IP process. Most members of the working groups agreed that a cornerstone of the implementation plan is cultivating public involvement and education, and encouraging commitment and partnerships between the citizens in the watershed and government agencies in order to improve water quality.

Assessment of Implementation Action Needs

The quantity of control measures, or BMPs, required during implementation was determined through spatial analyses of land use, stream-network along with regionally appropriate data archived in the VDCR Agricultural BMP Database. Additionally, input from local agency representatives was used to verify the analyses. Overall, the needs to

meet the TMDL for the fifteen-year implementation period were identified and are shown in Table ES.3. Stage I is the period of time representing the first five years of implementation and Stage II is the following five years.

Table ES.3 Agricultural, residential and other BMPs needed in the Little River watershed.

		Little River	
Control Measure	**Unit**	**Stage I** (2011-2016)	**Stage II** (2017-2021)
Agricultural			
Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T)	System	1,081	0
Stream Protection Systems (WP-2T)	System	25	0
Streamside Fencing Maintenance-perennial	ft-maintained	283,763	851,288
Conservation Tillage	Acres	18	0
Improved Pasture Management - Pasture	Acres	2,000	1,670
Residential			0
Sewer Connection (RB-2)	System	26	0
Alternative Waste Treatment System Installation (RB-5)	System	18	0
Septic System Installation/Replacement (RB-4)	System	316	0
Erosion and Sediment Control	Acre	30	0
Other			0
Reforestation of Disturbed Forest	Acre	200	70
Forest Harvesting Best Management Practices	Acre of BMP	100	170
Streambank Stabilization	ft	7,500	7,500
Forested Riparian Buffer	ft	148,500	148,500

Cost/Benefit Analysis

Unit costs for control measures were determined through analysis of control measures previously installed through the Virginia Cost-Share Program in Floyd County and Skyline SWCD activity area, discussion with local agency representatives, and working groups. The estimated total costs to install agricultural, residential and other control measures in the Little River watershed are $23.8 million, $3.1 million and $1.7 million respectively, excluding technical assistance. The estimated total cost to provide technical assistance during implementation is expected to be $1.09 million. The total cost estimated for ten years of implementation is $29.7 million.

The primary benefit of implementation is the reduction of fecal bacteria, sediment, 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. Sediment reduction measures suggested in this document will lead to improved benthic life. The reduced temperatures will provide healthier environment for fish. The practices recommended in this document will provide economic benefits to the landowner, 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 Little 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.

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the amount of BMPs installed each year, while water quality milestones establish the corresponding improvements in water quality that can be expected. The milestones described here are intended to achieve full implementation within 10 years, leaving five years to assess water quality for de-listing.

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient BMPs first. The Stage I goals will focus on the more cost-efficient BMPs. By the end of Stage I, bacteria, sediment, and temperature reductions are expected to be at 100%, 85%, and 50% of the final reduction goals, respectively.

Following Stage I implementation, the Steering Committee should evaluate water quality improvements and determine how to proceed to complete implementation during Stage II and whether the bacteria, sediment, and temperature reduction measures specified for Stage II are still needed. The third stage is a five-year period for assessment of stream

conditions, in which the streams are expected to recover and attain the stated water quality goals.

Potential Funds

Potential funding sources available during implementation were identified during plan development. Sources may include:

- Virginia Agricultural Best Management Practices Cost-Share Program
- Virginia Agricultural Best Management Practices Tax Credit Program
- Virginia Agricultural Best Management Practices Loan Program
- Virginia Small Business Environmental Assistance Fund Loan Program
- Virginia Water Quality Improvement Fund
- Community Development Block Grant Program
- Conservation Reserve Program (CRP)
- Conservation Reserve Enhancement Program (CREP)
- Environmental Quality Incentives Program (EQIP)
- Wildlife Habitat Incentive Program (WHIP)
- Wetland Reserve Program (WRP)
- Clean Water State Revolving Fund
- Virginia Landowner Incentive Program (LIP)
- Southeast Rural Community Assistance Project (SE/R-CAP)

The potential funding sources that should be sought first are the Virginia Agricultural BMP Cost-Share and Tax Credit Programs, and Southeast Rural Community Assistance Project (SE/R-CAP). In addition the Skyline SWCD has been receiving targeted TMDL implementation funds for agricultural BMP implementation through the Virginia Water Quality Improvement Fund. Additionally, it was recognized in the context of public participation that a diversity of alternative funding sources should be sought to increase flexibility in the approaches to implementation and to supplement or replace public funding that may be threatened by the current political climate.

Targeting of critical areas for agricultural BMP installation was accomplished through analysis of land use, census blocks, and stream network Geographic Information Systems (GIS) layers. The subwatersheds were ranked by the ratio of animals per length of fence needed and by the straight pipes loads estimated in each subwatershed. Additionally,

these data were combined with additional measures to determine an overall ranking of impairment areas.

Stakeholders and Their Role in Implementation

Implementation progress success will ultimately be determined by monitoring conducted by VDEQ through the agency's monitoring program. However, volunteer monitoring is encouraged and will help in determining progress and identifying areas of concern, where water quality improvement efforts should be focused.

It was recognized during public meetings that implementation efforts need to be locally driven. To this end, it is anticipated that a local entity (*e.g.*, Sustain Floyd) will take a lead role in encouraging participation and seeking alternative funding sources. Additionally, the Skyline SWCD 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 Skyline SWCD staff should conduct a number of outreach activities in the watershed to promote participation and community support to obtain 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 Skyline 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 VDEQ, VDCR, VDOF, Virginia Department of Mines, Minerals, and Energy (VADMME), Virginia Department of Agriculture and Consumer Services (VDACS), 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.

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1. INTRODUCTION

1.1 Background

Clean water is essential to all forms of life: human, plant, and animal. 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 Little River and tributaries to address bacteria, sediment, and high 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 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 (CDC) 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 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 fecal bacteria. 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 General Standard is meant to protect the health of aquatic life, and also to serve as a fallback monitoring program to identify problems that are not detected by the ambient monitoring system (*e.g.*, pollutant discharges that are intermittent in occurrence, isolated incidents of pollutant discharge, and discharge of pollutants that are not normally measured through the ambient monitoring system). The health of the aquatic life is measured through assessment of the benthic macroinvertebrate (benthic) community, which is integral to the food chain that supports higher-level organisms. An unhealthy aquatic community will impact local and downstream fisheries. Additionally, an aquatic community that is already impacted will not be a good indicator of pollutant problems in the stream. The specific pollutant being addressed for this General Standard TMDL Implementation Plan, sediment, is an indicator that soil is being lost from upland areas and/or stream banks. This should be a concern for landowners, who want to maintain the productivity of their land or protect their property from erosion.

The temperature standard is meant to protect conditions for native trout species as well as stocked trout. 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 the other two 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 contributions, 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 USEPA, 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 Little River watershed in Virginia's Floyd, Montgomery, and Pulaski counties is part of the New River basin and is shown in Figure 1.1. The Little River flows into the New River, which drains into the Ohio River. The Ohio River flows into the Mississippi River, which finally drains to the Gulf of Mexico. Improving water quality in the Little River can therefore be expected to have a positive effect on water quality within thousands of stream miles in the U.S. Alexander et al. (2007) demonstrated through simulation the influence of headwater on downstream receiving waters.

The study area contains 16 bacteria impaired segments, three general standard impairments, and eight temperature impairments. Impaired segments fall within the main stem of the Little River as well as its tributaries.

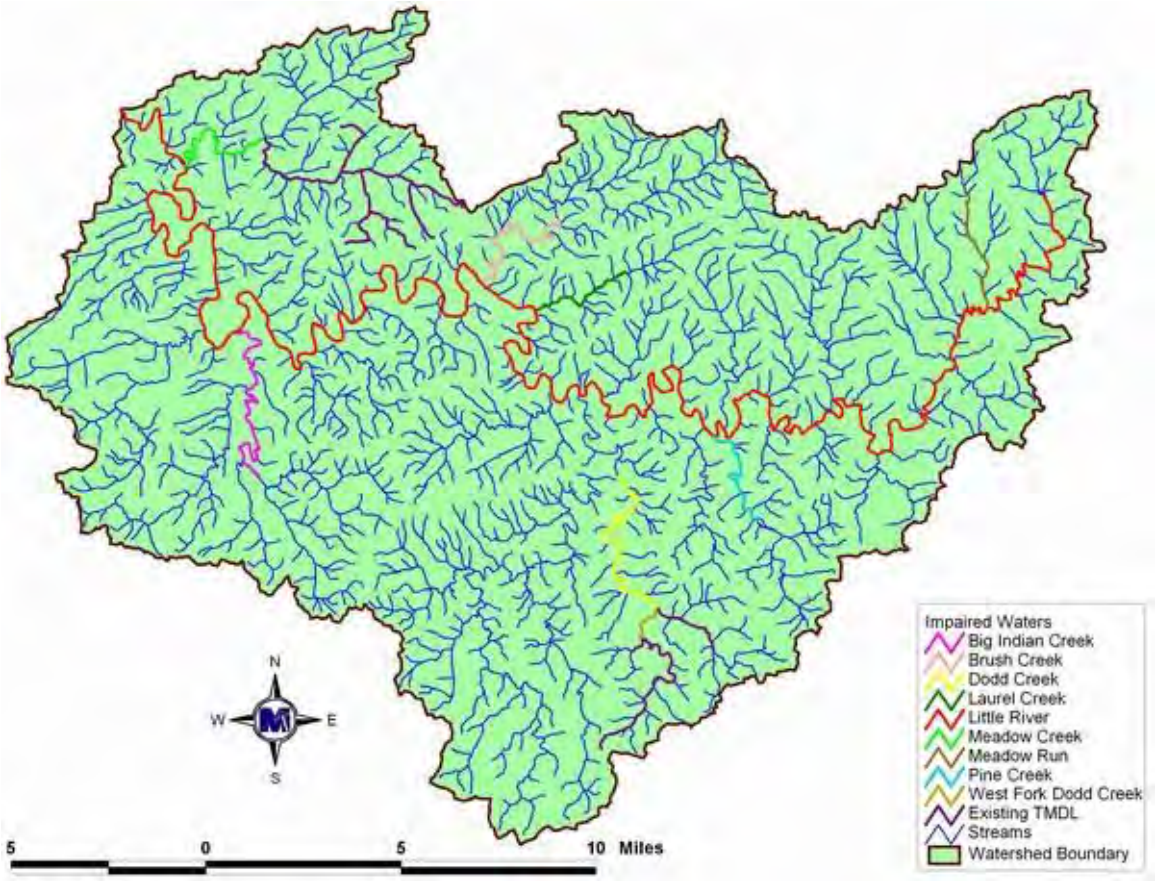

Figure 1.1 Location of the Little River watershed with the impaired stream segments.

The land area of the affected watershed is approximately 200,000 acres, with forest and pasture/hay as the primary land uses (Table 1.1 and Figure 1.2).

Table 1.1 Land uses in the Little River watershed (acreage and percent contribution).

Impairment	Barren	Commercial	Cropland	Developed	Forest	Livestock Access	Pasture/ Hay	Water	Wetland	Total Acres
Little River Watershed	193 0.1%	192 0.1%	1,185 0.6%	9,613 4.8%	113,715 56.6%	1,136 0.6%	73,265 36.4%	1,534 0.8%	235 0.12%	201,068 100%

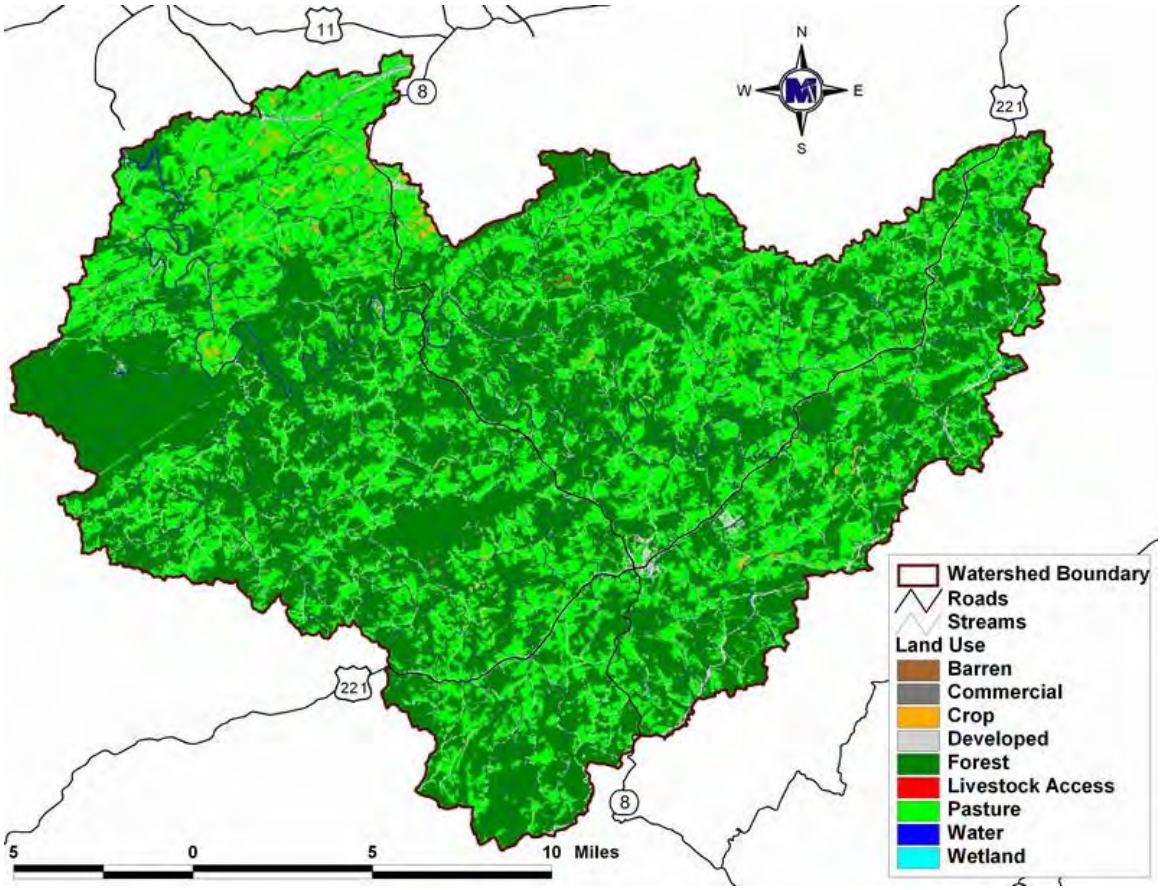

Figure 1.2 Land uses in the Little River watershed.

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 (VDEQ) 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, VDEQ 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 USEPA and VDEQ, VDEQ also submitted a draft Continuous Planning Process to USEPA in which VDEQ 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 swimming use for secondary contact in cases of: 1) natural contamination by wildlife, 2) small stream size, and 3) lack of accessibility to children, as well as due to widespread socio-economic impacts resulting from the cost of improving a stream to a "swimmable" status.

The re-designation of the current swimming use in a stream, 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 USEPA will have an opportunity to comment on these special studies.

1.3 Applicable Criteria for Bacteria Impairments

Based on the USEPA recommendation that all states adopt an *E. coli* or *enterococci* standard for fresh water and *enterococci* criteria for marine waters by 2003, Virginia adopted its current *E. coli* and *enterococci* standard in January 2003, and it was updated in 2009. USEPA has pursued the states' adoption of these standards because there is a strong correlation between the concentration of these organisms (*E. coli* and *enterococci*) and the incidence of gastrointestinal illness. *E. coli* and *enterococci* are both bacteriological organisms that can be found in the intestinal tract of warm-blooded animals. These organisms indicate the presence of fecal contamination. The criteria which were used in developing the bacteria TMDLs in this study are outlined in Section 9 VAC 25-260-170 (Bacteria; other recreational waters) and read as follows:

> *A. The following bacteria criteria (colony forming units (cfu)/100mL) shall apply to protect primary contact recreational uses in surface waters, except waters identified in subsection B of this section:*
>
> *E. coli bacteria shall not exceed a monthly geometric mean of 126 cfu/100mL in freshwater. Enterococci bacteria shall not exceed a monthly geometric mean of 35 cfu/100mL in transition and saltwater.*
>
> 1. *See 9VAC25-260-140 C for boundary delineations for freshwater, transition and saltwater.*
> 2. *Geometric means shall be calculated using all data collected during any calendar month with a minimum of four weekly samples.*
> 3. *If there [are] insufficient data to calculate monthly geometric means in freshwater, no more than 10% of the total samples in the assessment period shall exceed 235 E. coli cfu/100mL.*
> 4. *If there [are] insufficient data to calculate monthly geometric means in transition and saltwater, no more than 10% of the total samples in the assessment period shall exceed enterococci 104 cfu/100mL.*

5. *For beach advisories or closures, a single sample maximum of 235 E. coli cfu/100mL in freshwater and a single sample maximum of 104 enterococci cfu/100mL in saltwater and transition zones shall apply.*

B. The following bacteria criteria per 100mL (cfu/100mL) of water shall apply to protect secondary contact recreational uses in surface waters:

E. coli bacteria shall not exceed a monthly geometric mean of 630 cfu/100mL in freshwater. Enterococci bacteria shall not exceed a monthly geometric mean of 175 cfu/100mL in transition and saltwater.

