Upper Clinch River & Tributaries Watershed - Bacteria TMDLs Implementation Plan Technical Report

Prepared for:
Virginia Department of Environmental Quality
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Steering Committee Members

Working Group Members

Tazewell Soil & Water Conservation District

Virginia Department of Environmental Quality (VADEQ)

Virginia Department of Conservation and Recreation (VADCR)

Virginia Department of Health

Virginia Department of Mines Minerals and Energy

Local citizens and stakeholders in the Upper Clinch River watershed

Individual summaries of this document for the Upper Clinch River watershed are also available from the Virginia Department of Environmental Quality.

EXECUTIVE SUMMARY

The Upper Clinch River (VAS-P01R_CLN01A98) was first listed as impaired on Virginia's 1998 *303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1998) for failure to support the aquatic life use. This segment was subsequently listed as impaired on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004) for failure to support the recreational use. The Clinch River (VAS-P02R_CLN01A98 and VAS-P03R_CLN02A00) were first listed as impaired on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004), the Clinch River (VAS-P03R_CLN01A98) was first listed as impaired on the 2002 303(d) list (VADEQ, 2002), Middle Creek (VAS-P03R_MID01A98) was first listed as impaired on the 2006 305(b)/303(d) Integrated Report (VADEQ, 2006), Coal Creek (VAS-P03R_COL01A04) was first listed as impaired on the 2008 305(b)/303(d) Integrated Report (VADEQ, 2008), Indian Creek (VAS-P02R_IDI01A00) was first listed on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004) and Plum Creek (VAS-P01R_PLU01A04) was first listed as impaired on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004). These listings were due to violations of the State's water quality standards for fecal bacteria. This means that the stream does not support the primary contact recreation use including swimming, wading, and fishing due to an increased risk of illness or infection when coming in direct contact with the water.

The fecal coliform bacteria standards at the time of the 1998 impairment listings specified that in-stream fecal coliform levels must not exceed a single sample maximum of 1,000-cfu/100mL or a geometric mean of 200-cfu/100mL. The fecal coliform bacteria standard had been revised to 400-cfu/100 mL for the 2004 impairment listings. As a result of the impairment listings, and court actions taken against the United States Environmental Protection Agency (EPA), total maximum daily load (TMDL) studies were developed in the Upper Clinch River watershed in 2008 and 2011. These studies established the reduction in fecal bacteria loads from the Upper Clinch River watershed needed to restore it so that it would meet water quality standards for bacteria and fully support primary contact recreation.

These impairments are broken down into two areas within this implementation plan. The first implementation plan area, Upper Clinch River, Plum Creek, and Indian Creek, includes Clinch River (VAS-P01R_CLN01A98), Clinch River (VAS-P02R_CLN01A98), and Plum Creek (VAS-P01R_PLU01A04 and Indian Creek (VAS-P02R_IDI01A00). The second implementation plan area, Upper Clinch River, Middle Creek, and Coal Creek, includes Clinch River (VAS-P03R_CLN02A00), Clinch River (VAS-P03R_CLN01A98), Middle Creek (VAS-P03R_MID01A98) and Coal Creek (VAS-P03R_COL01A04).

At the same time of the development of the TMDL study for the Upper Clinch River, Coal Creek, Middle Creek, and Plum Creek, concerns were being raised regarding active mining in the watershed. VADEQ and DMME made the decision to delay the development of TDS and TSS TMDLs for the benthic impairment on Coal Creek, as well as a concurrent implementation plan for the bacteria and benthic impairments. VADEQ made the decision to update this plan to address only the bacteria impairments in the Upper Clinch River, Coal Creek, Middle Creek, Plum Creek, and Indian Creek.

Virginia law requires expeditious implementation of TMDLs. An implementation plan (IP) shows how fully supporting status for impaired waters can be achieved and the pollutant load reductions established in the TMDL studies can thereby be met. In making progress towards the state's requirement to implement TMDLs, a framework was established for reducing fecal bacteria levels to achieve the water quality goals for the impaired streams.

Review of TMDL Development

Biological Systems Engineering (BSE) at Virginia Tech developed a fecal bacteria TMDL study in 2007 for Indian Creek and MapTech, Inc. developed a fecal bacteria TMDL study in 2011 for the Clinch River, Coal Creek, Plum Creek and Middle Creek. The model accounted for loads of runoff resulting from wildlife (*e.g.,* deer, raccoon, muskrat, beaver, turkey, goose, mallard, and wood duck), livestock (*e.g.,* beef, dairy and horse), residential (*e.g.,* failing septic systems, straight pipes, dogs and cats) sources of fecal bacteria. Direct loads to the stream (including direct deposition from cattle and

wildlife), uncontrolled discharges (failing septic systems and straight pipes), and permitted sources were also accounted for in the model. The *E. coli* standard(s) current at the time of modeling, along with an implicit margin of safety (MOS) were used as the water quality endpoints.

The two Upper Clinch River watershed TMDLs indicate that in order to meet the water quality standard for *E. coli* the following reductions shown in Tables ES.1 must be achieved in the listed watersheds. An implementation plan for an aquatic life impairment on the Clinch River (P01) was developed in 2008. BMPs required by that plan that also reduce bacteria loadings will not be repeated in this one.

Table ES.1 Fecal bacteria TMDL reduction scenarios for the Upper Clinch River watershed and Indian Creek.

Percent (%) Reductions to Existing Bacteria Loads						
		Wildlife Land Based		Agricultural Land Based	Human Direct	Human and Pet Land Based
Area	Wildlife Direct	Barren, Commercial, Forest, HIR, Wetlands	Livestock Direct	Crop and Pasture	Straight Pipes	Residential
Upper Clinch River and Plum Creek	36	39	100	99	100	99
Upper Clinch River, Middle Creek, and Coal Creek	0	0	100	59	100	86
Indian Creek	30*	0	100	85	100	75

*A reduction of 100% for waterfowl was required.

Public Participation

The actions and commitments described in this document were drawn together through input from local citizens, local government representatives, Virginia Departments of Conservation and Recreation (VADCR), Environmental Quality (VADEQ), and Health (VDH), Virginia Cooperative Extension (VCE), Natural Resources Conservation Service (NRCS), the Tazewell Soil and Water Conservation District (Tazewell SWCD), MapTech, Inc., and other organizations. Every citizen and interested party in the watershed is encouraged to become involved in implementing the plan to help restore the health of the Upper Clinch River watershed.

Public meetings were conducted to distribute information and gain feedback from the community. Active participation was solicited in smaller forums called working groups. These groups were comprised of stakeholders with similar concerns (*e.g.,* agricultural, residential and urban, and governmental). Representatives from each working group participated in the Steering Committee, where input from the working groups was reviewed and decisions about the IP were made. Throughout the public participation process, a major emphasis was placed on discussing best management practices (BMPs), BMP specifications, locations of control measures, education, technical assistance, and funding.

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

Assessment of Implementation Action Needs

The quantity or extent of pollution control measures, or BMPs, needed during implementation was determined through spatial analyses of land use, stream-networks, along with regionally appropriate data archived in the VADCR Agricultural BMP Database. Additionally, input from local agency representatives and community

members were used to verify the analyses. Overall, the needs to meet the TMDLs for the 15-year implementation period were identified and are shown in Table ES.2.

Table ES.2 Agricultural and residential BMPs needed in the Upper Clinch River watershed.

Control Measure	Unit	Upper Clinch River, Plum Creek, and Indian Creek	Upper Clinch River, Middle Creek, and Coal Creek
Agricultural			
Livestock Exclusion with Riparian Buffers (LE-1T)	System	11	94
Livestock Exclusion w/Reduced Setback (LE-2T)	System	11	95
Stream Protection System (WP-2T)	System	1	10
Streamside Fence Maintenance	Linear ft	2,097	18,415
Reforestation of Erodible Pasture (FR-1)	Acres	631	647
Improved Pasture Management (SL-10T)	Acres	3,474	
Conservation Tillage	Acres	133	
Retention Ponds - Pasture	Acres - Treated	4,950	
Vegetated Buffers - Cropland	Acres	110	
Residential			
Septic System Pump-out (RB-1)	System	1,813	2,939
Sewer System Connection (RB-2)	System	48	80
Septic System Repair (RB-3)	System	88	122
Septic System Installation/Replacement (RB-4, RB-4P)	System	287	520
Alternative Waste Treatment System (RB-5)	System	144	261
Residential Pet Waste Education Program	Program	1	1
Residential Pet Waste Composter (PW-2)	Composter	1,652	2,882

Cost/Benefit Analysis

The costs of the above control measures were determined based on the cost of control measures previously installed through the Virginia Cost-Share Program in the Upper Clinch River watershed, and discussions with local agency representatives and working groups. The cost of technical assistance needed to implement the control measures was determined based upon discussions with working group members and technical assistance costs from both ongoing and previous implementation plans in similar watersheds. The estimated total cost to install agricultural and residential control measures in the Upper Clinch River watershed is $8.1M and 15.9M respectively, excluding technical assistance. The estimated total cost to provide technical assistance during implementation for Upper

Clinch River watershed is expected to be $0.9M The total cost estimated for ten years of implementation in the Upper Clinch River watershed is $25M.

The primary benefit of implementation is the reduction of *E. coli* bacteria, sediment and total dissolved solids in this watershed. With the completion of this implementation plan, the risk of illness or infection as a result of direct contact with *E. coli* bacteria through swimming in or drinking water from this stream will decrease significantly. Streambank protection, provided through exclusion of livestock from streams, will also lead to improved aquatic habitat. The practices recommended in this document will provide economic benefits to landowners in addition to the anticipated environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, and intensive pasture management will improve profitability of farms, while private sewage system installation and maintenance will ultimately save homeowners money by preventing expensive fees and repairs. Keeping cattle in clean, dry areas has been shown to reduce the occurrence of mastitis and foot rot. The VCE (1998a) reports that mastitis costs producers $100 per cow in reduced quantity and quality of milk produced. On a larger scale, mastitis costs the U.S. dairy industry about $1.7 billion to 2 billion annually or 11% of total U.S. milk production. While the spread of mastitis through a dairy herd can be reduced through proper sanitation of milking equipment, mastitis-causing bacteria can be harbored and spread in the environment where cattle have access to wet and dirty areas.

Measurable Goals and Milestones for Attaining Water Quality Standards

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

- Federal Clean Water Act Section 319 Incremental Funds
- Virginia Agricultural Best Management Practices Cost-Share Program (VACS)
- Virginia Agricultural Best Management Practices Tax Credit Program
- USDA Environmental Quality Incentives Program (EQIP)
- Virginia Revolving Loan Programs (Agricultural BMPs and onsite sewage disposal systems)
- USDA Wildlife Habitat Incentive Program (WHIP)
- Virginia Water Quality Improvement Fund (WQIF)

Implementation is scheduled to occur in two main stages. The first stage involves implementation of the most cost-effective control measures (see Table 6.1 and 6.2). Once the measures included in this stage are implemented, it is expected that the level of *E. coli* and diversity of aquatic life in these streams will meet the water quality standards such that they may be removed from the State's impaired waters list. Stage II describes the remainder of the control measures required to achieve the targeted pollutant load reductions and achieve the reductions called for in the TMDLs (see Table 6.1 and 6.2).

Identification of critical areas to be targeted first for agricultural BMP installation was accomplished through analysis of land use, farm boundaries, stream network Geographic Information Systems (GIS) layers, and monitoring results. The subwatersheds were ranked by the ratio of animals per length of fence needed and by the combined failing septic systems and straight pipes loads estimated in each subwatershed.

Stakeholders and Their Role in Implementation

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

The Tazewell Soil and Water Conservation District (Tazewell SWCD) will be in charge of initiating contact with farmers and homeowners 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 Tazewell SWCD staff will conduct outreach activities in the watersheds to garner the participation and community support necessary to obtain implementation milestones, and to make the community aware of the water quality impairments present and how they may affect local residents. Such activities will include information exchange through newsletters, mailings, field days, organizational meetings, etc. The Tazewell SWCD staff will work with appropriate organizations (such as VCE) to educate the public.

In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. The agencies regulating

activities that impact water quality in Virginia include: VADEQ, VADCR, Virginia Department of Agriculture and Consumer Services (VDACS), VADMME and VDH.

Achieving the goals of this IP (*i.e.*, improving water quality and removing these waters from the Section 303(d) list) is dependent on stakeholder participation – not only the local citizens needing agricultural control measures or residential waste treatment facilities, but also all citizens living in the watershed. It must be acknowledged first that there is a water quality problem, and changes must be made as needed in operations, programs, and legislation to address these pollutants. Local citizens can become involved by picking up after their pets, properly maintaining their septic systems, becoming water quality monitoring volunteers and volunteering to distribute information and educate others at public events.