1. *See 9VAC25-260-140 C for boundary delineations for freshwater, transition and saltwater.*
2. *Geometric means shall be calculated using all data collected during any calendar month with a minimum of four weekly samples.*
3. *If there [are] insufficient data to calculate monthly geometric means in freshwater, no more than 10% of the total samples in the assessment period shall exceed 1,173 E. coli cfu/100mL.*
4. *If there [are] insufficient data to calculate monthly geometric means in transition and saltwater, no more than 10% of the total samples in the assessment period shall exceed enterococci 519 cfu/100mL.*
5. *Where the existing water quality for bacteria is below the geometric mean criteria in a water body designated for secondary contact in subdivision 6 of this subsection that higher water quality will be maintained in accordance with 9VAC25-260-30 A 2.*

The criterion used in developing the bacteria TMDLs included in this study is the geometric mean of 126 cfu per 100 mL.

1.4 Applicable Criterion for Benthic Impairments

The **General Standard,** as defined in Virginia state law 9 VAC25-260-20, states:

A. *All state waters, including wetlands, shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.*

The General Standard is implemented by VDEQ through assessment of the benthic macroinvertebrate community. The Little River was assessed based on application of the Virginia Stream Condition Index (VSCI). Using the VSCI, the health of the benthic macroinvertebrate community is typically assessed through measurement of 8 biometrics

(Table 1.2) that measure different aspects of the community's overall health. Surveys of the benthic macroinvertebrate community performed by VDEQ are assessed at the family taxonomic level.

Each sample collected at a target station is measured against eight core metrics that when calculated into one number is known as the Virginia Stream Condition Index (VSCI) (Burton, 2003). The VSCI index number is then compared against the impairment threshold of 60, which is based upon a statistical separation of stressed and reference quality sites (e.g., a score greater than or equal to 60 is non-impaired and <60 is impaired).

Table 1.2 Components of the VSCI Assessment

Biometric	Benthic Health [1]
EPT Taxa	↑
Total Taxa	↑
% Ephemeroptera	↑
%Plecoptera plus Trichoptera less Hydropsychidae	↑
% Chironomidae	↓
% Top 2 Dominant Taxa	↓
HBI (Family Biotic Index	↓
% Scrapers	↑

[1] An upward arrow indicates a positive response in benthic health when the associated biometric increases

1.5 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 natural trout waters shall not exceed 20 ^{o}C. For stockable trout waters, the maximum temperature shall not exceed 21 ^{o}C.

1.6 Project Methodology

The overall goal of this project is to begin the process of restoring water quality in the Little River. 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 addressing *E. coli*, sediment, and temperature levels and achieving the water quality goals for the Little River impairment 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 USEPA 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 USEPA regulations do not require the development of implementation strategies. The USEPA 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 USEPA 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 USEPA develops guidelines that describe the process and criteria used to award CWA Section 319 nonpoint source (NPS) 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 nonpoint source (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.

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3. REVIEW OF TMDL DEVELOPMENT

MapTech, Inc. was contracted by the Virginia Department of Environmental Quality (VDEQ) to develop Total Maximum Daily Loads (TMDLs) for the Little River watershed in Virginia. The current implementation plan was developed simultaneously with the TMDL project and therefore, the TMDL document will be available at www.deq.virginia.gov/TMDLDataSearch/ReportSearch.jspx. Once the State Water Control Board (SWCB) issues its approval, the Implementation Plan (IP) document will be accessible through www.deq.virginia.gov/tmdl/iprpts.html. Water quality monitoring, water quality modeling, and allocated reductions were reviewed to determine the implications of TMDL and modeling procedures for IP development.

3.1 Water Quality Monitoring Results

3.1.1 VDEQ Sampling Results

Bacteria data collected by VDEQ were analyzed for the purpose of TMDL development. These samples were taken for the express purpose of determining compliance with the state instantaneous standard limiting concentrations to less than 400 cfu/100 ml for fecal coliform and 235 cfu/100 ml for *E.coli*. Tables 3.1 and 3.2 summarize the fecal coliform and *E.coli* samples collected at the in-stream monitoring stations used for TMDL assessment.

Table 3.1 Summary of fecal coliform (cfu/100mL) data collected by VDEQ from January 1990 – November 2009.

Stream	Station	Date	Count	Minimum	Maximum	Mean	Median	Standard Deviation	Violation[1] %
Brush Creek	9-BSH000.05	07/01 - 05/03	10	100	1,300	540	550	448	50.0%
Laurel Creek	9-LLL000.05	07/01 - 05/03	10	100	2,800	670	400	833	50.0%
Little River	9-LRV000.34	01/90 - 05/03	58	100	7,300	617	100	1,508	20.7%
Little River	9-LRV004.89	05/03	1	25	25	25	NA	NA	0.0%
Little River	9-LRV009.11	07/01 - 11/09	17	25	820	239	100	233	23.5%
Little River	9-LRV016.68	07/01 - 05/03	10	100	8,000	990	100	2,475	20.0%
Little River	9-LRV032.72	07/01 - 05/03	11	100	3,300	609	200	951	36.4%
Little River	9-LRV035.03	04/04	1	130	130	130	NA	NA	0.0%
Little River	9-LRV059.33	11/96 - 05/00	16	100	1,400	288	200	324	12.5%
Meadow Run	9-MDR003.60	11/01	1	900	900	900	NA	NA	100.0%
Meadow Creek	9-MDW004.62	07/01 - 05/03	11	100	8,000	1,418	700	2,279	54.5%

NA – Not applicable

[1] Based on the instantaneous fecal coliform standard of 400 cfu/100mL.

Table 3.2 Summary of *E. coli* (cfu/100mL) data collected by VDEQ from August 2003 – December 2009.

Stream	Station	Date	Count	Minimum	Maximum	Mean	Median	Standard Deviation	Violation[1] %
Brush Creek	9-BSH000.05	02/09 - 12/09	5	25	2,000	625	200	817	40.0%
Laurel Creek	9-LLL000.05	02/09 - 12/09	5	50	1,000	430	200	419	40.0%
Little River	9-LRV000.34	01/07 - 11/08	12	25	2,000	242	25	566	8.3%
Little River	9-LRV004.89	05/05	1	10	10	10	NA	NA	0.0%
Little River	9-LRV009.11	01/09 - 11/09	6	25	1,000	304	150	365	16.7%
Little River	9-LRV016.68	01/09 - 11/09	6	25	1,200	322	150	450	16.7%
Little River	9-LRV035.03	04/04	1	10	10	10	NA	NA	0.0%
Little River	9-LRV044.49	08/03 - 06/05	11	25	2,000	309	75	581	18.2%
Little River	9-LRV056.74	08/03 - 06/05	12	25	2,000	351	190	543	16.7%
Little River	9-LRV065.57	08/03 - 12/09	16	25	1,800	335	75	478	31.3%
Little River	9-LRV069.88	08/03 - 06/05	12	25	1,500	312	175	411	25.0%
Meadow Run	9-MDR000.34	08/03 - 12/09	17	25	2,000	489	200	550	41.2%
Meadow Creek	9-MDW004.62	01/07 - 11/08	12	25	2,000	520	250	656	25.0%
Pine Creek	9-PNC000.69	08/03 - 06/05	11	25	1,000	221	50	300	18.2%

NA – Not applicable

[1] Based on the current instantaneous *E. coli* standard of 235 cfu/100mL.

3.1.2 Data Collected to Support the General Standard TMDL

3.1.2.1 Benthic Macroinvertebrate Community Assessment – Little River

The General Standard used to be implemented by VDEQ through application of the modified Rapid Bioassessment Protocol II (RBP II) (Barbour, 1999). However, in January 2008, VDEQ moved to a multimetric index approach called the Virginia Stream Condition Index (VSCI) (Burton, 2003). The health of the benthic macroinvertebrate community is assessed through measurement of eight biometrics statistically derived from numerous reference sites in the non-coastal regions of Virginia. Surveys of the benthic macroinvertebrate community performed by VDEQ are assessed at the family taxonomic level. All eight biometrics are measured during all biological monitoring surveys and the total VCSI score is the sum of the eight individual scores. The VDEQ benchmark for a "not impaired" status is a VSCI total score of 60 (if a stream scores less than 60 it is considered impaired).

The Little River was initially listed on the *2008 303(d) TMDL Priority List* as not supporting the aquatic life use. All VDEQ water quality monitoring stations related to the biological impairments are shown in Table 3.3 and Figure 3.1.

Table 3.3 VDEQ monitoring stations evaluated for the benthic macroinvertebrate community impairment on the Little River.

Station	Type	Descriptive Location	River Mile
9-LRV032.72	Ambient/Benthic	Rt. 617 Bridge	32.72
9-LRV035.03	Probabilistic	Upstream of Laurel Fork Mouth	35.03
9-LRV044.49	Ambient	Rt. 615 Bridge	44.49

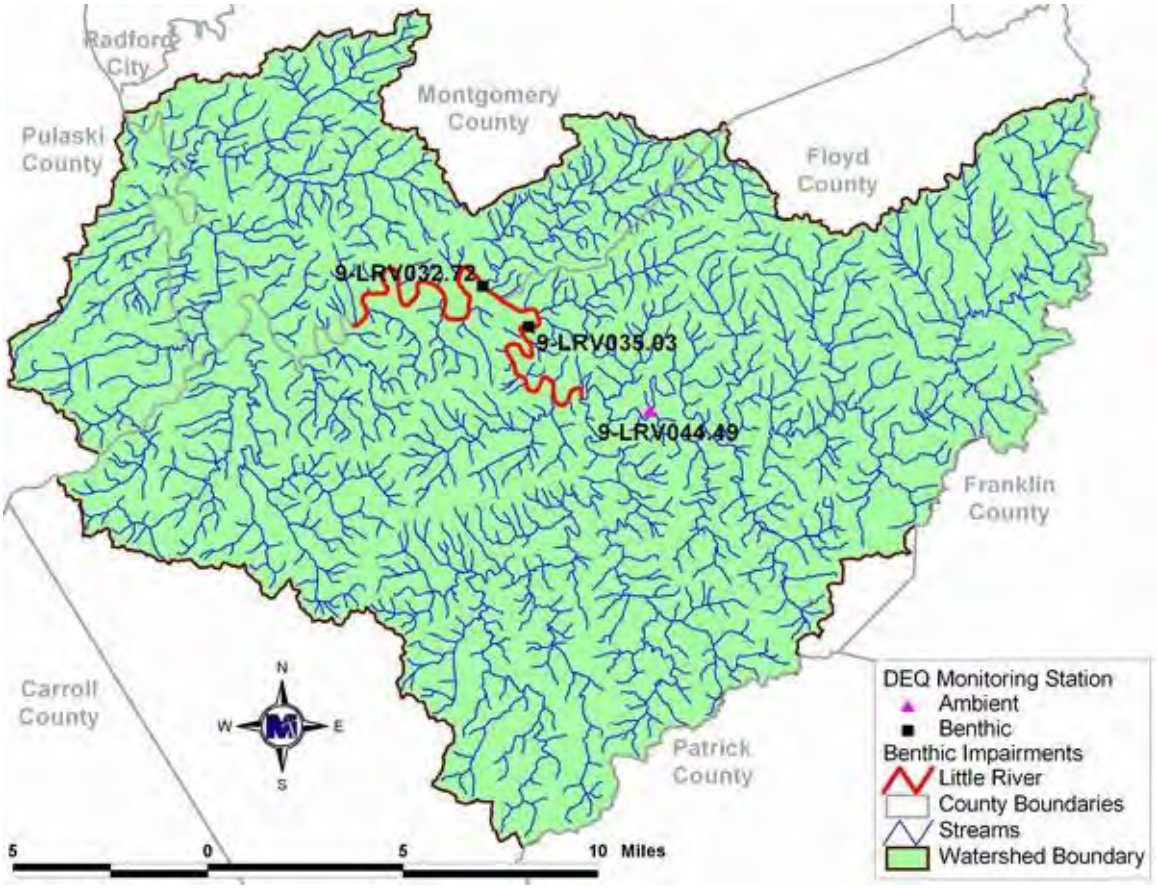


Figure 3.1 VDEQ water quality monitoring stations in the Little River watershed.

Two biological monitoring surveys were performed by the VDEQ in April and September 2004 at probabilistic monitoring station 9-LRV035.03 on the Little River. The VSCI scores are presented in Figure 3.2. The results indicate that the spring survey found impaired conditions.

One biological monitoring survey was performed at biological monitoring station 9-LRV032.72 on October 19, 2009. The VSCI score is presented in Figure 3.3. The result indicates a not impaired condition.

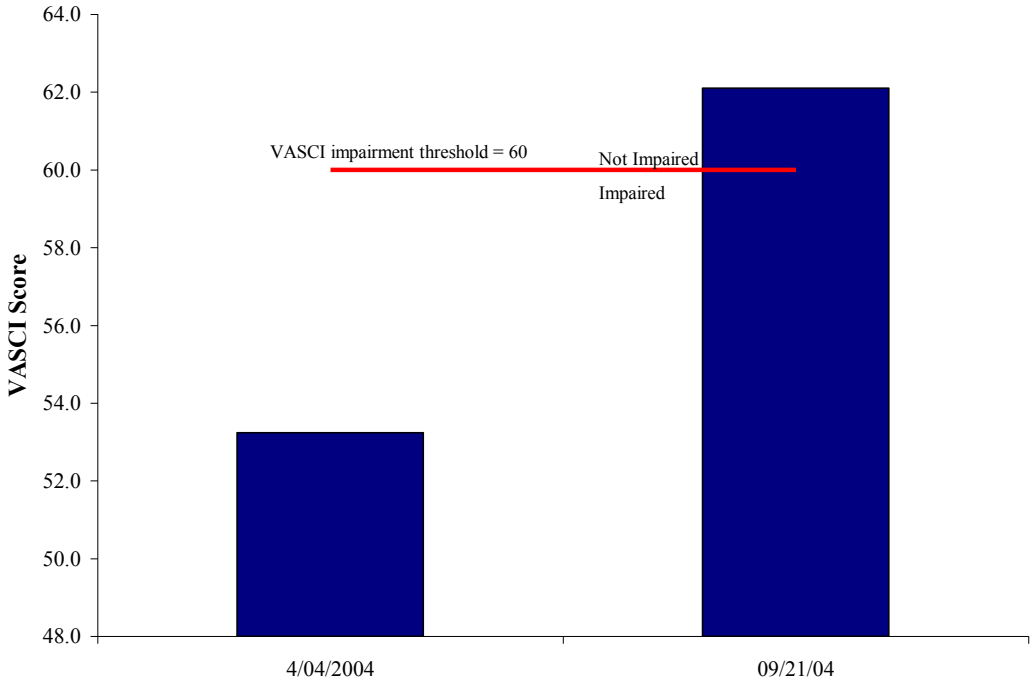


Figure 3.2 VSCI biological monitoring scores for VDEQ probabilistic monitoring station 9-LRV035.03 on the Little River.

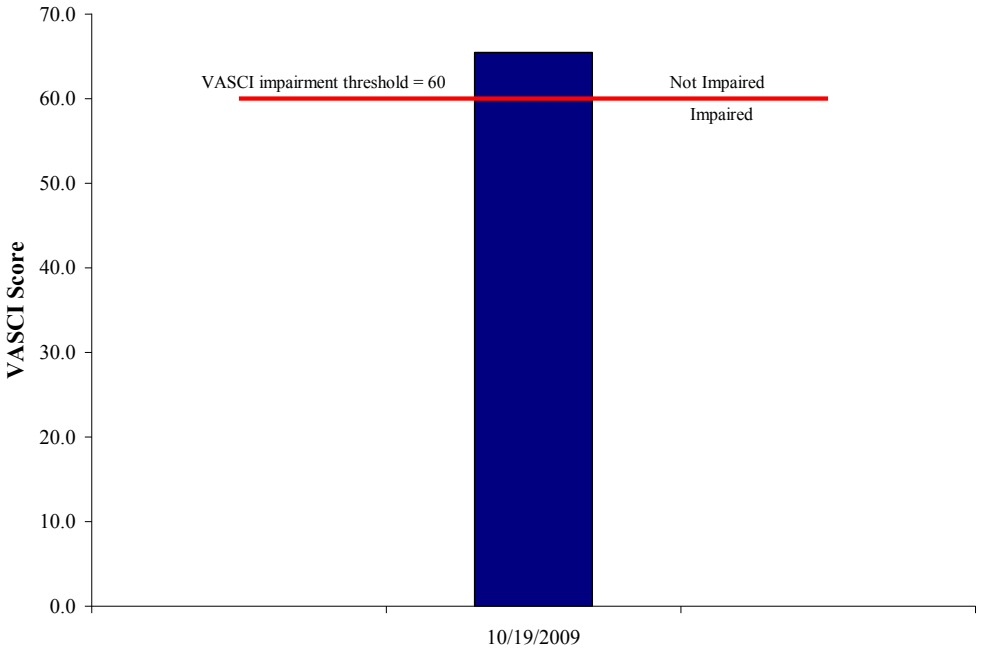


Figure 3.3 VSCI biological monitoring score for VDEQ biological monitoring station 9-LRV032.72 on the Little River.

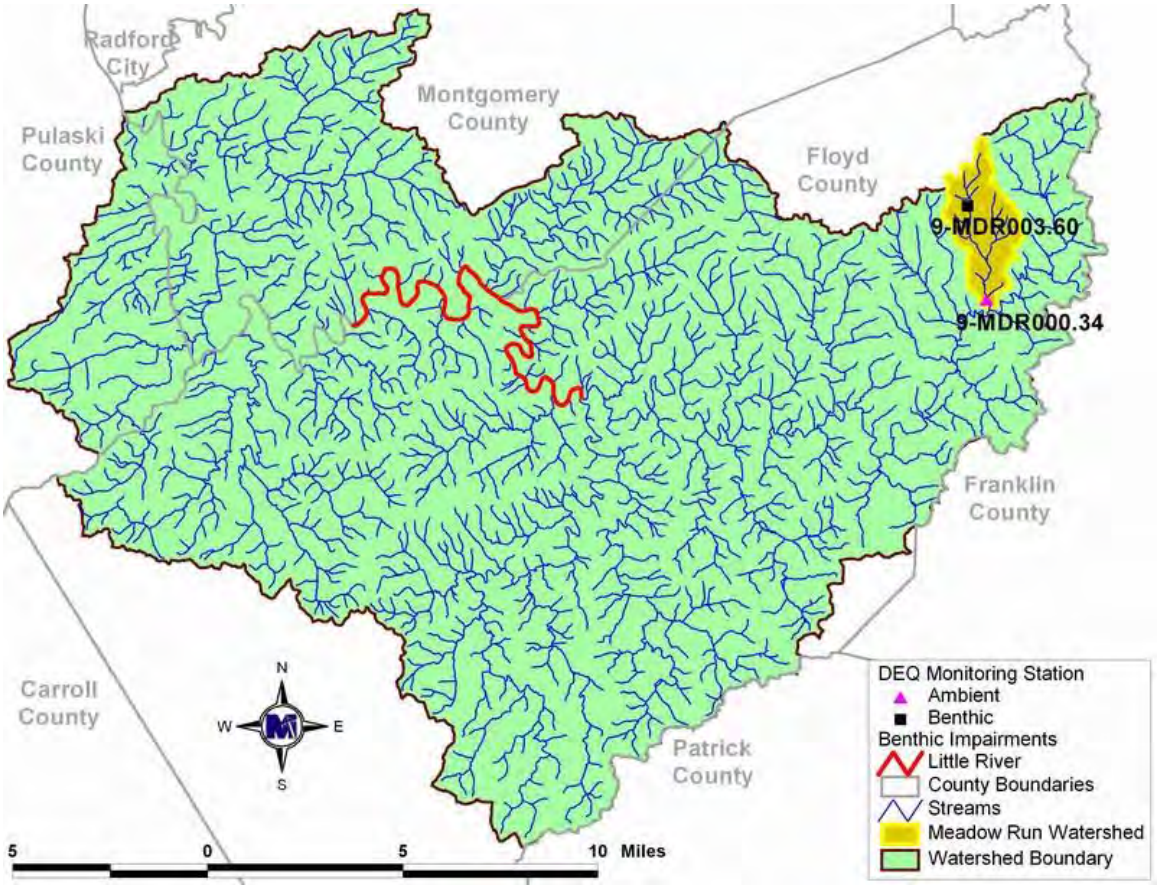
3.1.2.2 Benthic Macroinvertebrate Community Assessment – Meadow Run

Meadow Run was initially listed on the *2008 303(d) TMDL Priority List* as not supporting the aquatic life use. All water quality monitoring stations on Meadow Run are shown in Table 3.4 and Figure 3.4.

Table 3.4 VDEQ monitoring stations on Meadow Run.

Station	Station Type	Descriptive Location	River Mile
9-MDR000.34	Ambient	Rt 641 Bridge	0.34
9-MDR003.60	Probabilistic	Off of Rt. 610	3.60

Figure 3.4 Ambient and probabilistic water quality monitoring stations on Meadow Run.



Two biological monitoring surveys were performed by the VDEQ in April and November 2001 at probabilistic monitoring station 9-MDR003.60 on Meadow Run. The VSCI

scores are presented in Figure 3.5. The results indicate that the surveys found an impaired condition in the spring.

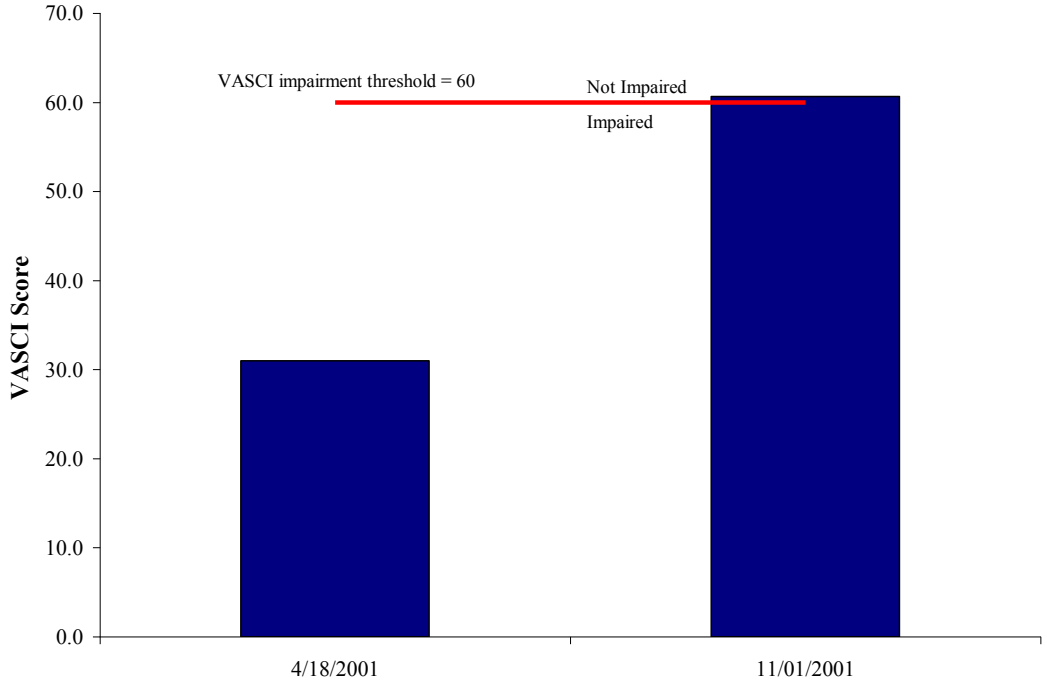


Figure 3.5 VSCI biological monitoring scores for VDEQ probabilistic monitoring station 9-MDR003.60 on Meadow Run.

3.1.2.3 Habitat Assessments

Benthic macroinvertebrate community impairments have two general causes: input of pollutants to streams and alteration of habitat in either the stream or the watershed. Habitat can be altered directly (*e.g.*, by channel modification), indirectly (because of changes in the riparian corridor leading to conditions such as streambank destabilization), or even more indirectly (*e.g.*, due to land use changes in the watershed such as clearing large areas).

Habitat assessments are normally carried out as part of the biological monitoring process. The overall habitat score is the sum of ten individual metrics, each metric ranging from 0

to 20. The classification schemes for the individual habitat metrics that comprise the overall habitat score for a sampling site are shown in Table 3.5.

Table 3.5 Classification of habitat metrics based on score.

Habitat Metric	Optimal	Sub-optimal	Marginal	Poor
Embeddedness	16 - 20	11 – 15	6 - 10	0 - 5
Epifaunal Substrate	16 - 20	11 – 15	6 - 10	0 - 5
Sediment Deposition	16 - 20	11 – 15	6 - 10	0 - 5
Flow	16 - 20	11 – 15	6 - 10	0 - 5
Channel Alteration	16 - 20	11 – 15	6 - 10	0 - 5
Riffles	16 - 20	11 – 15	6 - 10	0 - 5
Velocity	16 - 20	11 – 15	6 - 10	0 - 5
Bank Stability	18 - 20	12 – 16	6 - 10	0 - 4
Bank Vegetation	18 - 20	12 – 16	6 - 10	0 - 4
Riparian Vegetation	18 - 20	12 – 16	6 - 10	0 - 4

3.1.2.3.1 Habitat Assessment at Biological Monitoring Stations – Little River

Habitat assessment for the Little River includes an analysis of habitat scores recorded by the VDEQ biologists at the probabilistic and biological monitoring stations. The VDEQ habitat assessments for 9-LRV035.03 are displayed in Table 3.6. The Pool Sediment metric assesses the amount of sediment that collects in pool areas of the stream. The spring 2004 Pool Sediment score at this station was in the marginal category and the fall score was in the poor category, indicating that a significant amount of stream bottom was covered with sediment.

Habitat assessment scores at the VDEQ biological monitoring station 9-LRV032.72 are displayed in Table 3.7. The Pool Sediment score at this station was also in the marginal category.

Table 3.6 Habitat scores for VDEQ monitoring station 9-LRV035.03 on the Little River.

Habitat Metric	04/18/2004	09/21/2004	Average
Embeddedness	12	13	12.5
Epifaunal Substrate	12	7	9.5
Pool Sediment	7	5	6
Flow	20	19	19.5
Channel Alteration	20	17	18.5
Riffles	12	12	12
Velocity	20	16	18
Bank Stability	14	12	13
Bank Vegetation	16	13	14.5
Riparian Vegetation	11	10	10.5
Total	**144**	**124**	**134**

Table 3.7 Habitat scores for VDEQ monitoring station 9-LRV032.72 on the Little River.

Habitat Metric	10/19/2009
Embeddedness	12
Epifaunal Substrate	12
Pool Sediment	8
Flow	18
Channel Alteration	15
Riffles	12
Velocity	16
Bank Stability	14
Bank Vegetation	13
Riparian Vegetation	12
Total	**132**

3.1.2.3.2 Habitat Assessment at Biological Monitoring Stations – Meadow Run

Habitat assessment for Meadow Run includes an analysis of habitat scores recorded by the VDEQ biologist at one monitoring station (Table 3.8). Riparian Vegetation is a measure of the width of the natural riparian zone. A healthy riparian zone acts as a buffer for pollutants running off the land, helps prevent erosion, and provides habitat. The Riparian Vegetation around this monitoring station scored in the poor and marginal categories. The Pool Sediment habitat metric scored in the marginal category, indicating that excessive sediment is a problem at this monitoring station.

Table 3.8 Habitat scores at the VDEQ monitoring station on Meadow Run, 9-MDR003.60.

Metric	04/18/2001	11/01/2001	Average
Embeddedness	12	11	11.5
Epifaunal Substrate	12	12	12
Pool Sediment	9	9	9
Flow	17	19	18
Channel Alteration	15	18	16.5
Riffles	14	19	16.5
Velocity	14	10	12
Bank Stability	16	18	17
Bank Vegetation	15	15	15
Riparian Vegetation	5	8	6.5
Total	**129**	**139**	**134**

3.1.3 Temperature Data

The VDEQ provided observed temperature data for 12 monitoring stations on the Little River and its tributaries. Summary of data from in-stream water samples, collected at the 12 VDEQ monitoring stations (Figure 3.6) from February 1990 to December 2009 are presented in Table 3.9. Samples were taken for the express purpose of determining compliance with the state instantaneous standard limiting maximum temperature to 20 ^{o}C and 21 ^{o}C for natural and stockable trout waters, respectively.

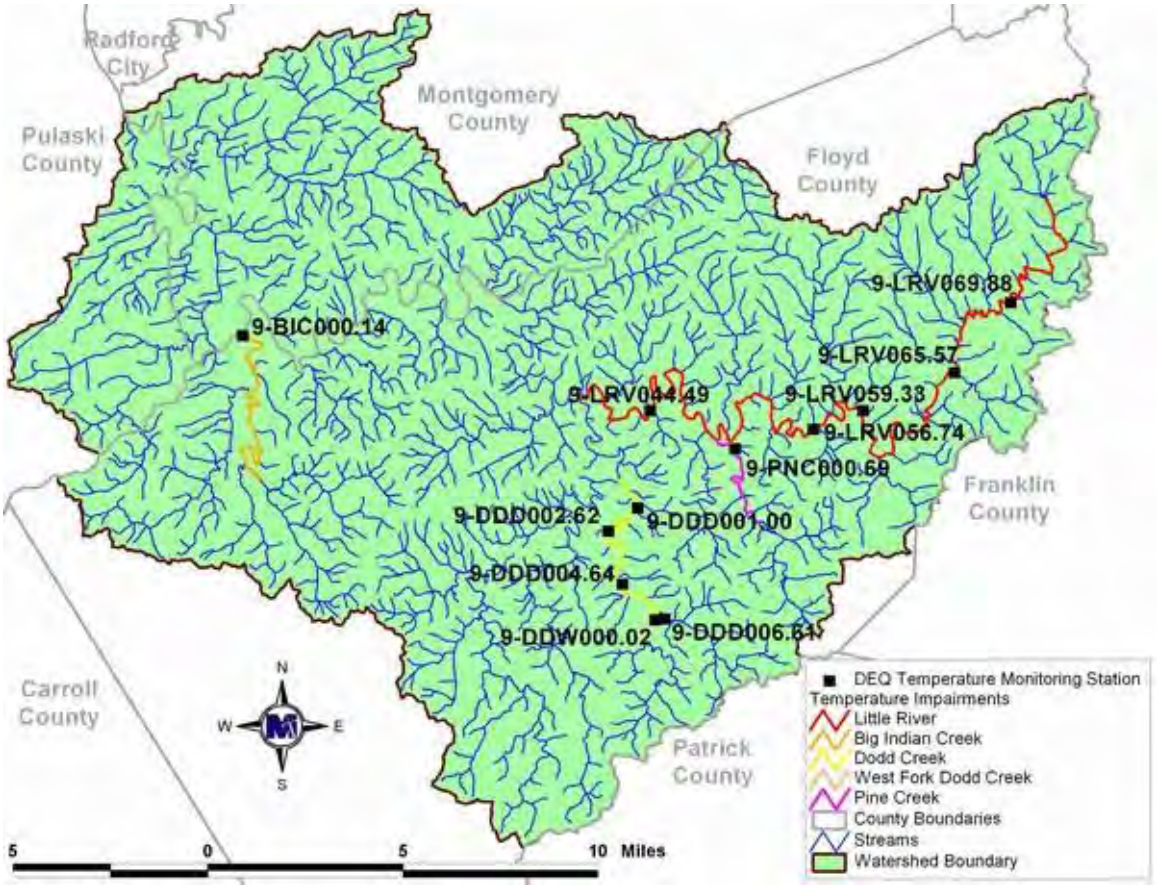


Figure 3.6 Location of VDEQ temperature water quality monitoring stations in the Little River watershed.

Table 3.9 Summary of temperature (^{o}C) data collected by VDEQ from February 1990 to December 2009.

Stream	Station	Sampling Dates	Count	Minimum	Maximum	Mean	Median	Standard Deviation	Violation[1] %
Pine Creek	9-PNC000.69	08/2003 - 06/2005	11	0.6	21.3	11.7	12.4	7.5	18.2%[1]
Big Indian Creek	9-BIC000.14	07/2001 - 11/2008	23	0.1	23.9	11.1	10.4	7.5	13.0%[2]
Dodd Creek	9-DDD001.00	08/2005 - 12/2009	27	0.0	22.1	12.0	10.4	6.9	11.1%[2]
Dodd Creek	9-DDD002.62	02/1990 - 12/2009	42	0.5	24.5	12.3	11.5	6.6	11.9%[2]
Dodd Creek	9-DDD004.62	02/1990 - 12/2006	49	1.8	24.5	12.9	12.7	6.4	10.2%[2]
Dodd Creek	9-DDD006.61	03/2003 - 05/2004	4	11.0	18.5	13.7	12.7	3.4	0.0%[2]
W. F. Dodd Creek	9-DDW000.02	01/2007 - 12/2009	18	0.0	22.3	12.4	12.0	6.7	11.1%[1]
Little River	9-LRV044.49	08/2003 - 06/2005	12	2.2	23.3	12.1	11.9	7.9	16.7%[1]
Little River	9-LRV056.74	08/2003 - 10/2009	14	0.3	21.4	11.4	12.2	7.4	14.3%[1]
Little River	9-LRV059.33	11/1996 - 05/2000	16	1.9	25.7	13.1	12.5	7.1	18.8%[1]
Little River	9-LRV065.57	08/2003 - 12/2009	20	0.7	20.4	11.1	10.8	6.2	10.0%[1]
Little River	9-LRV069.88	08/2003 - 06/2005	11	0.4	20.0	10.0	11.8	7.2	0.0%[1]

[1] Based on the natural trout waters maximum temperature standard of 20 ^{o}C.
[2] Based on the stockable trout waters maximum temperature standard of 21 ^{o}C.

3.2 Water Quality Modeling

In order to understand the implications of the load allocations determined during TMDL development, it is important to understand the modeling methods used in the analyses. Appropriate modeling frameworks were selected for bacteria, sediment, and temperature.

3.2.1 *E. coli* Modeling

The USGS Hydrologic Simulation Program - Fortran (HSPF) water quality model was used as the modeling framework to simulate hydrology and the transport of fecal coliform for the bacteria TMDL allocation. Seasonal variations in hydrology, climatic conditions, and watershed activities were accounted for in the HSPF model. The water quality endpoint used for determining the necessary reduction to *E. coli* loads was the 30-day *E. coli* geometric mean standard (126 cfu/100 mL).

3.2.1.1 E. coli Sources

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 to surface water are shown in Table 3.10. Other permitted point sources exist within the drainage area but are included in previously conducted bacteria TMDLs. The output from such areas is considered as a whole.

Table 3.10 Permitted Point Sources in the Little River Watershed.