1. INTRODUCTION

1.1 Background

The detrimental effects of bacteria in food and water supplies have been documented repeatedly. On August 8, 1994, the Virginia Department of Health (VDH) was notified that campers and counselors at a Shenandoah Valley summer camp developed severe gastrointestinal illness. It was confirmed that *E. coli* 0157:H7, a type of fecal coliform bacteria commonly found in the intestines of humans and animals, was the causative agent (CDC, 1995).

In Franklin County, Virginia, a 1997 outbreak of illnesses involving three children was attributed to *E. coli* (0157:H7) in Smith Mountain Lake. The children came in contact with the bacteria while swimming in the lake. As a result of this exposure, a two-year old child almost died (Roanoke Times, 1997a, 1997b, 1998b).

In August 1998, seven children and two adults at a day-care center in rural Floyd County were infected with *E. coli* (0157:H7). Upon investigation, two of the property's wells tested positive for total coliform (Roanoke Times, 1998a, 1998c). On June 6, 2000, Crystal Spring, (Roanoke, Virginia's second largest water source) was shut down by the VDH for *E. coli* contamination (Roanoke Times, 2000).

These are not isolated cases. Throughout the United States, the Centers for Disease Control estimates that at least 73,000 cases of illnesses and 61 deaths per year are caused by *E. coli* 0157:H7 bacteria (CDC, 2001). Other fecal coliform (FC) pathogens (*e.g., E. coli* 0111) are responsible for similar illnesses. In addition, the presence of other bacterial and viral pathogens is indicated by the presence of FC. Whether the source of contamination is human or livestock waste, the threat of these pathogens appears more prevalent as both populations increase. As stakeholders, we must assess the risk we are willing to accept and then implement measures to safeguard the public from these risks.

The Clean Water Act (CWA) that became law in 1972 requires that all U.S. streams, rivers, and lakes meet their state's water quality standards. The CWA also requires that states

conduct monitoring to identify polluted waters or those that do not meet standards. Through this required program, the state of Virginia has found that many stream segments do not meet state water quality standards for protection of the six beneficial uses: recreation/swimming, aquatic life, wildlife, fish consumption, shellfish consumption, and public water supply (drinking).

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

Once a TMDL is developed and approved by the State Water Control Board (SWCB) and EPA, measures must be taken to reduce pollution levels in the stream. Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) states in section 62.1-44.19:7 that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters". The TMDL Implementation Plan (IP) describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in a staged process.

The Clinch River (VAS-P01R_CLN01A98) was first listed as impaired on Virginia's 1998 *303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1998) for failure to support the aquatic life use. This segment was subsequently listed as impaired on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004) for failure to support the recreational use. The Clinch River (VAS-P02R_CLN01A98 and VAS-P03R_CLN02A00) were first listed as impaired on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004), the Clinch River (VAS-P03R_CLN01A98 was first listed as impaired on the 2002 303(d) list (VADEQ, 2002), Middle Creek (VAS-

P03R_MID01A98) was first listed as impaired on the 2006 305(b)/303(d) Integrated Report (VADEQ, 2006). Indian Creek (VAS-P02R_IDI01A00) was first listed on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004) and Plum Creek (VAS-P01R_PLU01A04) was first listed as impaired on the 2004 305(b)/303(d) Integrated Water Quality Assessment Report (VADEQ, 2004). All four streams were assessed as impaired for violations of the State's water quality standard for *E. coli* in the 2010 305(b)/303(d) integrated report. Descriptive information for each impaired stream is shown in Table 1.1 and Figure 1.1 with the impairment locations. An implementation plan for the aquatic life impairment on the Upper Clinch River was completed in 2008 and information from that plan will not be repeated in this plan.

Table 1.1 Descriptive information for impairments in the Upper Clinch River watershed.

Impairment	Impairment Type	Segment Begins	Segment Ends	Stream Miles	HUC12
Upper Clinch River, Plum Creek, and Indian Creek					
Clinch River VAS-P01R_CLN01A98*	*E. coli*	Lincolnshire Branch	Plum Creek	5.5	060102050101 (TC01)
Clinch River VAS-P02R_CLN01A98	*E. coli*	Plum Creek	Deskin Creek	6.01	060102050102 (TC02)
Plum Creek VAS-P01R_PLU01A04	*E. coli*	Headwaters	Clinch River confluence	5.06	060102050101 (TC01)
Indian Creek VAS-P02R_IDI01A00	*E.coli*	Greasy Creek	Clinch River confluence	9.07	060102050103 (TC03)
Upper Clinch River, Middle Creek, and Coal Creek					
Clinch River VAS-P03R_CLN03A98	*E. coli*	Raven-Doran water intake	Mill Creek	3.10	060102050104 (TC04)
Clinch River VAS-P03R_CLN02A00	*E.coli*	Dry Branch	Raven-Doran water intake	5.39	060102050104 (TC04)
Middle Creek VAS-P03R_MID01A98	*E. coli*	River mile 2.53	Clinch River Confluence	2.65	060102050104 (TC04)
Coal Creek VAS-P03R_COL01A04	*E. coli*	Left Fork Coal Creek	Clinch River Confluence	3.07	060102050104 (TC04)

* An implementation plan has already been completed for the benthic impairment on this segment.

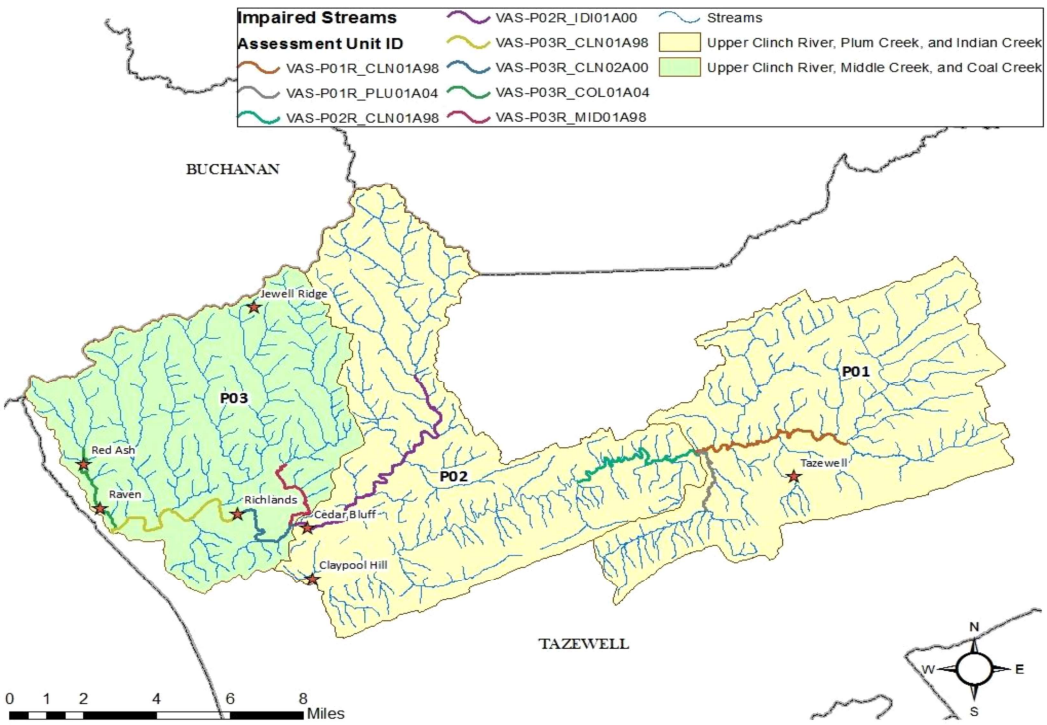

Figure 1.1 Location of impaired segments in the Upper Clinch River watershed.

Land use information for the Upper Clinch River watershed is shown in Table 1.2 and Figure 1.2.

Table 1.2 Spatial distribution of land use for the Upper Clinch River watershed.

Land Use	Acres
Forest	77,761
Pasture	21,517
Residential	8,647
Commercial	3,007
Mining Land Use	1,401
Water	832
Barren[1]	480
LAX[2]	350
Gas Wells	266
Crop	244
Total	**114,505**

[1] Barren - Areas of bedrock, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
[2] LAX - Livestock pasture access near flowing streams.

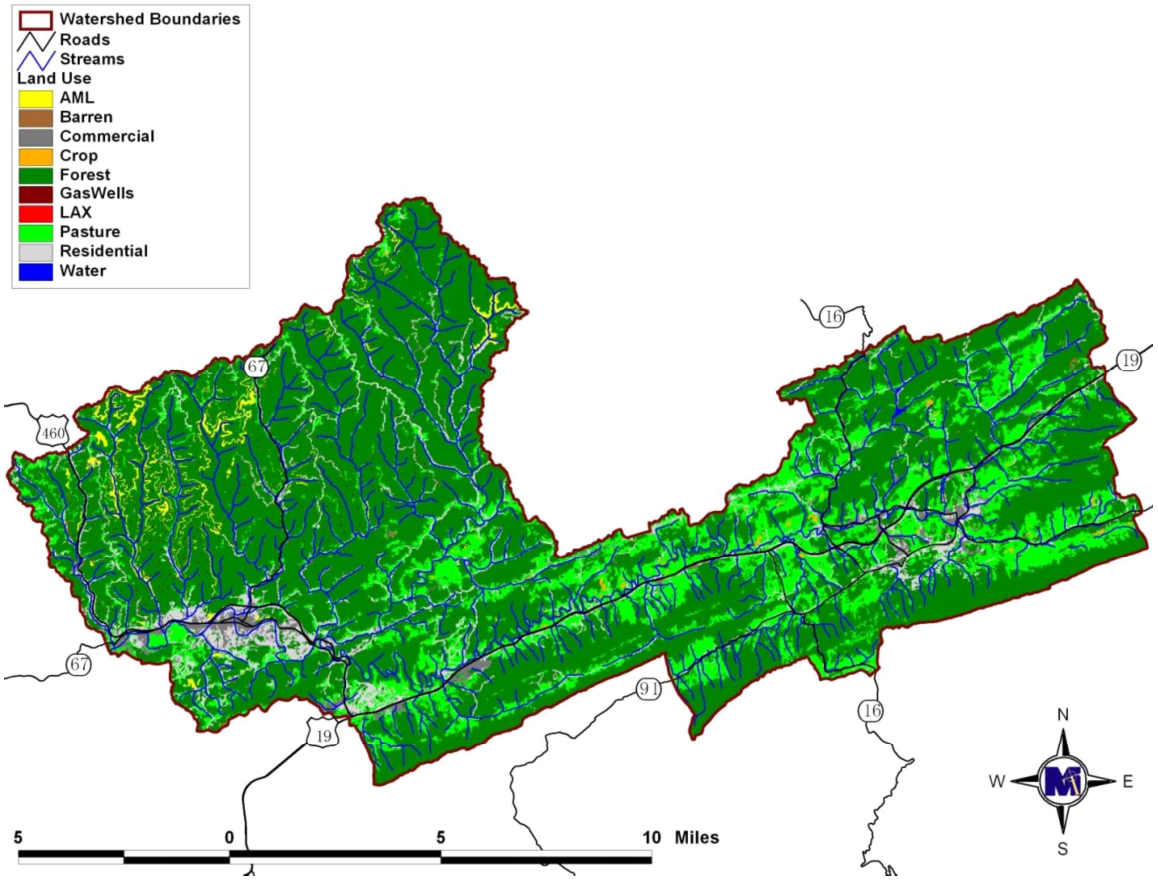

Figure 1.2 Land uses in the Upper Clinch River watershed.

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* (2003) were followed. Specific state and federal requirements of an IP are described in chapter 2 of this document.

Once developed, the Virginia Department of Environmental Quality (VADEQ) will take TMDL implementation plans to the SWCB for approval as the plan for implementing the pollutant allocations and reductions contained in the TMDLs. Also, VADEQ will request SWCB authorization to incorporate the TMDL implementation plan into the appropriate Water Quality Management Plan (WQMP) in accordance with the CWA's Section 303(e). In response to a Memorandum of Understanding (MOU) between EPA and VADEQ, VADEQ also submitted a draft Continuous Planning Process to EPA in which VADEQ commits to

regularly updating the WQMPs. Thus, the WQMPs will be, among other things, the repository for all TMDLs and TMDL implementation plans developed within a river basin.

1.2 Applicable Water Quality Standards

According to Virginia Water Quality Standard 9 VAC 25-260-5, the term 'water quality standards' means "provisions of state or federal law which consist of a designated use or uses for the waters of the Commonwealth and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law (§62.1-44.2 et seq. of the Code of Virginia) and the federal Clean Water Act (33 USC §1251 et seq.)."

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

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

◆

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

◆

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

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

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

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

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

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

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

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

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

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

If the waterbody exceeded either criterion more than 10.5% of the time, the waterbody was classified as impaired and a TMDL was developed and implemented to bring the waterbody into compliance with the water quality criterion. Based on the sampling frequency, only one

criterion was applied to a particular datum or data set (Virginia Water Quality Standard 9 VAC 25-260-170). If the sampling frequency was one sample or less per 30 days, the instantaneous criterion was applied; for a higher sampling frequency, the geometric criterion was applied.

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

1.3 Water Quality Standard Changes

Two regulatory actions related to the bacteria water quality standard in Virginia have been implemented. The first rulemaking pertains to the indicator species used to measure bacteria pollution. The second rulemaking is an evaluation of the designated uses as part of the state's triennial review of its water quality standards.

1.3.1 Indicator Species

The EPA recommended that all states adopt an *E. coli* or *enterococci* standard for fresh water and *enterococci* criteria for marine waters by 2003. The EPA pursued the states' adoption of these standards because there is a stronger correlation between the concentration of these organisms (*E. coli* and *enterococci*) and the incidence of gastrointestinal illness than with fecal coliform. *E. coli* and *enterococci* are both bacteriological organisms that can be found in the intestinal tract of warm-blooded animals. Like fecal coliform bacteria, these organisms indicate the presence of fecal contamination. The transition to the *E. coli* and *enterococci* standard began in 2003 and was completed in June 2008. For the 2006, 2008 and 2010 305(b)/303(d) Water Quality Assessment Integrated Report the new standard was used to assess the bacteria data. The *E. coli* water quality standard has an instantaneous level

of 235 colony-forming units (cfu) per 100 ml and geometric mean of 126 colony-forming units (cfu) per 100 ml for two or more samples over a 30-day period.

1.3.2 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 1.3.1 of this report. This standard is to be met during all stream flow levels and was established to protect bathers from ingestion of potentially harmful bacteria. However, many headwater streams are small and shallow during base flow conditions when surface runoff has minimal influence on stream flow. Even in pools, these shallow streams do not allow full body immersion during periods of base flow. In larger streams, lack of public access often precludes the swimming use.

Recognizing that all waters in the Commonwealth are not used extensively for swimming, Virginia has approved a process for re-designation of the recreational use for secondary contact in cases of: 1) natural contamination by wildlife, 2) small stream size, 3) lack of accessibility to children and 4) widespread socio-economic impacts resulting from the cost of improving a stream to a “swimmable” status.

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

1.3.3 Wildlife Contributions

In some streams for which TMDLs have been developed, water quality modeling indicates that even after removal of all of the sources of *E. coli* (other than wildlife), the stream will not attain standards. TMDL allocation reductions of this magnitude are not realistic and do not meet EPA’s guidance for reasonable assurance. Based on the water quality modeling, many of these streams will not be able to attain standards without some reduction in wildlife. Virginia and EPA are not proposing the reduction of wildlife to allow for the attainment of

water quality standards. While managing over-populations of wildlife remains as an option to local stakeholders, the reduction of wildlife or changing a natural background condition is not the intended goal of a TMDL. In such a case, after demonstrating that the source of *E. coli* contamination is natural and uncontrollable by effluent limitations and control measures, the state may decide to re-designate the stream's use for secondary contact recreation or to adopt site specific criteria based on natural background levels of *E. coli*. The state must demonstrate that the source of *E. coli* contamination is natural and uncontrollable by effluent limitations and control measures through a UAA as described above. All site-specific criteria or designated use changes must be adopted as amendments to the water quality standards regulations. Watershed stakeholders and EPA will be able to provide comment during this process.

1.4 Project Methodology

The overall goal of this project is to begin the process of restoring water quality in the impaired stream segments within the Upper Clinch River watershed.

The key components of the staged implementation plan are discussed in detail in the following sections: State and Federal Requirements for Implementation Plans, Review of TMDL Development, Process for Public Participation, Assessment of Needs, Measurable Goals and Milestones, and Implementation.

In fulfilling the state's requirement for the development of a TMDL IP, a framework has been established for reducing *E. coli* levels and achieving the water quality goals for the Upper Clinch River watershed impaired segments for which TMDL allocations were developed. With successful completion of the IP, Virginia will be well on the way to restoring the impaired waters and enhancing the value of this important resource. Additionally, development of an approved IP will improve the localities' chances for obtaining monetary assistance during implementation.

2. STATE AND FEDERAL REQUIREMENTS FOR IMPLEMENTATION PLANS

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

2.1 State Requirements

The TMDL IP is considered 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 expeditious implement total maximum daily loads. In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. WQMIRA requires that IPs include the following:

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

2.2 Federal Recommendations

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

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

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

2.3 Requirements for Section 319 Fund Eligibility

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

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

3. REVIEW OF TMDL DEVELOPMENT

Biological Systems Engineering (VT-BSE) and MapTech, Inc. were contracted to develop bacteria TMDLs for the Upper Clinch River watershed. The Indian Creek TMDL (2008) and the Upper Clinch River bacteria TMDL (2011) are posted on the VA DEQ website. The *E. coli* load reductions called for in the TMDL studies were reviewed to determine the water quality goals and associated pollutant reductions that would need to be addressed through the development of the subject implementation plan.

A benthic macroinvertebrate TMDL was prepared by Tetra Tech, Inc. and approved by USEPA in April 2004 for the Clinch River. The portion of the stream addressed in the TMDL runs from upstream of Plum Creek to its headwaters. An IP was also developed for this segment and approved by DEQ in July 2008. The IP also included the Plum Creek watershed. The BMPs required in the IP that are necessary in the current one will not be duplicated.

3.1 Water Quality Modeling

In order to understand the implications of the load allocations determined during TMDL development, it is important to understand the modeling used in the analysis. The approach is presented here in the "Fecal Bacteria Modeling" section.

3.1.1 Fecal Bacteria Modeling

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

3.1.2 *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 are shown in Table 3.1.

Table 3.1 Permitted point sources in the Upper Clinch River watershed.

Permit #	Facility Name	Design Flow (MGD)[1]	Status
VA0021199	Richlands Regional WWTF	4	Active
VA0026298	Tazewell WWTP	2	Active
VA0065676	Glenrae II Mobile Home Park STP	0.01	Active
VAG******	Each of the 66 Domestic Waste Treatment Permits	0.001	Active

[1]MGD – million gallons per day

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

Both urban and rural nonpoint sources of *E. coli* bacteria were considered in water quality modeling. Sources included residential sewage treatment systems, land application of waste, livestock, wildlife, and domestic pets. Loads were represented either as land-based loads or as direct loads 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.

3.1.3 *E. coli* Model Allocations

Several model runs were made investigating scenarios that would meet the 30-day geometric mean TMDL goal of 126 cfu/100mL (includes an implicit margin of safety). The final load allocations are shown in Table 3.2.

The final allocation scenarios calls for a 100% reduction of human straight pipes (failed septic systems are also considered to have a 100% reduction because they are illegal), 100% reduction from direct in-stream loading from livestock, a 59 - 99% reduction of the *E. coli* loading from agricultural land, a 75 - 99% reduction of the *E. coli* loading from residential land uses, and a 30 - 39% reduction from wildlife sources.

Table 3.2 Load reductions allocated during fecal bacteria TMDL development for the Upper Clinch River watershed.

% Reduction in Fecal Bacteria Loading From Existing Conditions

Impairment	Wildlife Direct Deposit	Wildlife Land Based	Livestock Direct Deposit	Cropland & Pasture Land Based	Human Direct Deposit	Residential Land Based
Upper Clinch River and Plum	36	39	100	99	100	99
Indian Creek	30*	0	100	85	100	75
Clinch River, Middle Creek, and Coal Creek	0	0	100	59	100	86

*A reduction of 100% for waterfowl was required.

3.2 Implications of TMDL and Modeling Procedure on Implementation Plan Development

The major implication in the development of these TMDLs is that large reductions are required to achieve the water quality standard. All uncontrolled discharges, failing septic systems, leaking sewer lines, and overflows must be identified and corrected; livestock must be excluded from streams and most of the residential nonpoint sources must be reduced. Additionally, residential and rural nonpoint sources of fecal bacteria must be reduced.

However, there are subtler implications as well. Implicit in the requirement for 100% correction of uncontrolled discharges is the need to maintain all functional septic systems.

This TMDL included straight pipes and failing septic systems in the total bacteria load to the streams. Using the 1990 and 2000 U.S. Census the number of straight pipes (515) and failing septic systems (1,049) were estimated in the watershed. In instances where currently available data was different than data in the TMDL report, the best available data was used to quantify corrective actions and develop cost estimates.

4. PUBLIC PARTICIPATION

Public participation was an integral part of the TMDL Implementation Plan development, and is critical to promote reasonable assurances that the implementation activities will occur. Attendance was encouraged through email, phone calls and notices sent to the Bluefield Daily Telegraph.

4.1 Public Meetings for the Upper Clinch River Watershed

Two public meetings were held for the project. The first public meeting was held at the Cedar Bluff Town Office in Cedar Bluff, Virginia on December 21, 2010. The meeting was publicized in the Bluefield Daily Telegraph and was attended by five (5) people, including, citizens, government agents and a consultant. Information regarding TMDL development background and IP development information was addressed at the first public meeting. A solicitation for participation in working groups was also presented.

The second public meeting for the Upper Clinch River watershed was held on May 12, 2011 in Cedar Bluff, VA. The primary purpose of this meeting was to present the final TMDL Implementation Plan. A presentation was given describing the implementation plan using major components as an outline: Review of TMDL development, public participation, assessment of needs, cost/benefit analysis, and implementation.

In addition to the public meetings, a steering committee and two specialized working groups were formed. Each working group constituted a group of citizens that were most invested in a common concern: agricultural/residential/urban, and government. The working groups served as the primary arena for seeking public input on implementation actions associated costs and outreach methods. The steering committee reviewed reports from each of the working groups and helped to guide the overall development of the implementation plan. A representative of the Virginia Department of Conservation and Recreation (VADCR) 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.

All meetings conducted during the course of the TMDL IP development are listed in Table 4.1.

Table 4.1 Meetings held pertaining to the Upper Clinch River watershed TMDL Implementation Plan development.

Date	Meeting Type	Location	Attendance
12/21/2010	1st Public Meeting	Cedar Bluff Town Office Cedar Bluff, VA	5
2/3/2011	1st Government Working Group Meeting	Cedar Bluff Town Office Cedar Bluff, VA	7
3/1/2011	1st Agricultural and Residential/Urban Working Group Meeting	Cedar Bluff Town Office Cedar Bluff, VA	9
4/21/2011	2nd Agricultural and Residential/Urban Working Group	Cedar Bluff Town Office Cedar Bluff, VA	6
5/12/2011	Steering Committee Meeting	Cedar Bluff Town Office Cedar Bluff, VA	6
5/12/2011	Final Public Meeting	Cedar Bluff Town Office Cedar Bluff, VA	11

4.1.1 Agricultural and Residential/Urban Working Group for the Upper Clinch River Watershed

The role of the Agricultural and Residential/Urban Working Group (AGRUWG) was to provide insight into the agricultural efforts in regards to relevancy of BMPs (type, number and costs), obstacles, and solutions. Also they discussed methods needed to reduce human and pet sources of bacteria entering the Upper Clinch River watershed, recommended methods to identify and correct or replace failing septic systems and straight pipes, and provide input on the BMPs to include in the plan.

The Agricultural and Residential/Urban Working Group (AGRUWG) had a total of 9 members. The first meeting occurred on March 1, 2011 at the Cedar Bluff Town Office in Cedar Bluff, Virginia. The members consisted of citizens from the watershed, representatives from Tazewell Soil and Water Conservation District, VADEQ, VDH, and VADCR. Discussion focused on the current status of agriculture in the watershed, stream fencing and riparian buffer practices for which financial assistance (cost share) is available through the

State Cost Share Program, USDA, and Section 319 funds administered by DEQ, and the maintenance issues involved with these practices.

The second AGRUWG meeting took place on April 21, 2011 at the Cedar Bluff Town office in Cedar Bluff, VA. Six members were in attendance. The group discussed the fencing estimates that had been prepared for the Upper Clinch River watershed and land based BMP practices. Some citizens were concerned about the impact of the landfill on water quality.

4.1.2 Government Working Group for the Upper Clinch River Watershed

The goals of the Government Working Group (GWG) was 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. In addition mining related issues were also considered.

The first Government Working Group (GWG) meeting took place on February 3, 2011. Discussion centered on the role of various government agencies in the implementation process and the role the Department of Mines Minerals and Energy in the reclamation of mining land in Coal Creek.

4.1.3 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 May 12, 2011 at the Town office in Cedar Bluff, VA.

4.2 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 bacteria levels and restoring water quality in the Upper Clinch River watershed.