Permit	Receiving Stream	Facility Type
VAG402042	Big Run Creek	Domestic
VAG402018	UT to Big Run Creek	Domestic
VAG402051	UT to Meadow Run	Domestic
VAG402090	UT to Little River	Domestic

At the time that the TMDL was created, permitted point discharges that may contain pathogens associated with fecal matter were required to maintain *E. coli* concentrations at or 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. Populations within the watershed were estimated during the TMDL development and are shown in Table 3.11. Loads were represented either as land-based loads (where they were deposited on land and available for wash off during a rainfall event) or as direct loads (where they were directly deposited to the stream). Land-based nonpoint sources are represented as an accumulation of pollutants on land, where some portion is available for transport in runoff. The amount of accumulation and availability for transport vary with land use type and season. The model allows a maximum accumulation to be specified. The maximum accumulation was adjusted seasonally to account for changes in die-off rates, which are dependent on temperature and moisture conditions. Some nonpoint sources, rather than being land-based, are represented as being deposited directly to the stream (*e.g.,* animal defecation in stream, straight pipes). These sources are modeled similarly to point sources, as they do not require a runoff event for delivery to the stream.

Table 3.11 Bacteria sources used during the TMDL development for the Little River watershed.

Bacteria Source	Little River Populations
Human:	
Houses with Failing septic systems	1,096
Houses with Straight Pipes	357
Livestock:	
Beef Adult	21,225
Beef Calves	26,477
Dairy Milkers	568
Dairy Dry	284
Dairy Calves	284
Sheep	1,788
Horses	1,089
Pets:	
Dogs	3,381
Cats	3,786
Wildlife:	
Deer	6,865
Turkey	1,742
Muskrat	63,619
Beaver	1,567
Raccoon	14,082
Goose	74
Duck	151

3.2.1.2 E. coli Model Allocations

Several model runs were made investigating scenarios that would meet the monthly geometric mean of 126 cfu/100mL goal at all impaired segments. The final load allocations are shown in Table 3.12.

The final allocation scenario calls for a 100% reduction of direct human loads (straight pipes and sewer overflows) and 73% reduction from direct in-stream loading from livestock.

Table 3.12 Load reductions allocated during TMDL development for the Little River watershed.

Scenario	NPS Wildlife	Direct Livestock	NPS Pasture, Livestock	Residential, Urban	Straight Pipe
Final Allocation	0%	73%	0%	0%	100%

3.2.2 Sediment Modeling

Excessive sedimentation is considered the primary cause of the listed benthic impairment in the Little River. This is based on the total suspended solids (TSS) concentrations and the poor habitat score for embeddedness and substrate. Embeddedness is an indication of significant fine sediment accumulation in the riffle area of a stream. Urban runoff, logging, construction activity, streambank erosion, and agricultural activity are the most likely sources of sediment.

The Generalized Watershed Loading Function (GWLF) model (Haith et al., 1992) was used to model sediment for the Little River. Since there is no state standard for sediment, a reference watershed approach was used to establish the water quality endpoint for the TMDL allocation. Using this approach, a similar, but non-impaired, watershed was selected and modeled to determine the acceptable load of sediment the Little River could assimilate while maintaining water quality standards. The reference watershed for the Little River was Big Reed Island Creek in Carroll and Floyd counties, Virginia.

3.2.2.1 Sediment Allocations

The target TMDL load for the Little River is the average annual load in metric tons per year (t/yr) from the area-adjusted Big Reed Island Creek watershed under existing conditions. To reach the TMDL goal (9,074 t/yr) several scenarios were simulated with GWLF. The final scenario is shown in Table 3.13. Table 3.13 shows reductions of 18% for sediment load from barren areas, disturbed forest, pastureland, and streams-edge access, cropland areas, and streambank erosion in addition to 100% reduction in straight pipe contribution.

Table 3.13 Alternative 1 TMDL allocation scenario for the Little River.

Sediment Source	Existing Loads t/yr	Scenario 1 Reductions (Final) (%)	Scenario 1 Allocated Loads t/yr
Barren	300.14	**17.77%**	246.81
Commercial	2.81		2.81
High Tillage	61.56	**17.77%**	50.62
Low Tillage	206.53		206.53
Developed	185.60		185.60
Forest	626.28		626.28
Disturbed Forest[1]	1,089.33	**17.77%**	895.76
Hay	152.96		152.96
Cattle-Grazed Pasture	1,092.52		1,092.52
Unimproved Pasture[2]	2,517.24	**17.77%**	2,069.93
Water	0.00		0.00
Wetland	1.49		1.49
Impervious Area:			
Barren	1.23		1.23
Commercial	6.42		6.42
Developed	188.76		188.76
Direct Sources:			
Streambank Erosion	2,824.54	**17.77%**	2,322.62
Straight Pipes	15.26	**100.00%**	0.00
Permitted Sources:			
DEQ Permits	26.65		26.65
Future Growth			89.84
Margin of Safety			907.46
Watershed Total	**9,299.32**	**12.18%**	**9,074.47**

[1] VADCR refers to this acreage as defined by Virginia Department of Forestry as forest lands that are non-functional following harvesting

[2] VADCR refers to this acreage as unimproved acres of pasture where cattle may pass through but are not fertilized for grazing

3.2.3 Temperature Modeling

The USGS Stream Segment Temperature Model (SSTEMP) Version 2.0 (Bartholow, 2002) was used in this project. The model predicts the minimum, maximum, and average daily 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.

3.2.3.1 Temperature Allocations

Using the calibrated model, allocations were run for the eight impairments. 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. Upland segments were allocated first and the allocated output from those segments was then used during the allocation of downstream segments. Allocation was conducted until all eight impaired segments met the water quality standards. To achieve the extra shading needed for meeting the temperature standards, a total of approximately 297,000 ft of forested riparian buffer is deemed necessary.

3.3 Implications of TMDL and Modeling Procedure on Implementation Plan Development

The promising outcome in the development of this TMDL IP is that reductions and measures that are required to achieve the water quality standards are not extreme as was the case in some other TMDLs. All uncontrolled discharges must be identified and corrected, and most livestock must be excluded from streams. Additionally, loadings from main sources of sediment must be reduced by approximately 18%.

There are subtler implications however. Implicit in the requirement for 100% correction of uncontrolled discharges is the need to maintain all functional septic systems.

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

bacteria regardless of source, so the modeled load of fecal bacteria directly deposited by cattle is representative of direct loads from all forms of livestock. Therefore, all livestock with stream access will be considered in order to reach the reduction in direct depositions that has been deemed necessary (*i.e.*, 73%).

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. Public meeting notices were sent to the Virginia Registrar and also via phone calls and electronic correspondence. In addition, signs and flyers were posted throughout the watershed.

4.1 Public Meetings for Little River watershed

The final public meeting for the TMDL project served as the kickoff meeting for the implementation plan. The meeting was held on March 16, 2011 at the Jessie Peterman Memorial Library in the Town of Floyd, Virginia. Sixteen people including landowners, agency personnel and consultants attended the meeting. The purpose of the meeting was to review the bacteria, sediment, and temperature TMDLs developed for the Little River and tributaries earlier and also to lay out the course of work for the development of the Implementation Plan. The idea of forming working groups was floated at the meeting and follow up took place thereafter to form the groups.

The final public meeting for the Little River IP was held on May 3, 2011 at the Jessie Peterman Memorial Library in Floyd, Virginia. The meeting was attended by 19 people. A presentation was given describing the implementation plan using major components as an outline: Review of TMDL development, public participation, assessment of needs, cost/benefit analysis, and implementation.

In addition to the public meetings, a steering committee and two specialized working groups (agricultural, residential) 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 from MapTech 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, and to review estimates on the type, number, and costs of BMPs. The primary role of the Residential Urban Working Group (RWG) was to discuss methods needed to reduce human sources of bacteria entering the Little River and tributaries, recommend methods to identify and correct straight pipes, and provide input on the BMPs to include in the plan. Government personnel attended the meetings helping 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, state, and federal levels representing agricultural and residential/governmental interests devoted hundreds of work-hours to attending meetings.

Table 4.1 Meetings held pertaining to the Little River TMDL Implementation Plan development.

Date	Meeting Type	Location	Attendance
03/16/2011	1st Public Meeting	Jessie Peterman Memorial Library Floyd, VA	16
04/20/2011	Residential Working Group Meeting	Jessie Peterman Memorial Library Floyd, VA	9
04/21/2011	Agricultural Working Group Meeting	Jessie Peterman Memorial Library Floyd, VA	15
04/25/2008	Steering Committee Meeting	Floyd County Administration Building Floyd, VA	10
05/03/2011	Final Public Meeting	Jessie Peterman Memorial Library Floyd, VA	19

4.1.1 Agricultural Working Group for the Little River

The Agricultural Working Group (AWG) had 15 members, including 7 farmers. The meeting occurred on April 21, 2011 in Floyd, Virginia. The members consisted of

citizens from the watershed, VDCR, VDEQ, Skyline SWCD and the New River Highlands Resource Conservation and Development Council (New River RC&D). Discussion focused on the current status of agriculture in the watershed, stream fencing and riparian buffer practices, pricing for practices.

4.1.2 Residential Working Group for the Little River

The Residential Working Group (RWG) meeting took place on April 20, 2011 in Floyd, Virginia. The members consisted of citizens, County Health Department, Skyline SWCD, VDEQ and VDCR and the consultants. Discussion centered on the estimates of BMPs, pricing, and additional actions that would aid in water quality improvement. Residents expressed interest that the IP should focus on the valuation of landscapes providing natural functions that improve water quality (wetlands in the Little River watershed). Related to this interest, residents also asked that the IP focuses on programs during implementation that are similar to and include Conservation Reserve Enhancement Program (CREP) and Wetland Reserve Program (WRP) which compensate landowners for protection of these lands.

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 25, 2011 at the Town of Floyd County Administration Building in Floyd, Virginia. The meeting was attended by 10 people, which included representatives from Skyline SWCD, VDEQ, VDCR, VDOF, NCNR, NRCS, Radford University, local citizens and MapTech, Inc. A report summarizing key points and recommendations from each of the working groups was presented to the steering committee for review. The findings for control measures for the final public meeting were reviewed and commented on by those in attendance. (The minutes from the working group and steering committee meetings and the reports can be found in Appendix A).

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. An assertion to individual responsibility provides a foundation for building partnerships among citizens, businesses, interest groups, and government agencies. It can also cultivate voluntary implementation and long-term support for reducing pollutant levels and restoring water quality in the Little River watershed.

Some key input that was received from the Working Groups and Steering Committee include:

- Implementation needs to be locally driven.
- Add management practices to address
    - stormwater,
    - failing septic systems,
    - stream restoration,
    - livestock waste management, and
    - relocation of concentrated feeding areas.
- A source of information on proper streamside plantings is needed.
- BMP incentive programs need to be more flexible.
- A better approach to the BMP incentive program would be to encourage protection of wetlands, which would, in turn, protect water quality.
- Water Quality monitoring needs to include
    - tracking the results of implementation, and
    - spatially intensive monitoring to help to identify specific areas of concern.

5. ASSESSMENT OF IMPLEMENTATION ACTION NEEDS

An important element of the TMDL IP is the encouragement of voluntary compliance with implementation actions by local, state, and federal government agencies, business owners, landowners and private citizens. In order to encourage voluntary implementation, information was obtained on the types of actions and program options that can achieve the goals practically and cost-effectively. This section outlines the methods used to identify practical and effective BMPs, or control measures, and quantify the BMPs needed to meet water quality goals.

5.1 Identification of Control Measures (BMPs)

Potential control measures, 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. Measures that can be promoted through existing programs were indicated; those that are not currently supported by existing programs (along with their potential funding sources) were identified. The assurance of implementation of specific control measures was assessed through discussion with the Working Groups and the Steering Committee. 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 watershed. These measures are discussed in sections 5.1.1 and 5.1.2.

5.1.1 Control Measures Implied by the TMDL

The allocations determined during the TMDL development dictate some of the control measures that must be employed during implementation. In order to meet the 73% reductions in direct deposition from livestock, 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. While it is recognized that landowners will want to minimize the cost of fencing and the amount of pasture lost, it was determined that any fencing installed through the use of cost-share programs should follow established Natural Resources Conservation Service (NRCS)

specifications and provide a buffer 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%. With the required reduction of 73%, this may be a large enough reduction to meet the TMDL. However, the need for stream bank stabilization to help address the sediment loads, and riparian vegetation to increase shade negates the sole use of alternative water sources. It is recognized that some farmers may be willing to install their own fencing to their own specifications if cost-share money is available for the water system. It should be stated here that it is recommended that all fence, even that which is installed solely at the landowner's expense, be placed at least 35-ft from the stream. The inclusion of a vegetated buffer helps to reduce sediment and bacteria 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 73% of livestock from the stream bank 100% of the time and establish permanent vegetation in the buffer area. This prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from the pasture, and establishes (with the growth of streamside vegetation) one of the foundations for healthy aquatic life.

From a livestock-production perspective, the best management scenario is one that provides the greatest profit to the farmer. Obviously, taking land (even a small amount) out of production is contrary to that goal. However, a clean water source has been shown to improve milk production and weight gain. Clean water will also improve the health of animals (*e.g.,* cattle and horses) by decreasing the incidence of waterborne illnesses and exposure to swampy areas near streams. Additionally, intensive pasture management, which becomes possible with an alternative water source, has been shown to improve overall farm profitability and environmental impact.

From a part-time farmer's perspective, the best management scenario is one that requires minimal input of time. This would seem to preclude intensive pasture management; however, those farmers who have adopted an intensive pasture-management system typically report that the additional management of the established system amounts to "opening a gate and getting out of the way" every few days. In addition, 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, a healthy riparian buffer is necessary to address the temperature impairments and will also help the sediment reductions. For planning purposes, it was assumed that a vegetated buffer would be established in conjunction with stream fencing.

The 100% reduction in loads from straight pipes is a pre-existing legal requirement as well as a result of the Little River bacteria TMDL. This reduction indicates that all illicit discharges (*i.e.*, straight pipes) in the watershed should be corrected. The options identified for correcting illicit discharges included: installation of a septic system, connecting unit to the town's sewer system, and installation of an alternative waste treatment system. It is anticipated that some portion of straight pipes will be located in areas where an adequate site for a septic drain field is not available. In these cases, the landowner will have to consider an alternative waste treatment system. These may be designed to accommodate multiple houses so cost and maintenance responsibilities are shared.

To address the elevated temperatures in certain stream segments within the drainage area, the temperature TMDLs specifically call for increased shading through forested riparian buffer. The required lengths of stream sides to be buffered were estimated utilizing GIS and aerial photography for the region.

5.1.2 Control Measures Selected through Stakeholder Review

In addition to the control measures that were directly indicated or implied by the TMDLs, a number of additional measures are needed to control sediment from land-based sources.

All scenarios began with implementation of the measures indicated by the TMDL. Practices that specifically address sediment were identified. Control measures included forest-harvesting BMPs, improved pasture management, conservation tillage, erosion and sediment (E&S) controls on construction sites, and streambank restoration.

Improved 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, and
- Distribution of manure through managed rotational grazing.

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

The final set of control measures identified and the efficiencies used in this study to estimate needs are listed in Table 5.1. The control measures listed in this table are divided into categories based on the method of load reduction. "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 measures for bacteria, sediment, and temperature.

Control Measure	Efficiencies			Reference
	Bacteria	Sediment	Temperature	
Direct Reduction Efficiency				
Streamside Fencing	100%	50%	0%	1
Corrected Straight-pipe	100%	100%	0%	1, 2
Streambank Restoration	N/A	2.55 lbs/ft/yr	0%	2
*Buffer Efficiency**				
Forested Riparian Buffer	35%	35%	100%	3
Runoff Treatment Efficiency				
Improved Pasture Management	50%	50%	0%	2
Erosion and Sediment Controls	85%	85%	0%	4, 5, 6
Conservation Tillage	61%	61%	0%	7
Reforestation of Disturbed Forest	35%	85%	0%	3
Forest Harvesting BMPs	35%	50%	0%	2,3

* Buffer efficiencies shown here are applied to runoff from twice the buffer area upstream of the buffer. Additional reductions result from the conversion of land from its existing condition to the buffer area.

1 Removal efficiency is defined by the practice.
2 Commonwealth of Virginia. 2005. Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy. www.naturalresources.virginia.gov/Initiatives/TributaryStrategies/
3 Estimated through modeling.
4 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.
5 Schwab, G.O., D.D. Fangmeier, W.J. Elliot, R.K. Frevert. 1992. Soil and Water Conservation Engineering, 4th Edition. Wiley.
6 Bacteria efficiency estimated based on sediment and nutrient efficiency.
7 Wischmeier, W.H., and D.D. Smith. 1978. Predicting Rainfall Erosion Losses. Agriculture Handbook no. 537, USDA Science and Education Administration.

5.2 Quantification of Control Measures

The quantity of control measures required during implementation was determined through spatial analyses, modeling alternative implementation scenarios, and working group member requests. Spatial analyses included the processing of data that included land use, census data, stream networks, and elevation, along with data archived from the VDCR Agricultural BMP Database and TMDL development documents. The map layers and archived data were combined to establish the number of control measures required in the entire area and in each subwatershed, where appropriate. Estimates of the amount of on-site treatment systems, 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. Geographic information systems software was used to estimate the portion of streams not covered by tree canopy that can be planted with forested riparian buffer.