5. ASSESSMENT OF IMPLEMENTATION ACTION NEEDS

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

5.1 Identification of Control Measures

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

5.1.1 Control Measures Implied by the TMDL

The bacteria reductions identified by the TMDL studies dictated some of the control measures that must be employed during implementation. For example, in order to meet the reductions in direct bacteria deposition from livestock, some form of stream exclusion is necessary. Fencing is the most obvious choice; however, the type of fencing, distance from the stream bank, and most appropriate management strategy for the fenced pasture are less obvious. The 100% reduction in loads from straight pipes, failing septic systems, sewer leaks, and sewer overflows is a pre-existing legal requirement as well as a result of this TMDL. This reduction indicates that all illicit discharges (*i.e.*, straight pipes and cross-connections) in the watersheds should be corrected, and that all onsite sewage treatment

systems (OSTS) (*e.g.,* septic systems and alternative waste treatment systems) and sewer infrastructure must be maintained in proper working condition.

While it is recognized that farmers will want to minimize the cost of fencing and the amount of pasture lost, any fencing installed through the use of cost-share programs should follow established NRCS specifications and be located from the stream bank as specified in existing programs.

An alternative water source will typically be required where pasture is fenced off from streams. The main criterion is that the system be dependable. Water systems alone (*i.e.,* with no streamside fencing) have been shown to reduce the amount of time cattle spend in the stream by as much as 50 to 80%. This is not a large enough reduction to meet all of the TMDLs. The inclusion of a buffer helps to reduce bacteria, as well as nutrient and sediment loads in runoff. The incorporation of effective buffers could reduce the need for more costly control measures.

From an environmental perspective, the best management scenario would be to exclude livestock from the stream bank 100% of the time and establish permanent vegetation in the buffer area. This prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from the pasture, and establishes (with the growth of streamside vegetation) one of the foundations for healthy aquatic life. From a livestock-production perspective, the best management scenario is one that provides the greatest profit to the farmer. Obviously, taking land (even a small amount) out of production is contrary to that goal. However, a clean water source has been shown to improve milk production and weight gain. Clean water will also improve the health of animals (*e.g.,* cattle and horses) by decreasing the incidence of waterborne illnesses and exposure to swampy areas near streams. Additionally, intensive pasture management, which becomes possible with an alternative water source, has been shown to improve overall farm profitability and environmental impact. From a part-time farmer's perspective, the best management scenario is one that requires minimal input of time. This would seem to preclude intensive pasture management; however, those farmers who have adopted an intensive pasture-management system typically report that the additional management of the established system amounts to "opening a gate

and getting out of the way" every couple of days. Additionally, the efficient use of the pasture often means that fewer supplemental feedings are necessary. Among both part-time and full-time farmers there are individuals who are hesitant to allow streamside vegetation to grow unrestricted because of aesthetic preferences or because they have spent a lifetime preventing this growth. However, given the reductions needed in pollutant (*i.e.*, fecal bacteria) delivery to the stream, a vegetated buffer will be needed. For planning purposes, it was assumed that a vegetated buffer would be established in conjunction with stream fencing.

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

5.1.2 Control Measures Selected through Stakeholder Review

In addition to the control measures that were directly indicated by the TMDL, a number of measures were needed to control fecal bacteria from land-based bacteria sources. Various scenarios were developed and presented to Working Groups. All scenarios began with implementation of the measures indicated by the TMDL. For instance, a residential pet waste program was specified in each watershed to educate citizens on proper disposal of pet wastes. Additionally, the use of pet waste composters on smaller lots will be encouraged.

Beyond this level of control for the pollutants of interest, practices that require the control or treatment of runoff are the primary tools available, such as improved pasture management. Improved pasture management is a BMP that is implemented to enhance the grazing land management system. Along with the infrastructure provided by a grazing land management system, 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.
- Distribution of manure through managed rotational grazing.

- Reseeding due to severe drought if necessary.

Currently, improved pasture management is available as an incentive based practice through NRCS – EQIP 528 Prescribed Grazing and DEQ's SL-10T Pasture Management BMP. BMPs available through the Virginia Agricultural BMP Cost-Share program that provide pasture management are SL-7 Extension if CREP Watering Systems and SL-9 Grazing Land Management. Employing the pasture management practices listed above can produce economic gains to producers at a very low investment cost. The final set of control measures identified and the efficiencies used in this study to estimate needs are listed in Table 5.1. "Direct Reductions" are those that reduce the load of pollutant from a specific source to the stream itself or to the land. "Buffer" practices control pollutants through both a land conversion and treatment of runoff from an upstream area. "Runoff Treatment" measures are those that either treat runoff from a given land area (*e.g.*, retention ponds) or treat runoff based on changing the runoff-producing characteristics of the land (*e.g.*, improved pasture management).

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

BMP	Type Description	Bacteria Reduction Efficiency	Reference
Res	Septic tank pump-out	5%	2
Res	Septic system repair	100%	1
Res	Septic system replacement	100%	1,2
Res	Alternative waste treatment	98%	1,2
Res	Connection to Sewer System	98%	
Res	Pet waste composter	100%	4
Res	Rain garden	40%	2,6
Res	Pet waste education program	50%	3
Ag	Improved pasture management	50%	5,8
Ag	Riparian buffer	50%	2
Ag	Woodland buffer filter strip	60%	2
Ag	Grassed buffer filter strip	50%	2
Ag	Livestock exclusion	100%	1
Ag	Poultry litter storage	99%	7
Ag	Manure storage	80%	7
Ag	Loafing lot management system	75%	6,7
Ag	Sod waterway	50%	9
Ag	Erosion and Sediment Controls	85%	8

1. Removal efficiency is defined by the practice
2. VADCR and VADEQ TMDL Implementation Plan Development Guidance Manual
3. Modified from 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.
4. Mill and Hawksbill TMDL IP, MapTech, September 13, 2007
5. Commonwealth of Virginia. 2005. Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy.
6. Chesapeake Bay Model version 4.3 BMP efficiencies
7. North River TMDL IP, MapTech, July 5, 2001
8. Bacteria efficiency estimated based on sediment and nutrient efficiency
9. Fiener, P., Auerswald, K. Effectiveness of grassed waterways in reducing runoff and sediment delivery from agricultural watersheds. J. Environ. Qual. 32:927-936 (2003).

5.2 Quantification of Control Measures

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

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

5.2.1 Agricultural Control Measures

5.2.1.1 Livestock Exclusion BMPs

The stream network was overlaid with land use in order to estimate fencing requirements within the watershed. Stream segments that flowed through or adjacent to land use areas that had a potential for supporting cattle (*e.g.,* improved pasture) were identified. If the stream segment flowed through the land-use area, it was assumed that fencing was required on both sides of the stream, while if a stream segment flowed adjacent to the land-use area, it was assumed that fencing was required on only one side of the stream. These assumptions were further refined to examine size of resultant pasture and existing BMPs. Due to limitations with the available GIS hydrology stream layers only perennial streams were included in this process. Not every land-use area identified as pasture has livestock on it at any given point in time. However, it is assumed that all pasture areas have the potential for livestock access. Maps of potential streamside fencing required for the Upper Clinch River watershed are shown in Figures 5.1 and 5.2. A total estimate of 267,780 feet of streamside fence (51 miles) would be required to exclude cattle from the streams.

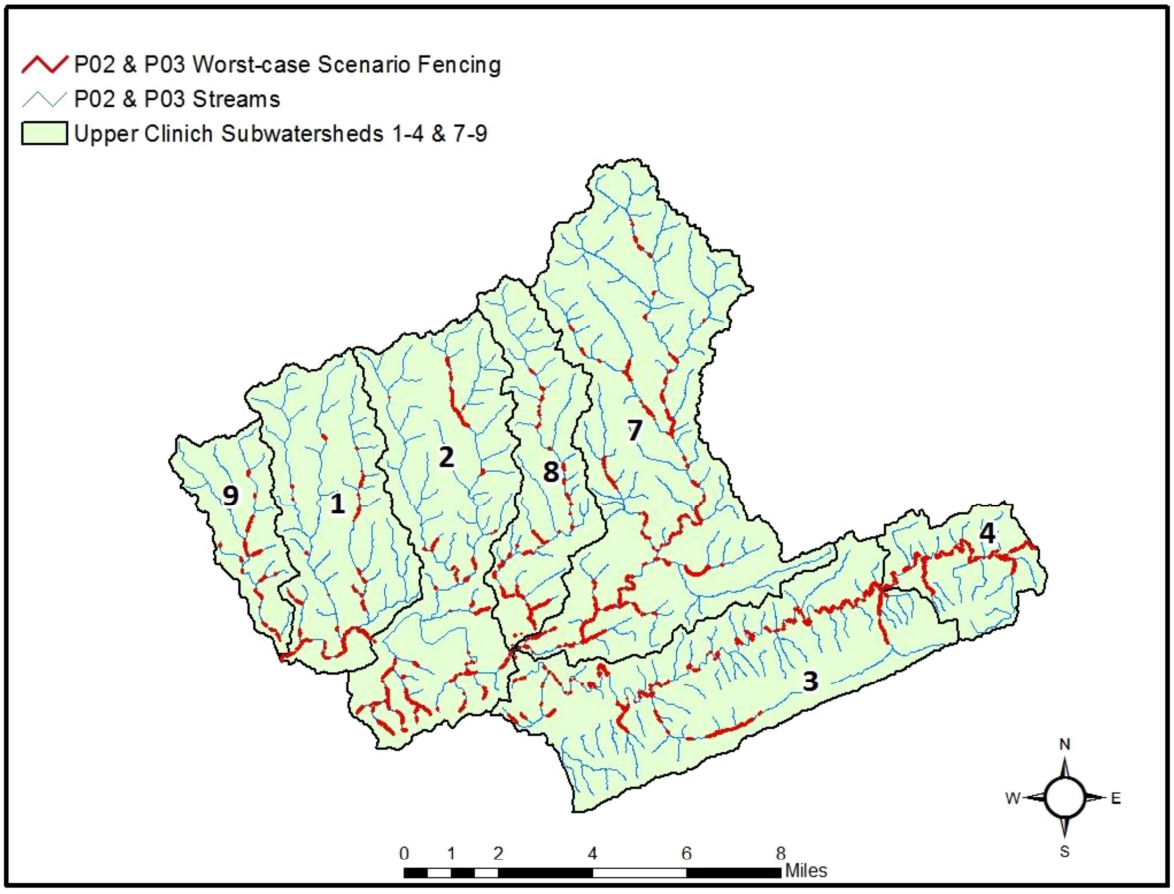

Figure 5.1 Potential streamside fencing for perennial streams in the Upper Clinch River Watershed.

The VADCR Agricultural BMP Database was utilized to determine typical characteristics (e.g., streamside fencing length per practice) of full livestock exclusion systems so that the number of different systems needed could be accurately estimated. The database was queried for information on Grazing Land Protection Systems and Stream Protection Systems (installed in Tazewell County. The SL-6 and LE-1T systems include streamside fencing, cross fencing, an alternative watering system, and a 35-ft buffer from the stream. The LE-2/LE-2T systems include the same items as the SL-6 and LE-1T but only require a 10-ft buffer). It was estimated that 50% of livestock exclusion systems would be accomplished through the installation of systems with 35-ft buffers. The LE-1T and SL-6 offer 85% to 80% cost share respectively. The LE-2/LE-2T offer a 50% cost share. The WP-2/WP-2T systems include streamside fencing, hardened crossings, and a 35-ft buffer from the stream.

The WP-2T practice is only available in TMDL targeted implementation areas such as the Upper Clinch River watershed. This practice includes an up-front cost share payment of 50 cents per linear foot of fence installed to assist in covering anticipated fencing maintenance costs. In cases where a watering system already exists, a WP-2T system is a more appropriate choice. Despite the additional payment for maintenance costs, members of the agricultural working group explained that this practice is seldom used because it does not provide cost share for the installation of a well, this was reflected in the number of WP-2 systems noted in the Agricultural BMP Database. Consequently, it was estimated that only 5% of fencing would be accomplished using the WP-2/WP-2T practice. Fencing through the Conservation Reserve Enhancement Program (CREP) is an option in the watershed provided up to a 35-ft streambank setback is utilized. The Conservation Reserve Program (CRP) is another alternative for landowners who do not want to install a 35-ft buffer but this program does require a 20-ft buffer.

To establish the total number of full livestock exclusion systems necessary to achieve full implementation, systems were calculated by dividing the potential pasture streamside fencing required by the average streamside fencing length per system. The breakdown of number of exclusions systems by specific practices that are expected to be implemented is based on historical use of exclusion system practices in the Upper Clinch River watershed and input from the agricultural working group. This IP focuses on fencing along perennial streams. Table 5.2 shows the livestock exclusion requirements for the Upper Clinch River watershed.

It was estimated that 7.5 % (20,514 feet) of all fencing length installed would need to be replaced during the length of the project.

Table 5.2 Estimation of streamside fence and number of full exclusion systems required in the Upper Clinch River watershed subwatersheds.

Sub-Watershed	Adjoining Pasture/Hay (Feet)	SL-6/LE-1T Systems	LE-2/LE-2T Systems	WP-2/WP-2T Systems
1	23,838	9	10	1
2	55,642	22	22	2
3	57,932	23	23	2
4	27,957	11	11	1
5*	NA	NA	NA	NA
6*	NA	NA	NA	NA
7	64,830	25	26	3
8	25,438	10	10	1
Totals	**255,637**	**100**	**102**	**10**

Values rounded to nearest integer
*Subwatersheds 5 & 6 already have an approved implementation plan with exclusion system requirements.

5.2.1.2 Land-Based BMPs

The Upper Clinch River watershed TMDLs include reductions to land-based bacteria loads. In order to meet these reductions, the BMPs in Table 5.3 are recommended. Improved pasture management is expected to have a substantial impact on water quality. It is anticipated that this improved management will take the form of rotational grazing systems. Vegetated buffers were also included in the implementation strategy to treat runoff from pasture and cropland. These buffers will act as filters, trapping bacteria, nutrients and sediment before it runs into the stream. When considering the effectiveness of a vegetated buffer in trapping pollutants, it is important to consider the area that will be draining to the buffer. For modeling purposes, it was assumed that a typical buffer would be capable of receiving and treating runoff from an area four times its width. For example, a buffer that was 35 feet wide and 1,000 feet long would treat runoff from an area that was 140 feet wide and 1,000 feet long. Once you move beyond four times the buffer width, it was assumed that the runoff would be in the form of channelized flow rather than the sheet flow that a buffer can filter.

Table 5.3 Agricultural land-based BMPs for the Upper Clinch River watershed.

Control Measure	Unit	Upper Clinch River, Plum Creek, and Indian Creek	Upper Clinch River, Middle Creek, and Coal Creek
Improved Pasture Management (SL-10T)	Acres	3,474	0
Reforestation of Erodible Pasture (FR-1)	Acres	631	647
Conservation Tillage	Acre	133	0
Retention Ponds – Pasture	Acres - Treated	4,950	0
Vegetated Buffers – Cropland	Acres	110	0

5.2.2 Residential Control Measures

5.2.2.1 BMPs to Correct Failing Septic Systems and Straight Pipes

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

The following BMPs have been identified to correct failing septic systems and straight pipes: septic system repairs, new septic system installation, connect to public sewer system and alternative waste treatment systems. It was estimated that 20% of the failing septic systems would need to be repaired. Of the remaining failing septic systems, 60% would be corrected with conventional septic systems and 20% would be corrected with alternative wastewater treatment systems. It should be noted that 319 grant funding cannot be utilized for discharging systems. It was also estimated that 10% would be able to connect to a public sewer system in the future. The Towns of Tazewell and Richlands have public sewer systems. The same percentages were applied to straight pipe corrections with the exception of septic system repairs.

Table 5.4 Estimated residential waste treatment systems in the Upper Clinch River subwatersheds.

Subwatershed	Houses with Standard Septic Systems	Potential Failing Septic Systems	Potential Straight Pipes
1	206	42	61
2	551	130	82
3	1,038	147	35
4	229	49	11
5	1,517	362	112
6	67	27	6
7*	879	185	131
8	91	37	15
9	174	70	55
Total	**4,752**	**1,049**	**508**

*Subwatershed 7 figures are from the Indian Creek TMDL developed by Biological Systems Engineering at Virginia Tech. All other figures are from the Upper Clinch River watershed TMDL developed by MapTech, Inc. Seven straight pipes are scheduled to be taken off line in subwatershed 8 and are not shown in this table.

5.2.2.2 Land-Based BMPs

The Upper Clinch River watershed TMDLs recommend reductions to residential land-based sources. In order to meet these recommendations, all the BMPs in Table 5.5 should be implemented; however, a staged approach to implementation is described in Chapter 6 of this document. In addition to these control measures, it was recognized that educational efforts would be vital to the successful implementation of these TMDLs. The residential education program includes a program addressing the benefits of cleaning up after pets and maintaining septic systems. The residential education program may also include a combination of educational materials distributed to pet owners, signage describing water quality concerns related to pet waste, and disposal bags and receptacles in areas of high pet traffic. The use of pet waste composters is also proposed to help eliminate pet waste in homeowner's yards and at kennels. The distribution of pet waste composters to households with pets is recommended. This could be accomplished through partnerships with local stores selling pet food, the Tazewell County Animal Shelter, and the Society for the Prevention of Cruelty to Animals (SPCA).

Table 5.5 All residential BMPs recommended to meet the Upper Clinch River watershed TMDLs.

Residential Control Measure Description	VA Cost-Share Practice Number	Upper Clinch River, Plum Creek, and Indian Creek	Upper Clinch River, Middle Creek, and Coal Creek
Septic Systems Pump-out Program	RB-1	1,813	2,939
Failing Septic System Corrections:			
Sewer System Connection	RB-2	35	49
Septic System Repair	RB-3	88	122
Septic System Replacement	RB-4, RB-4P	210	293
Alternative Waste Treatment System Installation	RB-5	105	147
Straight Pipe Corrections:			
Sewer System Connection	RB-2	13	31
Septic System Installation	RB-4, RB-4P	77	227
Alternative Waste Treatment System Installation	RB-5	39	114
Residential Pet Waste Education Program	N/A	1	1
Residential Pet Treatment BMP	PW-2	1,652	2,882

5.3 Technical Assistance and Education

Stakeholders agree that technical assistance and education is key to getting people involved in implementation. There must be a proactive approach to contact farmers and residents to articulate exactly what the TMDL means to them and what practices will help meet the goal of improved water quality. The working groups recommended several education/outreach techniques, which will be utilized during implementation. Outreach at County Fairs has been successful in other watersheds in the past. There are also opportunities for joint events with the Virginia Cooperative Extension Service. It may also be possible to involve the local Ruritan and Rotary Clubs. A program should be established to educate septic and alternative waste system installers on the maintenance requirements expected of the homeowner. Many waste system installers are not aware of the maintenance required. In addition a Pet Waste Education program will be developed.

The following tasks associated with agricultural and residential 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. Organize educational programs (*e.g.,* County Fair, presentations at joint VCE events or club events).
4. Distribute educational materials (*e.g.,* informational articles in FSA or Farm Bureau newsletters, local media).
5. Handle and track cost-share.
6. Assess and track progress toward BMP implementation goals.
7. 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. Organize educational programs (*e.g.*, inform on septic pump-outs, pet waste control).
4. Distribute educational material*s (e.g.*, informational pamphlets on TMDL IP and on-site sewage disposal systems).
5. Assess progress toward implementation goals.

The staffing needs to implement the agricultural and residential components of the plan were estimated based on discussions with stakeholders and the staffing levels used in similar projects. Staffing needs were quantified using full time equivalents (FTE), with one FTE being equal to one full-time staff member. It was determined that one agricultural FTE and one residential FTE would be needed to provide technical assistance in the watersheds for the first five years of implementation (Stage I). (If Stage II is necessary one residential half time FTE will be necessary.)

The Tazewell SWCD has agreed to manage the agricultural and residential programs. In this capacity, they will be in charge of funds for the associated FTEs. Implementation is already proceeding in the Tazewell area of the watershed due to a previously approved implementation plan.

5.4 Cost Analysis

5.4.1 Agricultural Control Measures

Streamside fencing through or adjacent to pasture with potential livestock access was translated and quantified into full livestock exclusion systems as described in Section 5.2.1.1. The costs for the exclusion systems were estimated based on the cost of systems already in

place in the Upper Clinch River watershed. The cost of an LE-1T and LE-2T systems were estimated at $53,000 for farms larger than 100 acres, the cost for smaller farms was estimated to be $11,500. The costs for hardened crossings and cross fencing would be included in the exclusion systems as appropriate.

The total cost of livestock exclusion systems includes the costs associated with fence installation, repair, and maintenance. The cost of fence maintenance was identified as a deterrent to participation. Financial assistance possibilities for maintaining fences include an annual 25% tax credit for fence maintenance and conservation easements where the landowner is paid a percentage of the land value to leave it undisturbed. Additionally, the Streambank Protection (WP-2T) cost-share practice will be available as part of the implementation project and provides an upfront incentive payment to maintain stream fencing. The cost per foot for streamside fence maintenance is estimated at $3.05/ft.

The remaining costs outlined in Table 5.7 were determined through literature review, analysis of the Virginia Agricultural BMP Database, and discussion with stakeholders. The number and type of practices that have been installed in each watershed were determined through discussions with local personnel and data from the Virginia Agricultural BMP Database.

Table 5.6 Agricultural control measure costs and needs in the Upper Clinch River watershed.

Agricultural Control Measure	Unit	Cost per Unit	Upper Clinch, Plum Creek, and Indian Creek Units Needed	Upper Clinch River, Middle Creek, and Coal Creek Units Needed
Grazing Land Protection System (LE-1T) Farms >100 acres	System	$53,000	5	47
Grazing Land Protection System (LE-2T) Farms >100 acres	System	$53,000	5	48
Grazing Land Protection System (LE-1T) Farms <100 acres	System	$11,500	6	47
Grazing Land Protection System (LE-2T) Farms <100 acres	System	$11,500	6	47
Stream Protection System (WP-2T)	System	$3,400	1	10
Streamside Fence Maintenance	Foot	$3.05	2,097	18,415
Improved Pasture Management (SL-10T)	Acre	$107	3,474	0
Reforestation of Erodible Pasture (FR-1)	Acre	$154	631	647
Conservation Tillage	Acre	$18	133	
Vegetated Buffers - Cropland	Acre	$360	110	
Retention Ponds – Pasture	Acre – Treated	$138	4,950	

5.4.2 Residential Control Measures

Following recommendations from the AGRUWG, it was estimated that 20% of the failing septic systems would need to be repaired ($4,000). Of the remaining failing septic systems, 60% would be corrected with conventional septic systems ($6,500) and 20% would be corrected with alternative wastewater treatment systems ($20,000). It was also estimated that 10% would be able to connect to a public sewer system in the future ($1,500). The same percentages were applied to straight pipe corrections with the exception of septic system repairs.

The remaining costs outlined in Table 5.8 were determined through literature review, and discussion with stakeholders.

Table 5.7 Residential control measure costs and needs in the Upper Clinch River Watershed.

Residential Control Measure	Unit	Cost per Unit	Upper Clinch River, Plum Creek, and Indian Creek Units Needed	Upper Clinch River, Middle Creek, and Coal Creek Units Needed
Septic Systems Pump-outs (RB-1)	System	$325	1,813	2,939
Connect to Public Sewage System (RB-2)	System	$1500	48	80
Septic System Repair (RB-3)	System	$4.000	88	122
Septic System Installation/Replacement (RB-4)	System	$6,500	287	520
Alternative Waste Treatment System Installation (RB-5)	System	$20,000	144	261
Pet Waste Education Program	System	$3,750	1	1
Pet Waste Composters (PW-2)	Composters	$60	1,652	826

5.4.3 Technical Assistance

It was determined by the working group members that it would require $60,000 to support the salary, benefits, travel, training, and incidentals for education of one technical FTE. With quantification analysis yielding a need for one full time agricultural and one residential technical FTE per year for the watershed, the total potential cost to provide agricultural technical assistance during Stage I implementation is expected to be approximately $60,000 per FTE per year for 5 years. For Stage II implementation, total potential cost to continue providing agricultural assistance is expected to be approximately $30,000 for one FTE for 10 years.

The total estimated costs for the implementation of BMPs in the Upper Clinch River watershed is shown in Table 5.9.

Table 5.9 Total estimated costs to meet the Upper Clinch River watershed bacteria TMDLs.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total Cost ($)
Upper Clinch River, Plum Creek, and Indian Creek	$1,871,782	$5,864,595	$450,000	$8,186,377
Upper Clinch River, Middle Creek, and Coal Creek	$6,305,803	$10,124,245	$450,000	$16,880,048
Total	**$8,177,586**	**$15,988,840**	**$900,000**	**$25,066,425**

Cost figures are rounded to four significant digits.

5.5 Benefit Analysis

The primary benefit of implementation is cleaner waters in Virginia. Specifically, *E. coli* contamination in the Upper Clinch River watershed will be reduced to meet water quality standards. Tables 5.10 and 5.11 indicate the cost efficiencies of the various practices being proposed in this IP. It is hard to gauge the impact that reducing *E. coli* contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the reductions required, the incidence of infection from *E. coli* sources through contact with surface waters should be reduced considerably.

Table 5.10 Cost efficiencies of control measures in units removed per $1,000 in Upper Clinch River, Plum Creek, and Indian Creek.