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 increase in forest harvesting. Care should be taken to monitor land changes and its impacts on water quality.

5.2.1 Agricultural Control Measures

5.2.1.1 Agricultural Control Measures: Livestock Exclusion

The length of streamside fencing needed was obtained by digitizing a one-side or two-side stream fence based on the stream network and the areas aerial photography. If a perennial stream crossed a pasture, a two-sided fence was estimated. For cases where the perennial stream was located at the edge of the field, only one-sided fence was estimated. This analysis resulted in a total of approximately 1.5 million linear feet of fencing. This length of fencing does not include the previously conducted bacteria TMDLs in Mill Creek and Dodd Creek. Not every land use area identified as pasture has livestock on it at any given point in time. However, it is assumed that unimproved pasture and cattle-grazed pasture areas have the potential for livestock access. A map of the streamside fencing estimates is shown in Figure 5.1.

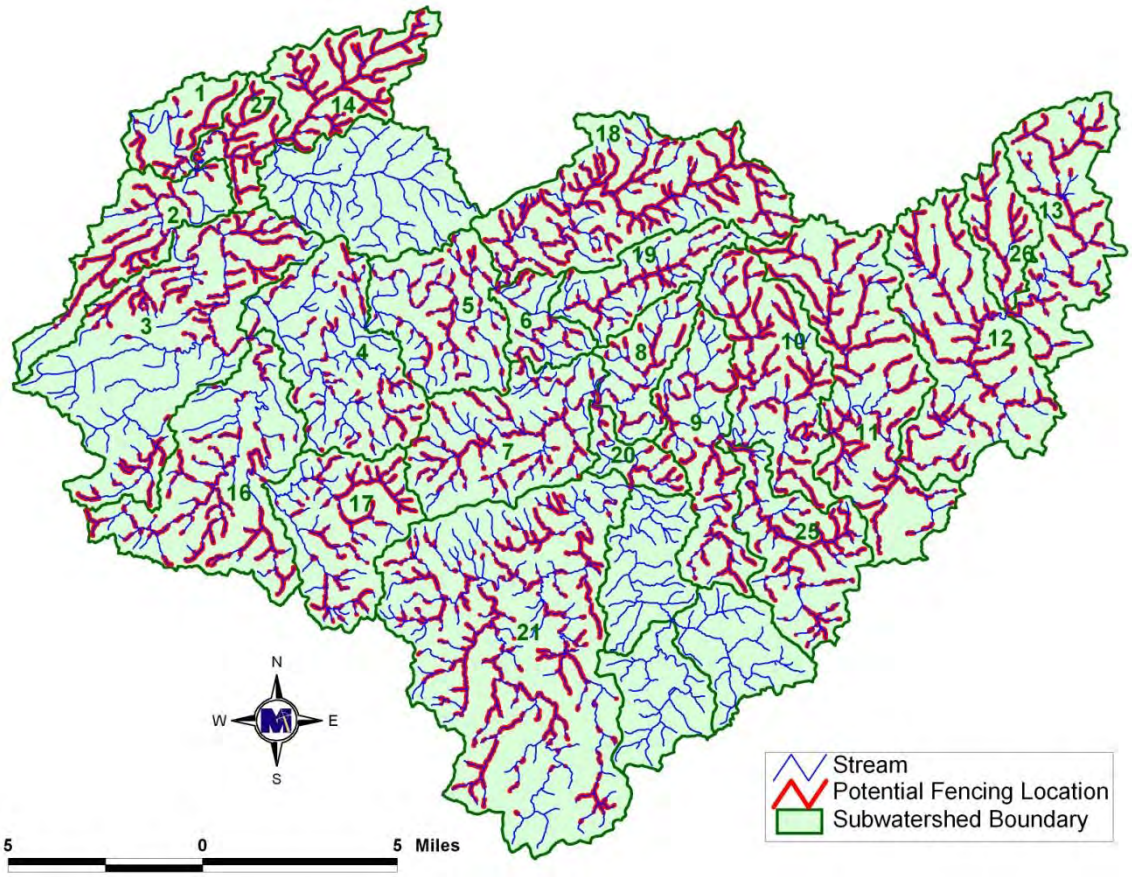


Figure 5.1 Fencing locations along with subwatersheds and streams.

The VDCR Agricultural BMP Database was utilized to determine typical characteristics (*e.g.,* streamside fencing length per practice) of full livestock exclusion systems leading to the quantification of the number of required systems. The database was queried for information on Grazing Land Protection Systems (SL-6) (This system is now called *Livestock Exclusion with Riparian Buffers for TMDL Implementation* (**LE-1T**)) and Stream Protection Systems (WP-2 and WP-2T) installed in the Skyline SWCD area. The LE-1T system includes streamside fencing, cross fencing, alternative watering system, and a 35-ft buffer from the stream. The WP-2 and WP-2T systems include streamside fencing, hardened crossings, and a 35-ft buffer from the stream. In TMDL implementation areas, the WP-2T practice is eligible and, in cases where a watering system already exists, a WP-2T system is a more appropriate choice. The average length

per system installed was approximately 1,400 ft. Only less than 3 percent of the systems installed were WP-2T systems and the rest were SL-6 systems.

To establish the total number of full livestock exclusion systems necessary to achieve full implementation, systems were calculated by dividing the potential pasture streamside fencing required by the average streamside fencing length per system. The breakdown of number of exclusions systems that are expected to be LE-1T or WP-2T systems is based on historical use of these practices in the Skyline SWCD area. It was determined that 116 total livestock exclusion systems (LE-1T and WP-2T) could be installed in the Little River watershed (Table 5.2). The subwatersheds referenced are displayed in Figure 5.2.

Table 5.2 Estimation of streamside fencing (LE-1T) and number of full exclusion systems (WP-2T) required in the Little River watershed.

Subwatershed[1]	LE-1T	WP-2
1	24	0
2	35	1
3	67	2
4	21	0
5	19	0
6	6	0
7	33	1
8	14	1
9	37	1
10	68	1
11	90	2
12	72	2
13	46	1
14	84	2
16	50	1
17	39	0
18	119	3
19	19	0
20	8	1
21	123	3
25	45	1
26	24	1
27	38	1
Total	***1,081***	***25***

[1] Reference Figure 5.2 for watershed locations.

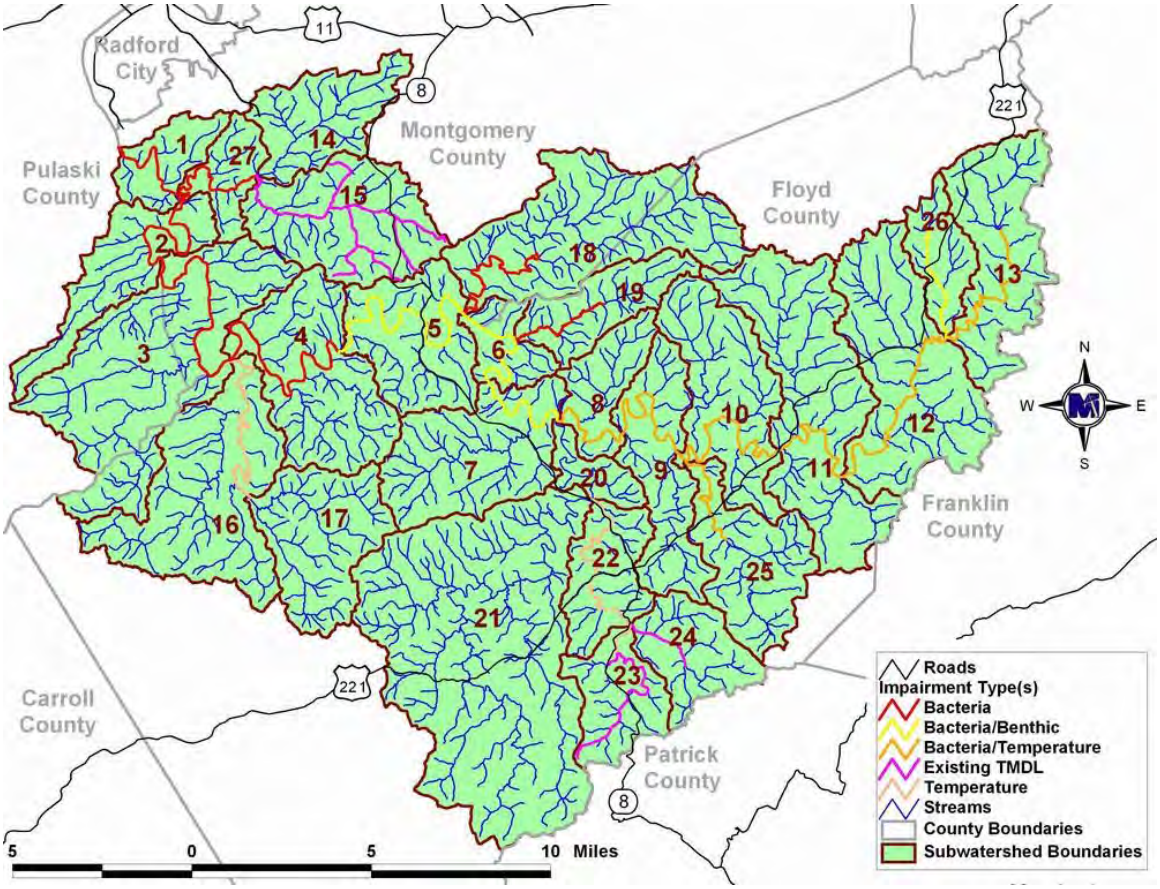


Figure 5.2 All subwatersheds delineated for modeling in the Little River study area.

5.2.1.2 Agricultural Control Measures: Land-Based

The Little River sediment TMDL requires reductions to land-based agricultural loads. In order to meet these requirements, the BMPs in Table 5.3 must be implemented; however, a staged approach to implementation is described in Chapter 6 of this document, whereby much of the needed reductions can be achieved without overly intensive actions. One category of practices that is expected to have a substantial impact on water quality improvement is improved pasture management. Improved pasture management, or rotational grazing, consists of cross fencing, which allows farmers to move cattle around pastureland more efficiently. Less trampling and less overgrazing keep vegetation on the ground, which holds soil, nutrients, and manure in place.

Conservation tillage involves continuous no-till practices which according to VDCR, reduces erosion and fertilizer use. The practice may involve renting or buying new

equipment, a concern that is offset by funding to cover the initial cost for farmers who qualify for federal cost-share programs. Another added benefit for farmers is the reduction in fuel and labor costs, in addition to the improved soil quality and moisture retention which lead to increased yields.

Table 5.3 Agricultural land-based BMPs required to meet the Little River TMDL.

Control Measure	Unit	# of Units
Improved Pasture Management - Pasture	Acres	3,670
Conservation Tillage	Acres	18

5.2.2 Residential Control Measures

5.2.2.1 BMPs to Correct Straight Pipes

All straight pipes must be identified and corrected during implementation since a 100% load reduction from this source was deemed necessary to meet the fecal bacteria and sediment TMDL goals. The number and location of straight pipes were based on analysis of census data and review by the RWG. Table 5.4 shows the number of straight pipes for each subwatershed.

The RWG identified the following BMPs to correct straight pipes: alternative waste treatment systems, installation of septic system, and connecting to town sewer line. Of the 360 straight pipes estimated for the entire study area, 5% (18 houses) were assumed to be houses with no proper land for a conventional septic system and therefore, will need an alternative treatment system. Of the remaining 342 houses, 26 houses were estimated to have the potential for connecting to town sewer based on GIS analysis of the census data. The remaining 316 houses are set to have a septic system installed (Table 5.5). The subwatersheds referenced are displayed in Figure 5.2.

Table 5.4 Estimated straight pipes in the Little River subwatersheds.

Subwatersheds[1]	Number of Straight Pipes
1	3
2	11
3	24
4	15
5	12
6	3
7	15
8	3
9	2
10	8
11	24
12	25
13	19
14	13
16	59
17	20
18	24
19	4
20	1
21	49
25	9
26	13
27	4
Total	***360***

[1] Reference Figure 5.2 for watershed locations.

Table 5.5 Estimated residential waste control measures needed in the Little River watershed.

Residential Control Measure Description	VA Cost-Share Practice Number	Units Needed
Straight Pipe Corrections:		
Sewer Connection	RB-2	26
Alternative Waste Treatment System Installation	RB-5	18
Septic System Installation/Replacement	RB-4	316

5.2.2.2 Residential Control Measures: Land-Based

The Little River sediment TMDL requires reductions to sediment load from land-based residential areas. In order to meet these requirements, the BMPs in Table 5.6 must be implemented. A staged approach to implementation is described in Chapter 6 of this

document, whereby much of the needed reductions can be achieved without overly intensive actions.

Erosion and sediment control (E&S) are a set of measures regulating land disturbing activities such as clearing, grading, excavating, transporting, and filling of land. There is a set of minimum standards that need to be met during such activities with the goal of minimizing sediment mobilization out of the given site. E&S measures were recommended for approximately 20% of the transitional or barren land in the area within the sediment impaired portion of the watershed.

Aside from correcting straight pipes, septic systems should be maintained and fixed when failing as a good practice. Other measures not called for directly by the plan but are encouraged are educational programs. It was recognized that educational efforts would be vital to the successful implementation of TMDLs in general. This education includes information on how pet waste should be disposed of, septic tank pump-out programs, information on septic maintenance, and other water quality tips. Having appropriate pet waste disposal bags and receptacles at sites such as parks and other locations with high dog traffic would be very helpful.

Stormwater carrying bacteria, sediment may be addressed even though modeling procedures showed that was not necessary. Measures such as rain gardens and retention ponds may be helpful. Rain gardens are planted in low-laying areas that absorb water resulting from rainfall over impervious surfaces such as rooftops. This practice reduces surface runoff by allowing water more time to soak into the ground resulting in less flow into storm drains and subsequently less flow downstream. This practice helps reduce flooding and channel erosion downstream. It also adds to the esthetic value of the property.

Finally, street sweeping removes sediment and other pollutants from the streets that would otherwise be available for wash-off into streams during storm events. While this practice is not quantified in this plan, it is a good practice that should be encouraged.

Table 5.6 Residential land-based BMPs required to meet the Little River TMDL.

Control Measure	Units Needed
Erosion and Sediment Control (Acre - treated)	30

5.2.3 Other Control Measures

In order to meet the sediment reduction requirements called for by the TMDL, the BMPs in Table 5.7 must be implemented. A staged approach to implementation is described in Chapter 6 of this document.

One of the measures called for here is forest harvesting BMPs. The Virginia Department of Forestry (VDOF) is in charge of regulating any logging operations from commercial or private entities. A logging company must call the VDOF to report that they are going to harvest an area within three days of starting. A VDOF representative inspects the site before, during (typically every 30 days), and after harvesting. There is a zero tolerance for sedimentation in nearby streams; if the VDOF thinks there is sedimentation possible, the loggers must have measures in place to prevent sediment travel within 10 days of a citation.

Some BMPs recommended on logging areas are not harvesting trees near streams (leaving a vegetated stream buffer), water bars, hardened stream crossings (*i.e.,* culverts, bridges), and seeding and mulching bare areas upon completion. More information on logging BMPs can be found at http://www.dof.virginia.gov/wq/index-BMP-Guide.shtml. If BMPs are not in place, special orders are handed to the company; fines are then assessed based on the extent of the disturbance and any prior citations. This money is channeled into an education fund used to train loggers in environmental practices. More information on regulations of resource extraction and logging operations is detailed in Chapter 7.

Another measure recommended for addressing sediment from logged areas was replanting the disturbed areas. Once mature, the planted trees provide a similar forest cover to pre-disturbed conditions.

A measure that was discussed in working group meetings that is helpful in reducing sediment load is dirt road stabilization. Dirt road stabilization involves mixing soils with binding compounds and compacting the surface of the dirt road which results in minimum erosion and dust.

Streambank stabilization is described by VDCR as protection methods along streams to reduce erosion, sedimentation, and the pollution of water from agricultural nonpoint sources. This is achieved through changing land use, providing vegetative stabilization, and through the use of more effective management techniques.

Table 5.7 Urban/Industrial land-based BMPs required to meet the Little River TMDL.

Control Measure	Units Needed
Forest Harvesting BMPs (Acre)	27
Reforestation of Disturbed Forest	270
Forested Riparian Stream Buffer (ft-streambank)	297,000
Streambank Stabilization (ft-stream)	15,000

5.3 Technical Assistance and Education

Technical assistance and education are critical for getting people involved in implementation. There must be a proactive approach to contact farmers and residents to articulate exactly what the TMDL means to them and what practices will help meet the goal of improved water quality. Several education/outreach techniques will be utilized during implementation. Articles describing the TMDL process, the reasons why high levels of the pollutants are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the problem, and the potential ramifications of not dealing with the problem should be made available to the public through as many channels as possible (*e.g.,* Farm Service Agency (FSA) newsletters, VDOF handouts, and targeted mailings).

Workshops and demonstrations should be organized to show landowners the extent of the problem, the effectiveness of control measures, and the process involved in obtaining technical and financial assistance. 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 organizations, such as Sustain Floyd.