Agricultural	Bacteria
Grazing Land Protection System (LE-1T and LE-2T) and Stream Protection System (WP-2T)	4.2E+10
Improved Pasture Management (SL-10T)	5.3E+12
Reforestation of Erodible Pasture (FR-1)	2.0E+12
Conservation Tillage	2.4E+11
Vegetated Buffers on Crop Land	1.8E+08
Retention Ponds - Pasture	1.8E+12
Residential	
Connect to Sewer System (RB-2)	1.0E+11
Septic System Repair (RB-3)	5.5E+10
Septic System Installation/Replacement (RB-4, RB-4P)	1.2E+11
Alternative Waste Treatment System Installation (RB-5)	4.6E+10
Pet Waste Education Program	4.8E+13
Pet Waste Composters (PW-2)	1.3E+12

Table 5.11 Cost efficiencies of control measures in units removed per $1,000 in Upper Clinch River, Middle Creek, and Coal Creek.

Agricultural	Bacteria (Colonies/yr)
Grazing Land Protection System (LE-1T and LE-2T) and Stream Protection System (WP-2T)	7.63E+11
Reforestation of Erodible Pasture (FR-1)	2.08E+13
Residential	
Connect to Sewer System (RB-2)	1.15E+13
Septic System Repair (RB-3)	1.18E+13
Septic System Installation/Replacement (RB-4, RB-4P)	1.33E+12
Alternative Waste Treatment System Installation (RB-5)	9.20E+11
Pet Waste Education Program	2.59E+15
Pet Waste Composters (PW-2)	2.16E+13

An important objective of the implementation plan is to foster continued economic vitality and strength. This objective is based on the recognition that healthy waters improve economic opportunities for Virginians and a healthy economic base provides the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the community, as well as the expected environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, improved pasture management, private sewage system maintenance and stream bank stabilization will each provide economic benefits to land owners. Additionally, money spent by landowners and state agencies in the process of implementing this plan will stimulate the local economy.

5.5.1 Agricultural Practices

A clean water source has been shown to improve weight gain and milk production in cattle. Fresh clean water is the primary nutrient for livestock with healthy cattle consuming, on a daily basis, close to 10% of their body weight during winter and 15% of their body weight in summer. Many livestock illnesses can be spread through contaminated water supplies. For instance, coccidia can be delivered through feed, water and haircoat contamination with manure (VCE, 2000). In addition, horses drinking from marshy areas or areas where wildlife or cattle carrying Leptospirosis have access tend to have an increased incidence of moonblindness associated with Leptospirosis infections (VCE, 1998b). A clean water source

can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills.

In addition to reducing the likelihood of animals contracting waterborne illnesses by providing a clean water supply, streamside fencing excludes livestock from wet, swampy environments as are often found next to streams where cattle have regular access. Keeping cattle in clean, dry areas has been shown to reduce the occurrence of mastitis and foot rot. The VCE (1998a) reports that mastitis costs producers $100 per cow in reduced quantity and quality of milk produced. On a larger scale, mastitis costs the U.S. dairy industry about $1.7 billion to 2 billion annually or 11% of total U.S. milk production. While the spread of mastitis through a dairy herd can be reduced through proper sanitation of milking equipment, mastitis-causing bacteria can be harbored and spread in the environment 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 implement an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40% and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80 % of the cost of growing or maintaining an animal, and pastures providing feed at a cost of 0.01 to 0.02 cents/l9b 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.

5.5.2 Residential Practices

The residential programs will play an important role in improving water quality, since human waste can carry with it human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry. In terms of economic benefits to homeowners, an improved understanding of on-site sewage treatment systems, including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. The average septic system will last 20 to 25 years if properly maintained. Proper maintenance includes: knowing the location of the system components and protecting them (e.g., not driving or parking on top of them), not planting trees where roots could damage the system, keeping hazardous chemicals out of the system, and pumping out the septic tank every 3 to 5 years. The cost of proper maintenance, as outlined here, is relatively inexpensive ($220/3-5 years) in comparison to repairing or replacing an entire system ($6,500 to $20,000).

In addition to the benefits to individual landowners, the economy of the local community will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside the impaired areas. Building contractors and material suppliers who deal with septic system pump-outs, private sewage system repair and installation, fencing, and other BMP components can expect to see an increase in business during implementation. Additionally, income from maintenance of these systems should continue long after implementation is complete. As will be discussed in greater detail in Chapter 8, a portion of the funding for implementation can be expected to come from state and federal sources. This portion of funding represents money that is new to the area and will stimulate the local economy. In general, implementation will provide not only environmental benefits to the community, but economic benefits as well, which, in turn, will allow for individual landowners to participate in implementation.

6. MEASURABLE GOALS AND MILESTONES FOR ATTAINING WATER QUALITY STANDARDS

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

6.1 Milestones Identification

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

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the amount of control measures installed within certain timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. The milestones described here are intended to achieve full implementation within 15 years.

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures first. For instance, the BST results for the Upper Clinch River watershed indicated that humans are a source of fecal pollution in the stream. Concentrating on eliminating straight pipes and correcting failing septic systems within the first year may provide the highest return on water quality improvement with less cost to landowners. The Stage I goals for implementation will focus on correcting straight pipes and failing septic systems, implementing a pet waste control program, fencing cattle out of the stream, and improving pasture management. Stage II focuses on implementing retention ponds in the Tazewell area and continuing pet waste programs.

Some implementation is already proceeding in the Tazewell area due to a completed implementation plan for an aquatic life impairment. It is anticipated that implementation will be in accordance with two implementation stages (I and II) over 15 years (Tables 6.1 and 6.2). The first milestone will be five years after implementation begins, whereby the more cost-efficient control measures will be installed, with significant reductions in bacteria anticipated. Table 6.3 presents a breakdown of the costs for Stage I. Following Stage I implementation, the steering committee should evaluate water quality improvements and determine how to proceed to complete implementation (Stage II). Costs for Stage II are presented in Table 6.4. Based on completing both implementation stages, the final milestone would be achieving the bacteria reductions required by the TMDL.

Table 6.1 Stage I and Stage II implementation goals for the Upper Clinch River, Plum Creek, and Indian Creek.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (LE-1T)	System	11	
Grazing Land Protection System (LE-2T)	System	11	
Stream Protection System (WP-2T)	System	1	
Conservation Tillage	Acres	133	
Improved Pasture Management (SL-10T)	Acres	3,474	
Reforestation of Erodible Pasture (FR-1)	Acres	631	
Streamside Fence Maintenance	Feet	1,049	1,048
Vegetated Buffers - Cropland	Acre	110	
Retention Ponds - Pasture	Acres/Treated		4,950
Residential			
Septic Systems Pump-out Program (RB-1)	System	907	906
Sewer System Connect (RB-2)	System	24	24
Septic System Repair (RB-3)	System	44	44
Septic System Installation/Replacement (RB-4, RB-4P)	System	144	143
Alternative Waste Treatment System Installation (RB-5)	System	72	72
Residential Pet Waste Program	Program	1	Ongoing
Residential Pet Waste Compost Program (PW-2)	Composter	826	826

Table 6.2 Stage I and Stage II implementation goals for the Upper Clinch River, Middle Creek, and Coal Creek.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (LE-1T)	System	94	
Grazing Land Protection System (LE-2T)	System	95	
Stream Protection System (WP-2T)	System	10	
Reforestation of Erodible Pasture (FR-1)	Acres	647	
Streamside Fence Maintenance	Feet	9,208	9,207
Residential			
Septic Systems Pump-out Program (RB-1)	System	1,470	1,469
Sewer System Connect (RB-2)	System	40	40
Septic System Repair (RB-3)	System	61	62
Septic System Installation/Replacement (RB-4, RB-4P)	System	260	260
Alternative Waste Treatment System Installation (RB-5)	System	131	130
Residential Pet Waste Program	Program	1	Ongoing
Residential Pet Waste Compost Program (PW-2)	Composter	1,441	1,441

Table 6.3 Costs to implement Stage I (1st 5 years) for the Upper Clinch River watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total Cost ($)
Upper Clinch River, Plum Creek, and Indian Creek	1,185,486	2,939,085	300,000	4,424,571
Upper Clinch River, Middle Creek, and Coal Creek	6,277,722	4,962,360	300,000	11,540,082
Total	**7,463,208**	**7,901,445**	**600,000**	**15,964,653**

Numbers are rounded to four significant digits.

Table 6.4 Costs to implement Stage II (2nd 10 years) for the Upper Clinch River watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Technical Assistance ($)	Total Cost ($)
Upper Clinch River, Plum Creek, and Indian Creek	686,296	2,925,510	150,000	3,761,806
Upper Clinch River, Middle Creek, and Coal Creek	28,081	5,161,885	150,000	5,339,966
Total	**714,377**	**8,087,395**	**300,000**	**9,101,772**

Numbers are rounded to four significant digits.

6.2 Timeline

Based on meeting the above milestones, a 15-year implementation plan timeline was formulated for the Upper Clinch River watershed (Figures 6.1 and 6.2). The timeline describes the needs for implementation in terms of completion of the agricultural and residential control measures. Tables 6.5 and 6.6 show the projected staged implementation timeline for all control measures, including technical assistance.

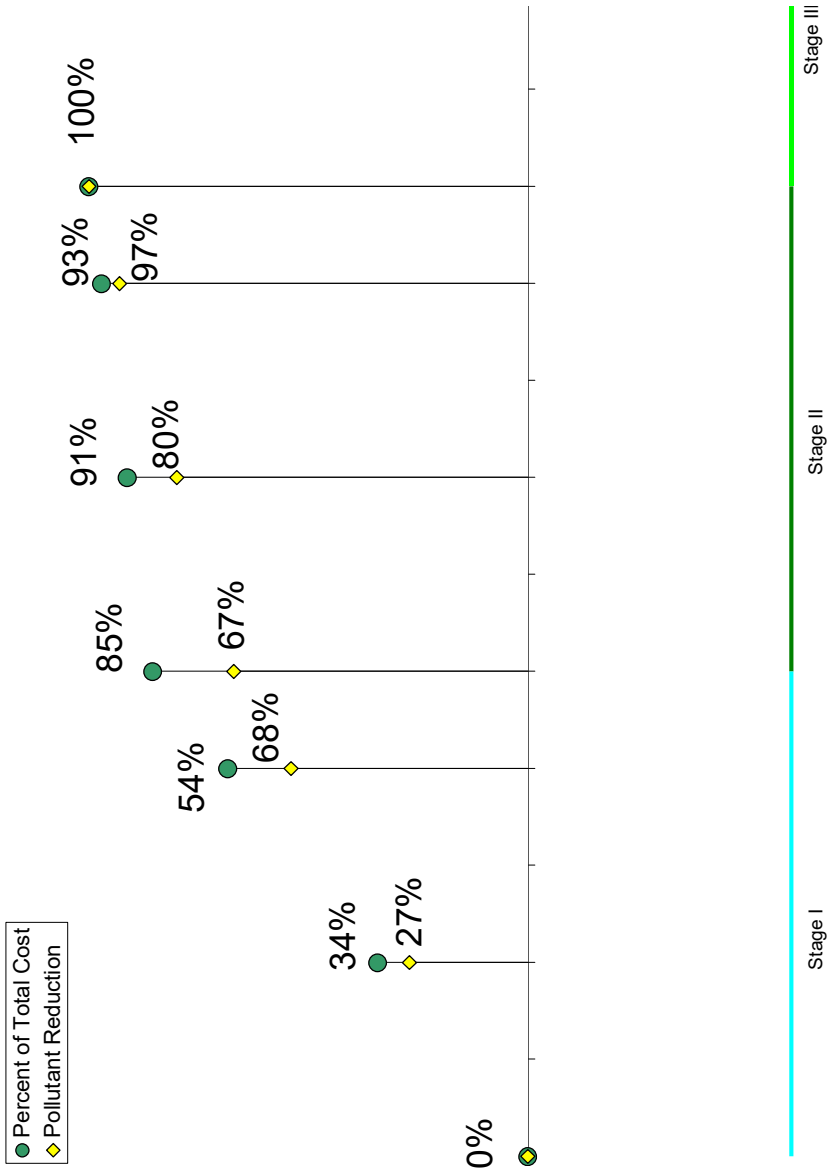

Figure 6.1 Timeline for implementation in the Upper Clinch River, Plum Creek, and Indian Creek.

Table 6.5 Timeline for implementation in the Upper Clinch River, Plum Creek, and Indian Creek.

Clinch River Implementation Milestones	Existing	Year 1	Year 2	-Stage I- Year 3	Year 4	Year 5	Stages II & III Year 15
Cumulative Progress Toward BMP Installation							
Agricultural:							
Grazing Land Protection System (LE-1T and LE-2T)	0%	20%	40%	60%	80%	100%	100%
Stream Protection System (WP-2T)	0%	20%	40%	60%	80%	100%	100%
Streamside Fence Maintenance	0%	6.6%	13.2%	19.8%	26.4%	33%	100%
Improved Pasture Management (SL-10T)	0%	18%	38%	58%	78%	98%	100%
Reforestation of Erodible Pasture (FR-1)	0%	20%	40%	60%	80%	100%	100%
Vegetated Buffers – Cropland	0%	20%	40%	60%	80%	100%	100%
Retention Ponds – Pasture	0%	0%	0%	0%	0%	0%	100%
Residential:							
Septic Systems Pump-out Program (RB-1)	0%	6.6%	13.2%	19.8%	26.4%	33%	100%
Septic System Repair (RB-3)	0%	20%	40%	60%	80%	100%	100%
Septic System Installation/Replacement (RB-4, RB-4P)	0%	20%	40%	60%	80%	100%	100%
Alternative Waste Treatment System Installation (RB-5)	0%	20%	40%	60%	80%	100%	100%
Residential Pet Waste Program	0%	6.6%	13.2%	19.8%	26.4%	33%	100%
Residential Pet Waste Compost Program (PW-2)	0%	6.6%	13.2%	19.8%	26.4%	33%	100%
Cumulative Progress Toward Bacteria Load Goal	0%	11%	27%	35%	54%	67%	100%
Cost (% of Total)	0%	17%	34%	51%	68%	85%	100%

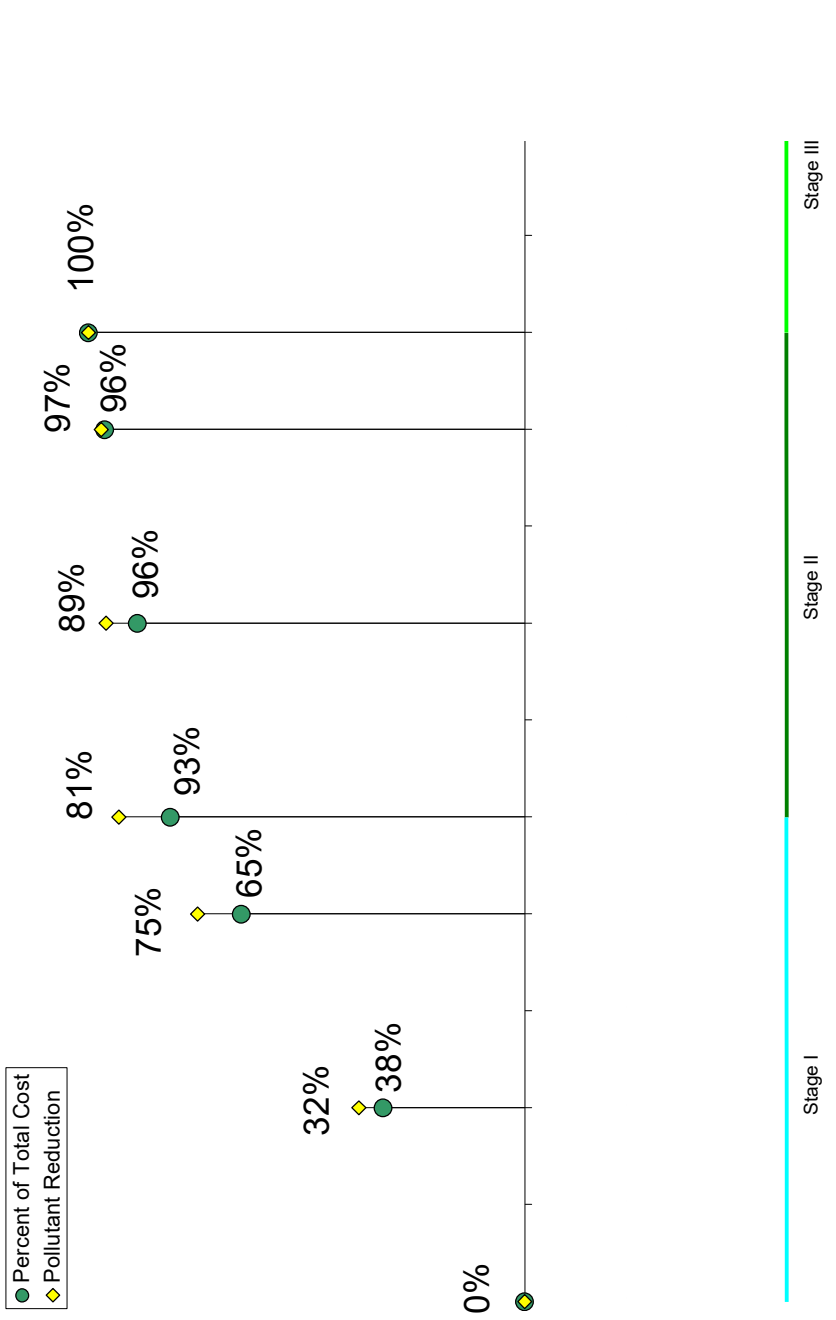

Figure 6.2 Timeline for implementation in the Upper Clinch River, Middle Creek, and Coal Creek.

Table 6.6 Timeline for implementation in the Upper Clinch River, Middle Creek, and Coal Creek.

Clinch River Implementation Milestones	Existing	Year 1	Year 2	-Stage I- Year 3	Year 4	Year 5	Stages II & III Year 15
Cumulative Progress Toward BMP Installation							
Agricultural:							
Grazing Land Protection System (LE-1T and LE-2T)	0%	20%	40%	60%	80%	100%	100%
Stream Protection System (WP-2T)	0%	20%	40%	60%	80%	100%	100%
Streamside Fence Maintenance	0%	0%	0%	0%	0%	100%	100%
Reforestation of Erodible Pasture (FR-1)	0%	20%	40%	60%	80%	100%	100%
Residential:							
Septic Systems Pump-out Program (RB-1)	0%	20%	40%	60%	80%	100%	100%
Septic System Repair (RB-3)	0%	20%	40%	60%	80%	100%	100%
Septic System Installation/Replacement (RB-4)	0%	20%	40%	60%	80%	100%	100%
Alternative Waste Treatment System Installation (RB-5)	0%	20%	40%	60%	80%	100%	100%
Residential Pet Waste Program	0%	10%	20%	30%	40%	50%	100%
Residential Pet Waste Compost Program (PW-2)	0%	10%	20%	30%	40%	50%	100%
Cumulative Progress Toward Bacteria Load Goal	0%	19%	37%	55%	73%	91%	100%
Cost (% of Total)	0%	16.5%	33%	51%	65%	85%	100%

6.3 Targeting

Implicit in the process of a staged implementation is targeting of control measures. Targeting ensures optimum utilization of resources. The Upper Clinch River watershed was divided into 8 subwatersheds (Figure 1.1). Targeting of critical areas for livestock fencing was accomplished through analysis of livestock population and the fencing requirements for each subwatershed. The subwatersheds were ranked in descending order based on the fence length required. If feasible, effort should be made to prioritize resources in the following order of subwatersheds in Tables 6.7 and 6.8. For example, the Tazewell SWCD should initiate participation from farmers in subwatershed 3 (Table 6.8). The targeting priority list should be used to focus outreach promoting the cost-share programs available. Any interested parties should not be turned away if their farm is in a low ranking subwatershed.

Targeting of residential BMPs should be initiated in the order shown in Tables 6.9 and 6.10. This order was derived from ranking the sum of loads from failing septic systems and straight pipes in each subwatershed. The subwatershed of highest priority is 9.

One method of targeting in agricultural and residential areas involves considering the cost-efficiency of specific practices. Table 5.11 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.

Table 6.7 Targeting subwatershed order for streamside fencing in Upper Clinch River, Plum Creek, and Indian Creek.

Priority	Subwatershed Number
1st	4

Streamside fencing for subwatersheds 5 & 6 is included in the Upper Clinch River Sediment TMDL IP, approved on 010/3/2008

Table 6.8 Targeting subwatershed order for streamside fencing in Upper Clinch River, Middle Creek, and Coal Creek.

Priority	Subwatershed Number
1st	3
2nd	9
3rd	7
4th	1
5th	2
6th	8

Table 6.9 Targeting subwatershed order for human fecal bacteria sources in Upper Clinch River, Plum Creek, and Indian Creek

	Subwatershed Number	
Priority	Failing Septic System	Straight Pipes
1st	4	5
2nd	5	4
3rd	6	6

Table 6.10 Targeting subwatershed order for human fecal bacteria sources in Upper Clinch River, Middle Creek, and Coal Creek.

	Subwatershed Number	
Priority	Failing Septic System	Straight Pipes
1st	9	9
2nd	3	1
3rd	7	8
4th	8	2
5th	2	7
6th	1	3

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 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 Tazewell SWCD has agreed to take responsibility for initiating contact to encourage landowners to install the agricultural BMPs and to correct residential onsite wastewater treatment systems in need. VADEQ staff will take the responsibility of working with the Tazewell 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.

7.2 Monitoring

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

The VADEQ monitoring stations in the Upper Clinch River watershed are described in Table 7.1 and shown in Figures 7.1 and 7.2. Stations are monitored every month for 1 year in a six year rotation. The station labeled 'trend' in the column "monitoring rotation" is the only station monitored continuously.

Up-to-date monitoring results are available to residents by requesting the information from the VADEQ. Following the initiation of implementation actions identified in this implementation plan, VADEQ will begin post implementation monitoring. This monitoring will begin no sooner than 2 years following the installation of BMPs to ensure that time has passed for remedial measures to have stabilized and BMPs to have become functional.

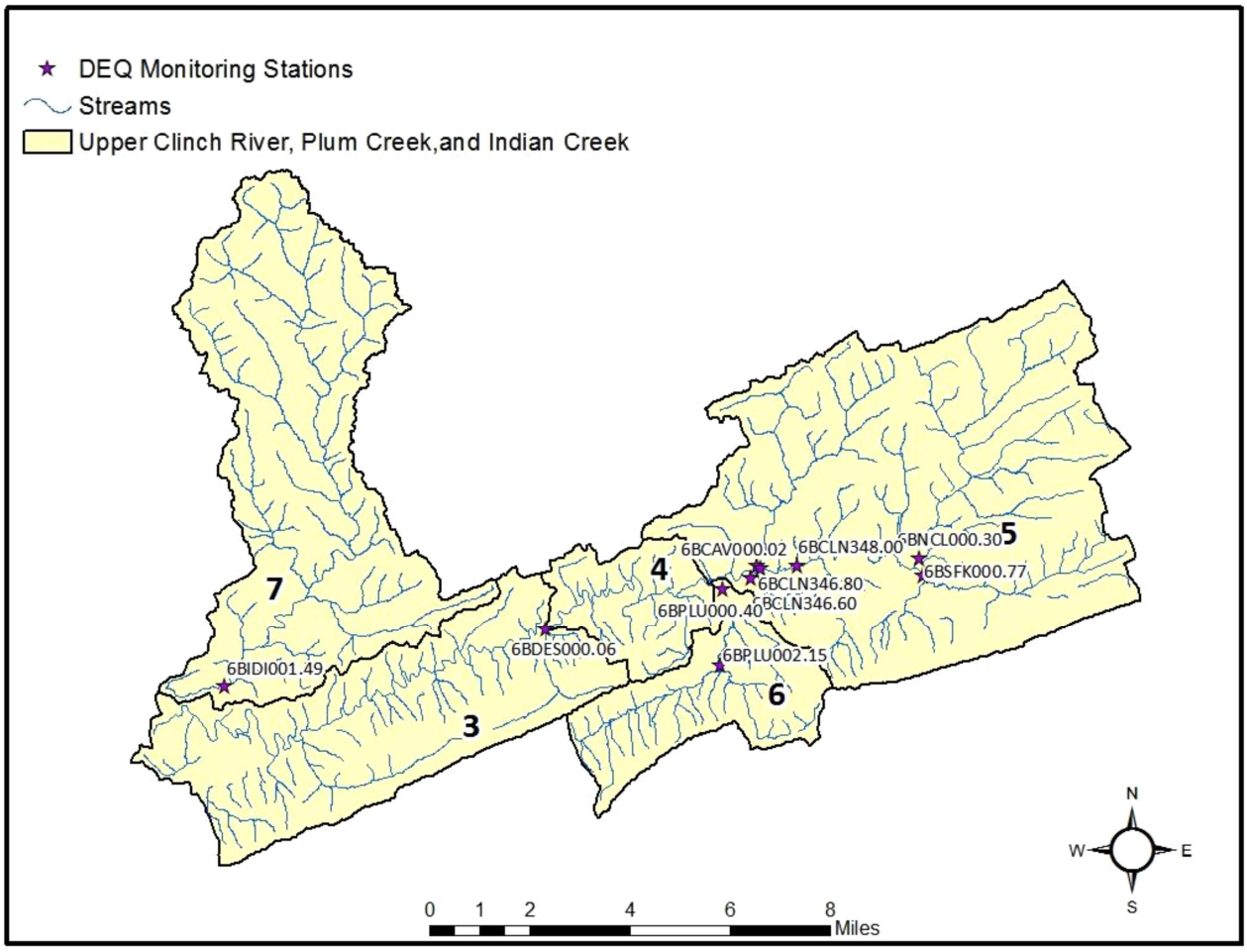

Figure 7.1 Location of monitoring stations in the Upper Clinch River, Plum Creek, and Indian Creek.