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

For residential issues, public outreach should focus on increasing awareness of private residential sewage treatment systems, control of pet waste, programs to describe the importance of erosion and sediment (E&S) controls to developers, and control of storm runoff. This outreach effort will provide useful information to residents and increase the likelihood of identifying straight pipes and failing septic systems in the impaired watersheds. Small community meetings similar to the small workshops proposed for the agricultural community can be organized for educating homeowners about residential issues. Information about the TMDL can be presented using media outlets and direct mailings, as well as through direct contact with potential corporate partners and residents, and presentations to community groups. An educational packet about septic system issues should be disseminated to new homeowners. Additionally, educational tools (*e.g.,* a model septic system used to demonstrate functioning and failing septic systems, a video of septic maintenance and repair) would be useful in communicating the problem to the public. The technical assistance and educational outreach tasks needed in the residential community during implementation were identified during plan development.

The following tasks associated with agricultural, residential, and other 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.,* pasture walks, presentations at field days or club events).
5. Distribute educational materials (*e.g.,* informational articles in FSA or Farm Bureau newsletters, and 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 and programs.
4. Organize educational programs (*e.g.*, demonstration septic pump-outs, pet waste control).
5. Distribute educational materials (*e.g.*, informational pamphlets on TMDL IP, rain gardens, and on-site sewage disposal systems).
6. Track BMP installations.
7. Assess progress toward implementation goals.

Other Programs

1. Develop educational materials and programs. Some suggestions include:
    a. An erosion and sediment control workshop, focusing on educating the public and key stakeholders along each watershed on E&S law and regulations.
    b. A brochure/mailing, explaining specific practices that individuals and small groups can and should use to reduce pollution (particularly bacteria and sediment) from reaching these streams.
2. Organize educational programs.
3. Distribute educational materials.
4. Correspond with VDOF to encourage and track BMP installation.
5. Assess progress toward implementation goals.

Two full time employees (FTEs) will be needed for the first five years of implementation (Stage I) and for the remaining five years (Stage II). One FTE will handle the agricultural program and one will handle the residential and other programs. The Skyline SWCD will be in charge of funds for the associated FTEs, either to pay existing staff or hire new employees to carry out the implementation of BMPs.

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. An average cost estimate for one Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T) was estimated based on historical records and revised upwards after input during Agricultural Working Group meetings. The cost for one LE-1T system was estimated as $18,000 with an average of 1,400 ft of fencing. The Stream Protection Systems (WP-2T, livestock exclusion system without installation of a water system, plus a fence maintenance incentive payment) was estimated as $5,250.

The cost for fencing maintenance was based on $3.50 per foot maintained and assuming 7.5% of total fencing length needing maintenance annually. A quarter of this total is assumed to be completed in Stage I and the remaining three quarters in Stage II. 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 Stream Protection (WP-2T) cost-share practice will be available as part of the implementation project and provides an incentive payment to maintain stream fencing. It was recognized that maintenance of fencing would add a significant cost.

The remaining costs outlined in Table 5.8 were determined through literature review, analysis of the Virginia Agricultural BMP Database, and discussion with stakeholders and during meetings. The estimated cost of implementing all agricultural practices is estimated as a little under $24 million.

Table 5.8 Agricultural control measure costs and needs.

Control Measure	Unit	Units Needed	Unit Cost	Total Practice Cost
Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T)	System	1,081	$18,000	$19,458,000
Stream Protection Systems (WP-2T)	System	25	$5,250	$131,250
Improved Pasture Management - Pasture	Acres	3,670	$75	$275,250
Conservation Tillage	Acres	18	$100	$1,800
Streamside Fencing Maintenance-perennial	ft-maintained	1,135,050	$3.5	$3,972,675

5.4.2 Residential Control Measures

It was assumed that approximately 5% of straight pipe corrections would require new alternative treatment systems ($20,000/each). The majority of straight pipe corrections would be via installing new standard septic systems ($8,000/each). Connecting houses to sewer lines is estimated to cost $6,000 per system for 26 straight pipes.

The remaining costs outlined in Table 5.9 were determined through literature review, and discussion with stakeholders. The total cost of implementing all residential practices is estimated as approximately $3.1 million.

Table 5.9 Residential control measure costs and needs.

Residential Control Measure	Unit	Units Needed	Unit Cost	Total Practice Cost
Sewer Connection (RB-2)	System	26	$6,000	$156,000
Alternative Waste Treatment System Installation (RB-5)	System	18	$20,000	$360,000
Septic System Installation/Replacement (RB-4)	System	316	$8,000	$2,528,000
Erosion and Sediment Control	Acre	30	$2,000	$60,000

5.4.3 Other Control Measures

The estimated cost of implementing all other BMPs in this watersheds is approximately 1.7 million dollars and is outlined in Table 5.10. Most of this cost is associated with streambank stabilization.

Table 5.10 Other control measure costs and needs.

Control Measure	Unit	Units Needed	Unit Cost	Total Practice Cost
Reforestation of Disturbed Forest	Acre	270	$300	$81,000
Forest Harvesting Best Management Practices	Acre of BMP	27	$10,000	$270,000
Streambank Stabilization	ft	15,000	$71	$1,065,000
Forested Riparian Buffer	ft	297,000	$1	$297,000

5.4.4 Technical Assistance

It was determined that it would require $52,000 to support the salary, benefits, travel, training, and incidentals for education of one technical FTE. It is estimated that two technical FTEs per year would be needed for the duration of the implementation. Another $5,000 per year is added for outreach efforts bringing the total cost of technical assistance to $109,000 per year. The total for the 10 years of implementation is therefore is $1,090,000.

5.4.5 Total Estimated Costs

The total estimated costs for the implementation of BMPs in the Little River watershed is approximately $28.6 million (Table 5.11). The technical assistance cost is $1.09 million.

Table 5.11 Total estimated costs to meet the Little River TMDL.

Program	Cost
Agricultural BMPs	$23,838,975
Residential BMPs	$3,104,000
Other BMPs	$1,713,000
Technical Assistance	$1,090,000
Total	$29,745,975

5.5 Benefit Analysis

The primary benefit of implementation is cleaner waters in Virginia. Fecal and sediment contamination in Little River and elevated temperatures will be reduced to meet water quality standards, and the aquatic community in these streams will be restored. Table

5.12 indicates the cost efficiencies of the various practices being proposed in this IP. It is hard to gauge the impact that reducing fecal contamination will have on public health as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the reductions required, the incidence of infection from fecal sources through contact with surface waters should be reduced considerably. In addition to allowing the aquatic community to thrive, the control measures that will be implemented to control sediment will also serve to reduce delivery of other pollutants to the stream from upland locations by reducing sediment load in runoff.

Table 5.12 Cost efficiencies of control measures in units removed per $1,000.

Control Measure	Bacteria (colonies)	Sediment (kg)	Temperature (^oF)
Agricultural			
Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T)	1.64E+10	26	--
Stream Protection Systems (WP-2T)	7.51E+10	118	--
Improved Pasture Management - Pasture	2.82E+12	1,620	--
Conservation Tillage	9.72E+12	5,968	--
Residential			
Sewer Connection (RB-2)	3.76E+11	7	--
Alternative Waste Treatment System Installation (RB-5)	1.13E+11	2	--
Septic System Installation/Replacement (RB-4)	2.82E+11	5	--
Erosion and Sediment Control	1.22E+10	903	--
Other			
Reforestation of Disturbed Forest	5.75E+10	1,504	--
Forest Harvesting Best Management Practices	1.73E+10	265	--
Streambank Stabilization	--	16	--
Forested Riparian Buffer	7.7E+06	47	0.022*

*Each $1000 spent on forested riparian buffer result in 0.022 ^oF reduction in temperature on average

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 other 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, and private sewage system maintenance 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. Reducing temperature in segments with elevated levels allows for more adequate conditions for fish and therefore can improve fishing in both natural trout streams and stockable trout streams.

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. Beef producers in several Virginia counties have reported weight gains in cattle after providing alternative water sources. Studies also show increased milk and butterfat production from dairy cattle ingesting water from a clean source (Zechowski et al, 2007). 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 as are often found next to streams where cattle have regular access. Keeping cattle in clean, dry areas has been shown to reduce the occurrence of mastitis and foot rot. The Virginia Cooperative Extension (VCE) reports that mastitis costs producers $100 per cow in reduced quantity and quality of milk produced (VCE, 1998a). Mastitis-causing bacteria can be harbored and spread in the environment where cattle have access to wet and dirty areas. Installation of streamside fencing and well-managed loafing areas will reduce the amount of time that cattle have access to these areas.

Taking the opportunity to instigate an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40% and, consequently, improve the profitability of the operation. 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 a financial benefit to producers (VCE, 1996). Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits by allowing higher stocking rates and increasing the amount of gain per acre. Another benefit is that cattle are closely confined allowing for quicker examination and handling. In general, many of the agricultural BMPs recommended in this document will provide both environmental benefits and economic benefits to the farmer.

The residential programs will play an important role in improving water quality, since human waste can carry with it human viruses, in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry. While measures dealing with septic systems are not necessary to meet the bacteria water quality standards in the Little River, citizens are encourage to adopt such measures since they constitute common sense practices that can help citizens economically on the long run. 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 three to five years. The cost of proper maintenance, as outlined here, is relatively inexpensive in

comparison to repairing or replacing an entire system. Additionally, the repair/replacement and pump-out programs will benefit owners of private sewage (*e.g.*, septic) systems, particularly low-income homeowners, by sharing the cost of required maintenance.

In addition to the benefits to individual landowners, the economy of the local community will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside the impaired areas. Building contractors and material suppliers who deal with septic system pump-outs, private sewage system repair and installation, fencing, and 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 Section 6.1, 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 is expected in ten years, with de-listing from the Virginia Section 303(d) list within 15 years. Described in this section are the identification of milestones, the timeline for implementation, and 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 the waters from the Commonwealth of Virginia's Section 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 control measures will be tracked through the Virginia Agricultural Cost-Share Program and by the Skyline Soil & Water Conservation District (Skyline SWCD).

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 ten years, leaving five years to assess water quality for de-listing. These goals are the basis for two of the milestones (*i.e.*, full implementation at the 10-year mark, and de-listing at the 15-year mark).

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures first, when appropriate. As described in Chapter 5, costs vary by practice and efficiency. The staged implementation can aid in attaining large reductions in pollutant loads through more cost-effective means.

Implementation is anticipated to begin in the summer of 2011; two five-year implementation stages will be followed by five years of water quality monitoring. The Stage I goals will focus on the more cost-efficient control measures, *i.e.,* correcting

straight pipes, fencing out cattle, implementing conservation tillage and improved pasture management. Stage I will also include completing half the recommended stream stabilization and forested riparian buffer planting. Following Stage I implementation, the Steering Committee should evaluate water quality improvements and determine how to proceed to complete implementation during Stage II.

In Stage II, the remainder of the all BMPs are scheduled for implementation. The proposed timeline points to completing Stage II ten years after the start of implementation. Stage III, during which the effects of the BMPs are monitored, will be completed five years after the completion of Stage II.

Table 6.1 shows the types and quantities of BMPs to be installed during each stage. It is anticipated that the de-listing of the impaired segments from the Section 303(d) list will occur by 2026.

Table 6.1 Stage I and Stage II implementation goals for Little River.

		Little River	
Control Measure	**Unit**	**Stage I**	**Stage II**
Agricultural			
Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T)	System	1,081	0
Stream Protection Systems (WP-2T)	System	25	0
Streamside Fencing Maintenance-perennial	ft-maintained	283,763	851,288
Conservation Tillage	Acres	18	0
Improved Pasture Management - Pasture	Acres	2,000	1,670
Residential			0
Sewer Connection (RB-2)	System	26	0
Alternative Waste Treatment System Installation (RB-5)	System	18	0
Septic System Installation/Replacement (RB-4)	System	316	0
Erosion and Sediment Control	Acre	30	0
Other			0
Reforestation of Disturbed Forest	Acre	200	70
Forest Harvesting Best Management Practices	Acre of BMP	100	170
Streambank Stabilization	ft	7,500	7,500
Forested Riparian Buffer	ft	148,500	148,500

6.2 Timeline

A ten-year implementation plan timeline for bacteria, sediment, and temperature was formulated for the Little River watersheds (Tables 6.2 and 6.3). The timelines describe the needs for implementation in terms of completion of the agricultural, residential and other control measures. Table 6.4 shows the projected staged implementation costs for agricultural, residential, and other control measures, including technical assistance.

Table 6.2 Timeline for implementation in the Little River watershed – Stage I.

Implementation Milestones	Existing	2011	2012	2013	2014	2015
Cumulative Progress Toward BMP Installation						
***Agricultural*:**						
Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T)		20%	40%	60%	80%	100%
Stream Protection Systems (WP-2T)		20%	40%	60%	80%	100%
Streamside Fencing Maintenance-perennial		5%	10%	15%	20%	25%
Conservation Tillage		20%	40%	60%	80%	100%
Improved Pasture Management - Pasture		10%	21%	32%	43%	54%
***Residential*:**						
Sewer Connection (RB-2)		20%	40%	60%	80%	100%
Alternative Waste Treatment System Installation (RB-5)		20%	40%	60%	80%	100%
Septic System Installation/Replacement (RB-4)		20%	40%	60%	80%	100%
Erosion and Sediment Control		20%	40%	60%	80%	100%
***Other*:**						
Reforestation of Disturbed Forest		14%	29%	44%	59%	74%
Forest Harvesting Best Management Practices		7%	14%	21%	29%	37%
Streambank Stabilization		10%	20%	30%	40%	50%
Forested Riparian Buffer		10%	20%	30%	40%	50%
Exceedance of Geometric Mean EC Standard (126 cfu/100mL) (%)	0%	0%	0%	0%	0%	0%
Progress Towards Bacteria Reduction (% of Total Reductions Needed)		20%	40%	60%	80%	100%
Progress Towards Sediment Reduction (% of Total Reductions Needed)		17%	34%	51%	68%	85%
Progress Towards Temperature Reduction (% of Total Reductions Needed)		10%	20%	30%	40%	50%
Cost (% of Total)		18%	35%	53%	71%	88%

Table 6.3 Timeline for implementation in the Little River watershed – Stages II and III.

Implementation Milestones	2016	20177	2018	2019	2020	2025
Cumulative Progress Toward BMP Installation						
***Agricultural*:**						
Livestock Exclusion with Riparian Buffers for TMDL Implementation (LE-1T)	100%	100%	100%	100%	100%	100%
Stream Protection Systems (WP-2T)	100%	100%	100%	100%	100%	100%
Streamside Fencing Maintenance-perennial	40%	55%	70%	85%	100%	100%
Conservation Tillage	100%	100%	100%	100%	100%	100%
Improved Pasture Management - Pasture	63%	72%	81%	91%	100%	100%
***Residential*:**						
Sewer Connection (RB-2)	100%	100%	100%	100%	100%	100%
Alternative Waste Treatment System Installation (RB-5)	100%	100%	100%	100%	100%	100%
Septic System Installation/Replacement (RB-4)	100%	100%	100%	100%	100%	100%
Erosion and Sediment Control	100%	100%	100%	100%	100%	100%
***Other*:**						
Reforestation of Disturbed Forest	80%	85%	90%	95%	100%	100%
Forest Harvesting Best Management Practices	50%	63%	76%	89%	100%	100%
Streambank Stabilization	60%	70%	80%	90%	100%	100%
Forested Riparian Buffer	60%	70%	80%	90%	100%	100%
Exceedance of Geometric Mean EC Standard (126 cfu/100mL) (%)	0%	0%	0%	0%	0%	0%
Progress Towards Bacteria Reduction (% of Total Reductions Needed)	100%	100%	100%	100%	100%	100%
Progress Towards Sediment Reduction (% of Total Reductions Needed)	88%	91%	94%	97%	100%	100%
Progress Towards Temperature Reduction (% of Total Reductions Needed)	60%	70%	80%	90%	100%	100%
Cost (% of Total)	91%	93%	95%	98%	100%	100%

Table 6.4 Costs to implement Stage I and II for Little River.

Stage	Agricultural BMPs ($)	Residential BMPs ($)	Other BMPs ($)	Tech. Assist. ($)	Total ($)
Stage I	*20,734,219*	*3,104,000*	841,000	545,000	25,224,219
Stage II	3,104,756	0	872,000	545,000	4,521,756
Total	23,838,975	3,104,000	1,713,000	1,090,000	29,745,975

6.3 Targeting

Implicit in the process of a staged implementation is targeting of control measures: this ensures optimum utilization of resources. Targeting of critical areas for livestock fencing was accomplished through analysis of livestock population and the fencing requirements for each subwatershed. The subwatersheds referenced are displayed in Figure 5.2. The subwatersheds were ranked in descending order based on the ratio of animals per fence length. If feasible, effort should be made to prioritize resources in the order of subwatersheds in Table 6.5. The targeting priority list should be used to focus outreach by promoting the cost-share programs available. However, interested parties should not be turned away if their land is in a low ranking subwatershed.

Table 6.5 Targeting subwatershed order for streamside fencing.

Subwatershed Priority	Streamside Fencing[1]
1st (highest priority)	2
2nd	1
3rd	3
4th	5
5th	4
6th	12
7th	13
8th	6
9th	19
10th	7
11th	20
12th	9
13th	16
14th	8
15th	21
16th	11
17th	17
18th	26
19th	10
20th	27
21st	18
22nd	14
23rd (lowest priority)	25

[1] Reference Figure 5.2 for watershed locations.

The subwatersheds were also prioritized in order of most fecal load from straight pipes. The results of the targeting analysis show the order in which straight pipes should be identified and corrected (Table 6.6).

Table 6.6 Targeting subwatershed order for residential waste treatment BMPs.

Subwatershed Priority	Subwatershed ID[1]
1st (highest priority)	16
2nd	21
3rd	12
4th	3
5th	11
6th	18
7th	17
8th	13
9th	4
10th	15
11th	7
12th	26
13th	14
14th	5
15th	2
16th	22
17th	25
18th	10
19th	23
20th	19
21st	27
22nd	6
23rd	8
24th	1
25th	9
26th	24
23rd (lowest priority)	20

[1] Reference Figure 5.2 for watershed locations.

One method of targeting involves considering the cost-efficiency of specific practices. Table 5.12 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.

In addition to the outlined method for targeting practices within the whole watershed, Individual impairments were ranked based on the targeting results above, as well as the number of impairment types (higher priority for more impairment types), the size of impairment (higher priority for smaller watersheds), and the frequency of water quality violations (higher priority for more frequent violations). The top five results of this ranking are shown in Table 6.7, ending with the entire watershed.

Table 6.7 Ranking of implementation areas based on priority scoring (0-10).

Impairment	Score
Meadow Run	8.8
Little River (above Meadow Run)	6.5
Laurel Creek	6.1
Little River – (upstream from the outlet of the benthic impairment)	5.8
Little River – (entire watershed)	5.6

7. STAKEHOLDERS AND THEIR ROLE IN IMPLEMENTATION

Achieving the goals of this effort (*i.e.,* improving water quality and removing these waters from the impaired waters list) is dependent 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 Skyline SWCD has agreed to take responsibility for implementation. VDEQ and VDCR staff will take the responsibility of working with the Skyline SWCD 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. Coordination of the implementation project with these existing programs could result in additional resources and increased participation.

Virginia's Wildlife Action Plan (WAP) was developed to both keep wildlife from becoming endangered and to keep common wildlife species common. The Plan helps achieve these goals by identifying Virginia's species of greatest conservation need, the habitats these species rely upon, the issues impacting these species and/or their habitats, and the conservation actions needed to address these issues. The WAP was created with the help of dozens of partners and an extensive public review process. The WAP is scheduled to be updated in 2015.

Using information provided within the WAP, there are 10 species of fish, three mussels, two aquatic insects, a snail, three crayfish and one amphibian species of greatest concern in the New River Basin Ridge and Valley habitat area. As such, the Little River TMDL implementation plan compliments the Virginia Wildlife Action Plan by creating strategies to improve aquatic habitats that dozens of species of greatest conservation need depend upon.

An electronic copy of the WAP can be found on the Internet at http://www.bewildvirginia.org/wildlifeplan/. The New River in the Ridge and Valley habitat area and the highest priority species within that drainage are discussed in Chapter 7.

Implementation efforts in the previously developed bacteria TMDLs in Mill Creek and Dodd Creek are accounted for in this implementation plan. The Skyline SWCD may be able to coordinate efforts between these two projects and the current implementation plan.

7.2 Monitoring

Improvements in water quality will be determined in the Little River watershed through monitoring conducted by the VDEQ's ambient monitoring program. Figure 7.1 and Table 7.1 show the proposed VDEQ monitoring stations, which are subject to change based upon the development of the VDEQ Monitoring Strategy. Typically, monitoring in an implementation area begins two years after implementation is initially funded, and monitoring continues bimonthly in two-year cycles. The monitoring data includes bacteria, physical parameters (dissolved oxygen, temperature, pH, and conductivity), nutrients and suspended, dissolved solids, and biological assessments. Additionally, biomonitoring is conducted in the spring and fall. The VDEQ uses the data to determine overall water quality status, and gauge the success of implementation aimed at reducing the amount of pollutants in the streams of the Little River watershed.

Additionally, volunteer monitoring is encouraged to supplement the monitoring conducted by VDEQ. Interested parties should contact Skyline SWCD or the National Committee for the New River.

The Steering Committee, Skyline SWCD, VDH, and VDEQ will assess progress toward end goals during implementation through tracking of control measure installations and continued water quality monitoring.

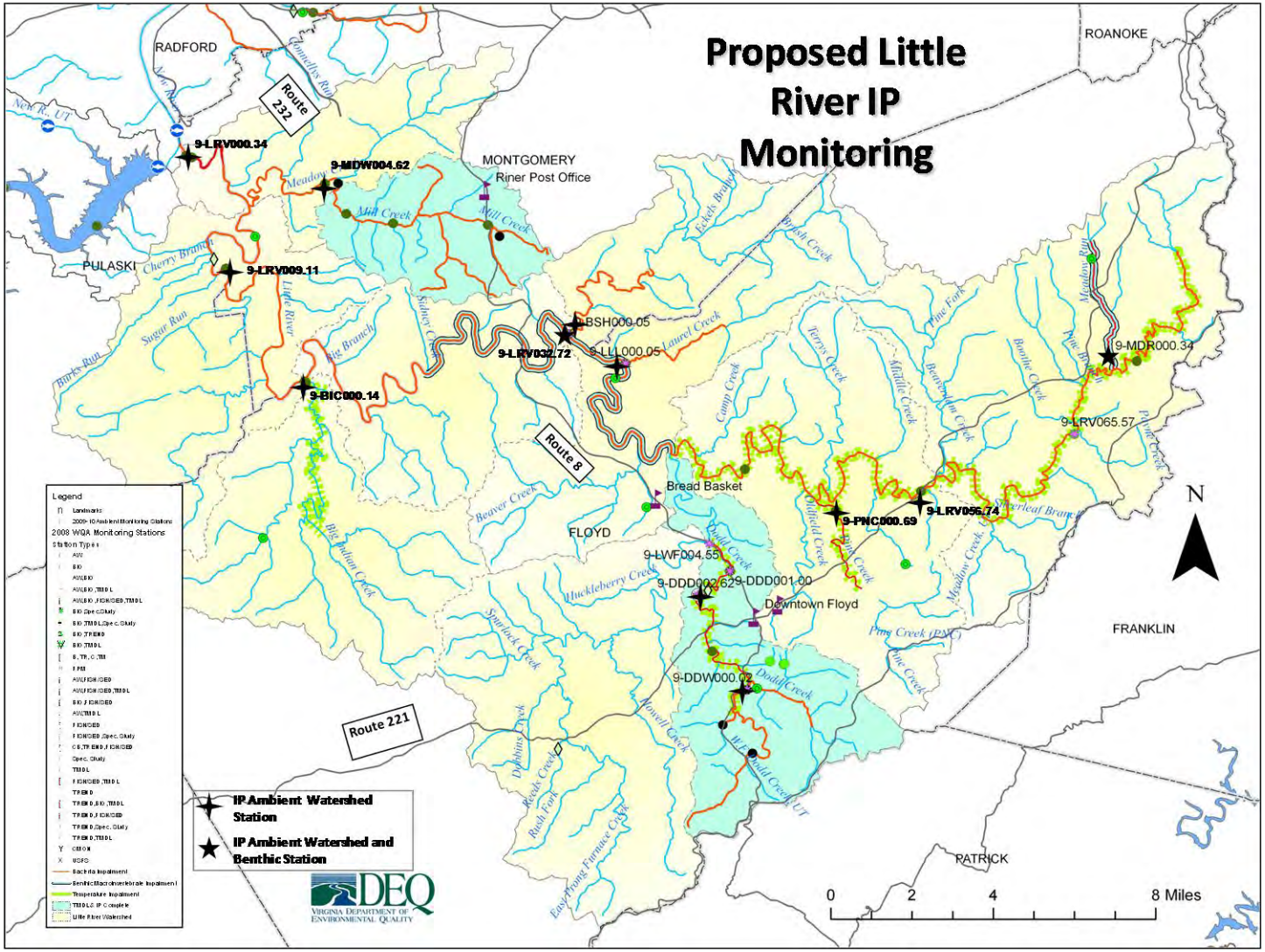


Figure 7.1 Location of monitoring stations in the Little River watershed.

Table 7.1 Little River watershed VDEQ monitoring stations.

Stream Name	Station Id	Station Description	Spg Code	Listing Type
Brush Creek	9-BSH000.05	Rt. 617 Bridge	AW	Bac,
Laurel Creek	9-LLL000.05	Rt. 705 Bridge	AW	Bac,
Little River	9-LRV000.34	RT. 605 Bridge, S of Radford	AW	Bac,
Little River	9-LRV009.11	RT. 693 Bridge	AW, B	Bac,
Little River	9-LRV032.72	Rt. 617 Bridge	AW, B	Bac,
Little River	9-LRV056.74	Rt 221 Bridge	AW, B	Bac,T
Meadow Run	9-MDR000.34	Rt 641 Bridge	AW, FP	Bac
Meadow Creek	9-MDW004.62	Rt. 600 Bridge	AW	Bac,
Pine Creek	9-PNC000.69	Rt 682 Bridge	AW	Bac,T
Big Indian Creek	9-BIC000.14	Rt. 787 Bridge	AW	T
Dodd Creek	9-DDD002.62	Rt. 696 Bridge below Floyd STP	AW, TM, C	T
Dodd Creek, West Fork	9-DDW000.02	Rt. 8 Bridge	TM	T

AW - Ambient Watershed - 2 yr
B - Benthic
C - Fish Tissue, Sediment
FP - Probabilistic; Benthic, Conventionals, Metals, Organics, Sediment
TM - TMDL Study Station

7.3 Agricultural and Residential Education Programs

It was frequently suggested that educational efforts would be greatly enhanced by the participation of local groups such as Sustain Floyd or the Little River Watershed Association (if revitalized). Education and outreach is a significant component of any TMDL implementation project. The Skyline SWCD 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 septic system maintenance and pet waste sanitation will be cost-effective options. If the Master Gardener program were involved, education materials could be handed out through them. The Cooperative Extension and the Skyline SWCD could also help distribute information on how citizens need to maintain their septic systems and clean up after their pets.

7.3.1 Skyline Soil & Water Conservation District (Skyline SWCD)

The Skyline Soil & Water Conservation District (Skyline SWCD) is a local government entity providing soil and water conservation assistance to farmers and residents of Floyd, Montgomery, and Pulaski counties. During the implementation project, the Skyline SWCD will provide outreach, technical and financial assistance to farmers and homeowners in the Little River watershed through the Virginia Agricultural BMP Cost-Share and Tax Credit programs. Their responsibilities will include promoting implementation goals, available funding and the benefits of BMPs and providing assistance in the survey, design, layout, and approval of agricultural BMPs. Education and outreach activities are a significant portion of their responsibilities. Specific education and outreach methods recommended by the working groups are described in section 5.3 of this document. The Skyline SWCD will be eligible for technical assistance funding to support their duties.

7.4 Legal Authority

Multiple Federal and State agencies share the responsibilities with the USEPA of overseeing the various programs necessary for the success of the Clean Water Act. However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are four state agencies responsible for regulating activities that impact water quality in Virginia. These agencies are VDEQ, VDCR, VDH, and Virginia Department of Agriculture and Consumer Services (VDACS).

VDEQ 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 VDEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999). On January 1, 2008 DEQ assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids as a directed by the Virginia General Assembly in 2007. DEQ's Office of Land Application Programs within the Water Quality Division manages the biosolids program. The biosolids program includes having and following nutrient management plans for all fields receiving biosolids, unannounced inspections of the land application sites, certification of persons land applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied.

VDCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. Historically, most VDCR 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. 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 the desired level of participation. Although VDCR does not have regulatory authority over the majority of NPS issues addressed here, the department does administer the MS4 stormwater permit program in case such a permit were to be issued in the future for the Town of Floyd. Additionally, VDCR administers the State's construction stormwater permit program, which is enforced locally.

Through Virginia's Agricultural Stewardship Act (ASA), the Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing

a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty of up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. VDACS has limited staff 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.

VDH is responsible for maintaining safe drinking water measured by standards set by the USEPA. Their duties also include septic system regulation and, historically, regulation of biosolids land application on permitted farmland sites. Like VDACS, VDH's actions are complaint-driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. In relation to these TMDLs, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes.

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

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 involved counties (if they have not already done so) 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 1998 in Virginia, the American Canoe Association and the American Littoral Society filed a complaint against USEPA 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 aquaculture operation owner claimed that the agricultural runoff created from the plasticulture operation carried pollutants, which were destroying his shellfish beds. The suit was settled out of court in favor of the aquaculture operation owner.

Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role, of course, falls on the landowner. However, local, state and federal agencies also have a stake in 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 Little River IP: LE-1T (Livestock Exclusion with Riparian Buffers for TMDL Implementation), WP-2T (Streambank Protection in TMDL areas), RB-2 (Sewer Connection), RB-4 (Septic Tank System Installation/Replacement), RB-5 (Alternative On-site Waste Treatment System), erosion and sediment control, improved pasture management, conservation tillage, streambank stabilization, forested riparian buffers, reforestation of disturbed forest lands, and forest harvesting BMPs. Other programs that are encouraged but not quantified for this study include residential pet waste education program, dirt road stabilization, and septic system pump out, septic system repair and replacement for failing septic systems. 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, VDCR, NRCS, and VCE). Each of the funding sources has specific requirements and benefits that will vary in applicability to specific circumstances. It is recommended that participants discuss funding options with experienced personnel at their local SWCD in order to choose the best option. Information on program description and requirements was provided from fact sheets prepared by Virginia State Technical Advisory Committee, VDEQ, and VDCR.

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 is consistent with other state and federal programs that address agricultural nonpoint source pollution management. Any practice approved by the local SWCD Board shall be completed within the taxable year in which the credit is claimed. The credit shall be allowed only for expenditures made by the taxpayer from funds of his/her own sources. The amount of such credit shall not exceed $17,500 or the total amount of the tax imposed by this program (whichever is less) in the year the project was completed, as certified by the Board. If the amount of the credit exceeds the taxpayer's liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. This program can be used independently or in conjunction with other cost-share programs on the stakeholders' 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 VDEQ. 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 VDEQ, 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 it will allow the small business to implement voluntary pollution prevention measures. The loans are available in amounts up to $50,000 and will carry an interest rate of 3%, with favorable repayment terms based on the borrower's ability to repay and the useful life of the equipment being purchased or the life of the BMP being implemented. There is a $30 non-refundable application-processing fee. The Fund will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act.

Virginia Water Quality Improvement Fund

This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible recipients include local governments, Soil and Water Conservation Districts, and individuals. Grants for point sources are administered through VDEQ and grants for nonpoint sources are administered through VDCR. 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. The Skyline SWCD is already receiving technical assistance funds for one FTE and cost-share funds for agricultural BMPs to address bacteria and sediment impairments.

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 estate property, relocation and demolition, rehabilitation of structures, and provision of public facilities and improvements, such as new or improved water and sewer facilities.

Conservation Reserve Program (CRP)

Offers are accepted and processed during fixed signup periods that are announced by FSA. All eligible (cropland) offers are ranked using a national ranking process. If accepted, contracts are developed for a minimum of 10 and not more than 15 years. Payments are based on a per-acre soil rental rate. Cost-share assistance is available to establish the conservation cover of tree or herbaceous vegetation. The per-acre rental rate may not exceed the Commodity Credit Corporation's maximum payment amount, but producers may elect to receive an amount less than the maximum payment rate, which can increase the ranking score. To be eligible for consideration, the following criteria must be met: (1) cropland was planted or considered planted in an agricultural commodity for two of the five most recent crop years, and (2) cropland is classified as "highly-erodible" by the Natural Resources Conservation Service (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 area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area. The statewide goal is 9,000 acres.

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

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

Environmental Quality Incentives Program (EQIP)

This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource needs and objectives. This program replaces the Agricultural Conservation Program (ACP) and the Water Quality Incentive Program (WQIP). Approximately 65% of the EQIP funding for the state of Virginia is directed toward “Priority Areas.” These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. EQIP offers 5 to 10-year contracts to landowners and farmers to provide 75% cost-share assistance, 25% tax credit, and/or incentive payments to implement conservation practices and address the priority concerns statewide or in the priority area. Eligibility is limited to persons who are engaged in livestock or agricultural production. Eligible land includes cropland, pasture, and other agricultural land in

priority areas, or land that has an environmental need that matches one of the statewide concerns.

Wildlife Habitat Incentive Program (WHIP)

WHIP is a voluntary program for landowners and land users who want to develop or improve wildlife habitat on private agriculture-related lands. Participants work with NRCS to prepare a wildlife habitat development plan. This plan describes the landowner's goals for improving wildlife habitat and includes a list of practices and a schedule for installation. A 10-year contract provides cost-share and technical assistance to carry out the plan. In Virginia, these plans will be prepared to address one or more of the following high priority habitat needs: early grassland habitats that are home to game species such as quail and rabbit, as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share assistance 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.

National Fish and Wildlife Foundation

Offers are accepted throughout the year and processed during fixed signup periods. The signup periods are on a year-round, revolving basis, and there are two decision cycles per year. Each cycle consists of a pre-proposal evaluation, 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

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

Virginia's Landowner Incentive Program (LIP)

To protect and restore biological diversity, the Virginia Department of Game and Inland Fisheries (VDGIF) is providing financial and technical assistance to private landowners through the Landowner Incentive Program (LIP). LIP is a federal grant program funded by US Fish and Wildlife Service and administered by VDGIF. It can provide cost-share of 75% of conservation project costs to landowners willing to install and maintain stream restoration and riparian buffer projects on their property for a minimum of 10 years. These LIP projects are undertaken to improve degrading lands, reduce sediment in streams, and improve critical habitats for at risk species. A complete list of species ranked according to their need for conservation in Virginia, can be found in the Virginia Wildlife Action Plan, which is available at http://bewildvirginia.org/

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APPENDIX A

Working Group and Steering Committee Minutes and Reports

Little River TMDL Implementation Plan Development

1st Residential Working Group Meeting
April 20, 2011

Jessie Peterman Memorial Library, Floyd, VA

Attendees:

Drew Miller (VDEQ)

Tina Thompson (VDH)

Jayn Avery (Citizen)

Matt O'Malley (MapTech)

Jim Kern (MapTech)

Eileen Rowan (VDCR)

Alicia Jones (Skyline SWCD)

Jason Burgard (Citizen)

Jeff Walker (Citizen)

Overview:

- Little River Watershed Association had some successes on Middle Creek (Citizen)
    - Had two fliers that he said he would send Maptech and VDEQ
- Citizen stated that this is a poor time to have meeting for citizen participation
    - Offered suggestions of other places to meet to allow for improved meeting times
- Stream Bank Failure:
    - Citizens losing "real-estate" and concerned especially after this last flash flood event
    - Citizens interested in preserving stream banks
    - Citizens probably looking at assistance in design maybe not so much financial assistance
    - stormwater issue concerns in developed subwatersheds
- Temperature
    - Not only should we look at riparian buffers as a solution but solutions to stormwater effects (heated suburban runoff)

- How will we target our BMPs?
    - Based on looking at density of stressor ex. Homes with failing systems, cattle in streams…Also, stakeholder input is very important and can direct BMP implementation
    - There will be a phased implementation of BMPs
    - Reality of funding?
        - Not certain at this moment.
        - However, numbers of BMPs and cost estimates will be available as a result of this IP effort
    - Citizens here do not like government influence
        - Little River Association had good successes because of ties to the community
            - Suggest funding of Assoc. put out RFP and get people out in the community and use Skyline SWCD
        - Citizen passed out handouts of examples of Little River Association successes
        - Need to have support from Skyline!
        - Suggestions of the Steering Committee continuing much like Stroubles Creek has continued and getting the outreach and buy in similar to what Stroubles Creek Steering committee is doing
        - Master Naturalist program as a tool to provide education
        - Word of mouth and at the right moment is important for community education and creating interest and participation
    - Possibly creating partnerships with the different groups in the watershed to gain some momentum for the watershed IP. Overall, many groups working in the area, but efforts need to be brought together to see improved results.
- Straight pipes:
    - People concerned about repercussions of having one/embarrassed about straight pipes.
        - SWCD staff reminded that is where SWCD comes into play. Not regulatory and not required to report to Health Dept.
    - SWCD fixed 1 in Dodd Cr watershed to date
        - 4 fixed in Dodd Creek watershed by Citizen
        - Citizen thinks Maptech estimate method is as good as any

- Non-ag measures to reduce sediment into streams
    - Citizen concerned about sediment as a result of VDOT practices
    - Not certain the success possibilities of livestock fencing, both by Citizen and Citizen
    - Suggestion: Farmers do have good land practices and those that do should receive payment (financial awards) rather than having projects installed and having no or little incentive to maintain them.
        - Thoughts: Land trust and conservation easements are a double edge sword because of some poor examples, but could be a possibility

            - Landcare is an option ex. Grayson County
            - Sustain Floyd and tying in the Landcare practices and the IP results being tied in through these organizations
    - Suggested BMPs
        - Look into Forest Service BMPs
        - Improved E and S policy and enforcement
        - Compliance training for VDOT operators
- Creating a list of resources and incentives available to the citizens to include:
    - Book shelf in the library
    - Newspaper articles
    - Fliers to landowners
    - Fliers to citizens in general
        - Although a previous flier effort was not as successful as expected and costly
- Public educational/summary document will be a result of the IP-Maptech
- Citizen: suggested survey to citizens (success in another effort was found through this tool)
    - Survey for: what questions do people have about the topic
        - Yields participation, interest and activity within the community
- A feedlot was closed down in the headwaters around 2008 (Thompson Rd area)
- Thoughts on paying landowners to be good stewards
    - 482 acres is the acreage as a result of buffering 70 feet of stream for the 300k feet of buffering suggested by the TMDL. Again a payment to landowners to establish riparian buffers
    - Incentive backed for BMPs/pay people to meet std ex. Saving/protecting wetlands
- Thoughts on the figure “non-ag measures to reduce sediment load into streams” current ex. $2500/acre to wind row and reseed cutoff land
- SWCD sending Maptech numbers from Mill/Dodd IP to compare with this current “costs of Non-Ag measures” figure in handout.
- Overall, there was much and productive effort put into the thoughts of education and outreach of the watershed by the citizens present.

Little River TMDL Implementation Plan Development

1st Agricultural Working Group Meeting
April 21, 2011

Little River Questions and Answers:

Q: What are the bacteria levels now, after some work has been done in the county?

A: Impairments are for data that is recent. The Little River was listed in 2004. There is not much historical data. Little River continues to be on the list. We don't have enough data to show a trend.

Q: Farmers are trying to do the best that they can to preserve their property. How do they know the effectiveness of these practices and how they are helping our streams?

A: Typically, implementation plans that fence out 50% of the streams, will show a decrease in the bacteria counts. These bacteria counts don't go down enough to delist the stream, however the bacteria counts do go down.

Q: Why are streams showing up as impaired now rather than earlier in history?

A: It was probably worse back then. The Clean Water Act is driving this effort. The state was sued for not doing enough to clean up streams, therefore the states now have to monitor streams and compare the results to a standard.

Q: Who sets the standards?

A: There is a primary contact standard for swimming and fishing. There is a correlation between the number of bacteria and how often people get sick. The State Water Control Board changes these standards, it takes 3 years to come up with new standards.

Q: What BMPs give the best "Bang for the Buck"?

A: Fencing livestock out of stream, water boxes, and set-backs.

Comment: There needs to be a success story. There should be a baseline study from VA Tech w/ Don Cherry. He came out to Mr. Benders farm with graduate students and did some water testing years ago.

Q: Over the last 15 years, the restrictions on the BMPs are getting greater and greater. What BMP's give the best "Bang for the Buck" and what is involved with each of these BMPs?

A: State is trying to increase the options of what a farmer can do.

Q: Is there room for negotiations?

A: No, However changes may take place, but it does take time. It has taken 10 years to change the 35 ft buffer to an option of a 10 ft buffer. Ie. Mennonites didn't want to take money from the government, therefore they encouraged their members to fence out cattle with polywire. (not standard type of fencing). This should a positive impact on the quality of the stream.

Q: Have you taken into account the wildlife?

A: There was a study in Washington County that showed that you didn't trade the livestock loads for wildlife loads when you fenced out the stream and established a buffer. Through BST (Bacterial Source Tracking), the study showed the loads were dramatically lowered. Wildlife load numbers went up slightly, but livestock numbers went down significantly.

Q: How long do e.coli exist in a cow pie?

A: BSE did a study in 1999. There were still bacteria counts a month later.

Q: Is there science to back up that e.coli can proliferate in the stream?

A: No science, but anecdotal. Yes, it may proliferate, if the conditions are optimal.

Note: Keep in mind that we are not only talking about cattle, we are talking about all types of livestock.

Note: You get large spikes of bacteria loadings after storm events. Direct Deposition is always here.

Q: There are 300 miles of dirt roads. Are you willing to help pave these smaller roads?

A: There may be funding sources. The dirt roads are covered in the Implementation Plan as barren land. The largest sediment contributor is the eroding streambanks.

Note: Getting funds from the Corp of Engineers to help with stream bank erosion is very hard. Basically, they won't help anybody that doesn't have cattle. There needs to be a way to address the needs of folks that have eroding streambanks that do not have livestock. McClellan (MapTech) talked about a program that is in the works that may be able to help. People who need to pay into a mitigation bank for wetlands that are destroyed (VDOT, etc.) can pay into this fund and it can help

folks that need financing for streambank restoration who may not have cattle. Funding is getting more competitive. (If you go in with a strong Implementation Plan and enthusiasm, this really helps in receiving funding, per Eileen Rowan.) When the SWCD gets a pot of money, 20% of the money must be used for base costs. An example of base cost is stream bank restoration. Right now the SWCD usually spend this money on waste handling issues. Most implementation plans are done in a phased approach. You only do what is needed. If water quality starts to improve you may not have to do everything that is in the Implementation Plan.

Q: Will Implementation Plan voluntary participation become mandatory?

A: As long as TMDL watershed stakeholders are making an effort to implement, it would be hard to mandate participation.

Q: If the SWCD could get some flexibility w/BMP then the farmers would probably buy in more.

A: DCR is more motivated by the SWCD. SWCD has sent changes to the technical committee in DCR. Then these changes can either happen or not. The flexibility is not allowed. Phil said it was actually different SWCDs complaining about other SWCDs getting certain allowances when they weren't getting the same allowances. Suggestion: Get the boards of the SWCD to agree to flexibility. We can see some flexibility in the process. This will start a little bit more compromise. Based on local input there needs to be more flexibility.

Comment: When you say it's all or nothing, some folks will just say it's nothing. (Hypothetical- If we go to Trout Unlimited and ask them to pay 50% for a polywire fence for the trout waters, they very well may agree. This would not have the same restrictions as the cost share through SWCD). Some areas are not practical to fence out.

Q: Some farmers can't do a entire project because they can't afford it.

A: On the state level, farmers can work on a field level. If you look at EQUIP (Federal Level) you have to address the entire farm.

Note: A comment was made about the impaired waters in Floyd County. Miller (DEQ) said he would email these out to folks.

Q: Should we include waste handling facilities?

A: We can include, but we will not include the money that is associated with funding for the cost analysis. You can also include streambank erosion BMPs, but again not the money associated with establishing them.

Q: Can you get cost share for ford stabilization?

A: Maybe you could find funding.

Q: Is there any study on the effectiveness on fencing only one side of a creek? Is there any consideration of this?

A: Seems feasible, but haven't seen any studies.

Q: Most farmers know the type of fencing needed to accomplish what they are trying to accomplish. The cost share fence type needs to be more flexible.

A: You could do this if you did rotational grazing and work with water troughs.

Q: Fencing 2-sides of a stream can be overwhelming.

A: This practice can fall back to the producer's management plan.

Comment: If you don't fence both sides of the stream, then this doesn't work for establishing the riparian buffer. You may try fencing out one side and then go back and fence the other side alter.

Q: Project margins are such that cost share is tough to do. Most full-time farmers don't have enough profit to come up with their share of the cost share. People want to do this but they don't have the money.

A: One farmer said to go to Farm Credit and get a loan. Revolving loan program.

Comment: The SWCD representative said the costs for the BMP measures seemed low to him. He said he thought the cost needed to go up $8,000. He said that if you need to drill a well, the costs need to go up. He also said that you could have multiple troughs on one well. SWCD does have flexibility in their money sometimes.

Note: The timeline for the implementation plan is 15 years. The first 5-years we would try to establish the BMP practices that would exclude the livestock from the streams. The next 5-years we could add conservation tillage. You could still have other options available, but fencing cattle out of streams should be the first step.

Comment: We need to focus on success stories. It would be good to see how the data has changed. Farmers want to see what they have accomplished. The State (DEQ) needs to give feedback. There is a monitoring plan included in the Implementation Plan. (ie Stroubles Creek Implementation Plan Steering Committee agreed to continue to meet to see how the BMPs are changing things in the watershed.)

Q: Are there targeted areas?

A: MapTech will do an assessment to see where the most cattle are and where the BMP's would have the most impact.

Comment: Some farmers have problems with citizen monitoring because some people have different agendas.

Q: Are there any Tribs being monitored?

A: Yes

Q: Is the river in critical shape. What is the health on the mussel?

A: There is room for improvement with minimal amounts of effort. Sediment is the stressor and this can be controlled.

The Steering committee meeting is at 2:00 on Monday at the Administration Building. May 3, 2011 will be the Final Public Meeting here at the library. Public comment period will start then.

Q: What was the consensus of the residential meeting?

A: Accuracy of the number of straight pipes, controlling dirt roads, establishing some sort of outreach project.

Comment: Farmers are good stewards. Cost is limiting. It would be ideal, if there was some way to monitor where the bacteria was coming from. There are some bad actors out there. We may find that there are some tribs that are cleaner than others. Is there any way to have outreach for farmers?

Note: People can report bad actors, but they may not be investigated. Anonymous complaints do not necessarily have to be investigated. Just because something is investigated does not ensure that action will be taken.

Little River TMDL Implementation Plan

Steering Committee Meeting

Floyd County Administration Building, Floyd, VA

April 25, 2011

Attendees:

Cynthia Hancock (Skyline SWCD)
Courtney Wait via phone (NCNR)
Dennis Anderson (VDOF)
Rick Roth (Radford U. & FONR)
Drew Miller (VDEQ)
Becky Barlow (VDCR)
Jim Kern (MapTech)
Paula Nash (VDEQ)
Matt O'Malley (MapTech)
Jeff Walker (Citizen and Residential Working Group Rep.)

Q: Are all of the impairments being addressed in the TMDL and the IP?

A: Yes, Stressor source identification identified sediment as the stressor.

Q: Any insight as to why the benthic impairment is in the middle of the River and there are none upstream.

A: The benthic impairment was listed based upon a Probabilistic monitoring site. Additional biological monitoring sites were added during the development to better understand the impairment. What goes on in the tributaries does affect the main stem.

Q: Who was present at the Ag meeting?

A: Drew Miller read the names off the sign in sheet.

Q: Did the farmers give any reasons as to why they are reluctant to participate?

A: BMP Flexibility and money

Q: Were the farmers able to apply a money value to their property if they were to install these BMPs?

A: No

Q: How can we provide a greater incentive to the farmer rather than have them produce livestock alone?

A: There is a federal program for wetland reserves. However, these programs want large acreage areas. Steering Committee can put language in the plan, but this is problematic.

Q: What about wetland mitigation banks?

A: People in this watershed want to buy the credits, but no one wants to sell the credits. RC&D is working on a plan to set up a program for placing property in a type of bank. Steering committee will look into this. Per Cynthia: People in Floyd are not willing to do this.

Comment: Per Cynthia-10 ft buffers do make a difference in the streams in this watershed.

Per Jim: The steering committee cannot get out on every person's property and ground truth. The numbers in the plan are rough numbers.

Q: How did the Ag community feel about the residential BMPs?

A: Not much feedback.

Q: What do the numbers in the plan mean?

A: The numbers are estimates as to what measures would be needed to reduce bacteria, sediment, and temperature in the watershed. The cost numbers are the estimated costs for each of these practices. These estimates are needed when the steering committee is ready to look for funding sources.

Q: Per Jeff: We are paying farmers to put in fences. We should be paying the farmers to make wetlands or buffers.

A: There is not a program to do this.

Q: Where is the educational outreach?

A: Education will be in the plan.

Comment: We do know that these BMPs will show improvements in the bacteria density.

Q: Who funded the Little River Association?

A: EPA, this was just before the policies that are in place now. The money did come through DCR. Per Becky Barlow, some 319 money is going to be cut due to the budget.

Key points of the working groups:

- The plan identifies the needs to reduce bacteria and sediment while also providing shade for the temperature impairment. The plan will also include practices that are not needed, but could potentially help. These practices will not have money associated with them.
- Implementation should be locally driven.

Q: How will the failing septic tanks be handled?
A: This will go through VDH.

Q: Is there any way to incorporate the County as far as E&S?
A: The plan can include E&S policy and enforcement.

Q: Is there any way to influence VDOT practices?
A: This was noted in the initial meeting.

Q: Why are we not seeing Phosphorus numbers?
A: There is probably phosphorus here, but there is not a standard for Phosphorus.

Comment: DEQ will not be able to do more spacial monitoring to try and track the bacteria sources. The steering committee may not want to "point fingers" while we are trying to get volunteers to put in BMPs. Drew spoke about keeping teachers involved to help with education and monitoring efforts (citizen monitoring/NCNR monitoring efforts).

Q: Who funds the citizen monitoring?
A: DCR grant, DEQ, and fine money. Using the money that is left to try and keep the equipment up to date.

Comment: Save Our Streams- Has a new statewide coordinator. They can help with benthic data. DEQ uses SOS data to point out potential problems.

Comment: The responsibility of overseeing the Implementation Plan usually lies with the SWCD. Steering Committee can put verbiage in the plan that says we will work on the local level; however the SWCD should be the overseers. Per Drew: All of the groups mentioned in the Residential Working Group Meeting could try and partner to get more done (i.e. Sustain Floyd, RC&D). Due to the geography of the watershed, we need to coordinate three counties. We would need to partner with Pulaski, Montgomery, and Floyd counties.

Q: Do you see the roundtable as a partner?

A: Yes, they could be.

Comment: Highland RC&D covers 12 counties. They are not watershed based, they are SWCD based.

Q: What is the timeline for the development of this Implementation Plan?

A: The final meeting will be held on May 3, 2011

Comment: DOF representative suggested that it would be a good idea to allow white pines in the riparian buffers. He discussed the reasons why hardwoods may not always be ideal. He also discussed disease that was spreading into some types of trees (Hemlock and Rhododendron).

Implementation Plan goes to State Water Control Board, DCR uses the plan to receive funds from USEPA to put BMPs on the ground.

Q: Are there any plans to promote flood plain development?

A: Stream restoration BMPs may help with this.

Comment: Some steering committees decide to continue meeting throughout the Implementation of the plan. This allows the steering committee to track the progress that is being made with certain BMPs being installed. The Implementation Plan is a living document and can be adjusted as needed.