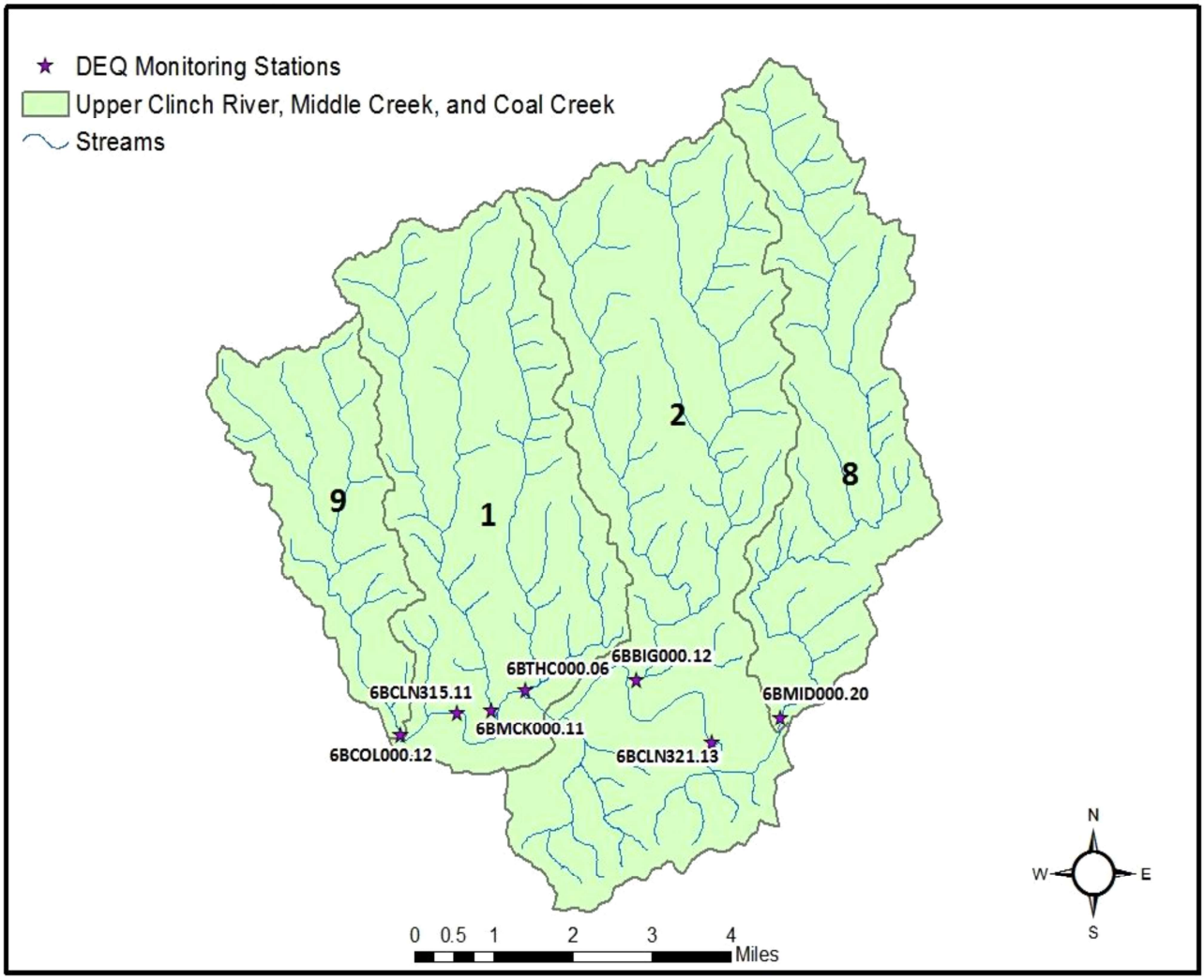

Figure 7.2 Location of monitoring stations in the Upper Clinch River, Middle Creek, and Coal Creek.

Table 7.1 Monitoring station IDs, station locations, and monitoring schedules for the Upper Clinch River watershed VADEQ stations.

Stream	Station	Monitoring Rotation
Big Creek	6BBIG000.12	6year rotation
Cavitts Creek	6BCAV000.02	6year rotation
Clinch River	6BCLN315.11	6year rotation
Clinch River	6BCLN321.13	Trend
Coal Creek	6BCOL000.12	6 year rotation
Mudlick Creek	6BMCK000.11	6year rotation
Middle Creek	6BMID000.20	6year rotation
Town Hill Creek	6BTHC000.03	6year rotation
Clinch River	6BCLN346.60	6year rotation
Clinch River	6BCLN346.80	6year rotation
Clinch River	6BCLN348.00	6year rotation
Deskin Creek	6BDES000.06	6year rotation
North Fork Clinch River	6BNCL000.30	6year rotation
Plum Creek	6BPLU000.40	6year rotation
Plum Creek	6BPLU002.15	6year rotation
South Fork Clinch River	6BSFK000.77	6year rotation

7.3 Agricultural and Residential Education Programs

Education and outreach is a significant component of any TMDL implementation project. The Tazewell 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 pet waste and pet waste composters are both potential cost-effective options. Educational materials can also be

distributed through the Master Gardener program. The Cooperative Extension and the Tazewell SWCD could also help distribute information on how citizens need to clean up after their pets.

7.3.1 Tazewell Soil & Water Conservation District (TSWCD)

The Tazewell SWCD is a local government entity providing soil and water conservation assistance to farmers and residents of Tazewell County. During the implementation project, the Tazewell SWCD will provide outreach, technical and financial assistance to farmers and homeowners in the Upper Clinch River watershed through the Virginia Agricultural BMP Cost-Share and Tax Credit programs. Their responsibilities will include promoting implementation goals, available funding and the benefits of BMPs and providing assistance in the survey, design, layout, and approval of agricultural and residential BMPs. Education and outreach activities are a significant portion of their responsibilities. Specific education and outreach methods recommended by the working groups are described in section 5.3 of this document.

7.4 Legal Authority

The EPA has the responsibility of overseeing the various programs necessary for the success of the CWA. However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are five state agencies responsible for regulating activities that impact water quality in Virginia. These agencies are VADEQ, VADCR, VDH, VADMME and Virginia Department of Agriculture and Consumer Services (VDACS).

VADEQ has responsibility for monitoring waters to determine compliance with state standards, and for requiring permitted point dischargers to maintain loads within permit limits. It has the regulatory authority to levy fines and take legal action against those in violation of permits. Beginning in 1994, animal waste from confined animal facilities that hold in excess of 300 animal units (cattle and hogs) has been managed through a Virginia general pollution abatement permit. These operations are required to implement a number of practices to prevent surface and groundwater contamination. In response to increasing

demand from the public to develop new regulations dealing with animal waste, the Virginia General Assembly passed legislation in 1999 requiring VADEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999). On January 1, 2008 DEQ assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids as directed by the Virginia General Assembly in 2007. DEQ's Office of Land Application Programs within the Water Quality Division 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 applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied.

VADEQ holds the responsibility for addressing nonpoint sources (NPS) of pollution. General permits that control stormwater discharges from municipal storm sewer systems (MS4s) and construction activities are administered by DEQ through the Virginia Stormwater Management Program (VSMP) regulations (9VACS25-870) which are authorized by the Virginia Stormwater Management Act. Locally adopted stormwater programs are implemented according to the federal and state regulation.

Historically, VADCR programs have dealt with agricultural NPS pollution through education and voluntary incentive programs. Because these are voluntary actions, cost-share programs have been developed in order to encourage greater participation. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the level of participation required by TMDLs (near 100%).

Through Virginia's Agricultural Stewardship Act (ASA), the Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local Soil and Water Conservation District. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty of up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut

down all or part of an agricultural activity and require specific stewardship measures. VDACS has only two staff members dedicated to enforcing the Agricultural Stewardship Act, and very little funding is available to support water quality sampling. The Agricultural Stewardship Act is entirely complaint-driven.

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

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

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

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

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 Tazewell County 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. Tazewell County 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.

8. FUNDING

The following practices are identified as vital to attaining the goals of the Upper Clinch River watershed IP: Grazing Land Protection (LE-1T and LE-2T), Streambank Protection (WP-2T in TMDL areas), Streamside Fence Maintenance, Improved Pasture Management (SL-10T), Conservation Tillage, Vegetated Buffers-Cropland, Retention Ponds- Pasture, Septic Tank Pump-Out (RB-1), Connect to Public Sewage System (RB-2), Septic System Repair (RB-3), Septic Tank System Installation/Replacement (RB-4), Alternative On-site Waste Treatment System (RB-5), Reforestation of Erodible Crop and Pastureland (FR-1), Pet Waste Education Program and Pet Waste Composters (PW-2). 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 SWCD, VADCR, DEQ, NRCS, and VCE. It is recommended that participants discuss funding options with experienced personnel at their local SWCD in order to choose the best option. Information on program description and requirements was provided from fact sheets prepared by Virginia State Technical Advisory Committee, VADEQ, VADCR, and Southeast Rural Community Assistance Project, Inc.

Federal Clean Water Act 319 Incremental Funds

Through Section 319 of the Federal Clean Water Act, Virginia is awarded grant funds to implement the nonpoint source programs. VADEQ administers the money to fund watershed projects, demonstration and educational programs, nonpoint source pollution control program development, and technical and program staff. VADEQ reports annually to the EPA on the progress made in nonpoint source pollution prevention and control.

Virginia Agricultural Best Management Practices Cost-Share Program

The cost-share program is funded with state and some 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. The Virginia Natural Resources Conservation Fund (VNRCF) provides funding for this program.

Virginia Agricultural Best Management Practices Tax Credit Program

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

Virginia Agricultural Best Management Practices Loan Program

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

Virginia Small Business Environmental Assistance Fund Loan Program

The Fund, administered through VADEQ, is used to make loans or to guarantee loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural 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, SWCDs, and individuals. Grants for point and nonpoint sources are administered through VADEQ. Most WQIF grants provide matching funds on a 50/50 cost-share basis. Successful applications are listed as draft/public-noticed agreements, and are subject to a public review period of at least 30 days. This fund was identified as a potential funding source for the urban stream buffers and pet waste composters included in the implementation plan.

Community Development Block Grant Program

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

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

Conservation Reserve Program (CRP)

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

Conservation Reserve Enhancement Program (CREP)

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

addition, a 40% incentive payment upon completion is offered and an average rental rate of $70/acre on stream buffer area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area. The statewide goal is 8,000 acres.

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

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

Environmental Quality Incentives Program (EQIP)

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

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

Wildlife Habitat Incentive Program (WHIP)

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

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

The mission of this project is to promote, cultivate, and encourage the development of water and wastewater facilities to serve low-income residents at affordable costs and to support other development activities that will improve the quality of life in rural areas. Staff members of other community organizations complement the SE/R-CAP central office staff across the region. They can provide (at no cost to a community): on-site technical assistance and consultation, operation and maintenance/management assistance, training, education, facilitation, volunteers, and financial assistance. Financial assistance includes $1,500 toward

repair/replacement/installation of a septic system and $2,000 toward repair/replacement/installation of an alternative waste treatment system. Funding is only available for families making less than 125% of the federal poverty level. The federal poverty threshold for a family of four is $25,813.

National Fish and Wildlife Foundation

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. 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.

EPA Environmental Education Grant Funding Opportunity

EPA has recently announced an exciting environmental education grant funding opportunity. The purpose of the grants is to promote environmental stewardship and help develop knowledgeable and responsible students, teachers and citizens.

GLOSSARY

303(d). A section of the Clean Water Act of 1972 requiring states to identify and list water bodies that do not meet the states' water quality standards.

ACP. Agricultural Conservation Program.

AGRUWG. Agricultural and Residential/Urban Working Group.

Allocations. That portion of a receiving water's loading capacity attributed to one of its existing or future pollution sources (nonpoint or point) or to natural background sources. (A wasteload allocation [WLA] is that portion of the loading capacity allocated to an existing or future point source, and a load allocation [LA] is that portion allocated to an existing or future nonpoint source or to natural background levels. Load allocations are best estimates of the loading, which can range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading.)

ASA. Agricultural Stewardship Act.

Benthic organisms. Organisms living in, or on, bottom substrates in aquatic ecosystems.

Benthic. Refers to material, especially sediment, at the bottom of an aquatic ecosystem. It can be used to describe the organisms that live on, or in, the bottom of a waterbody.

Best management practices (BMPs). Methods, measures, or practices determined to be reasonable and cost-effective means for a landowner to meet certain, generally nonpoint source, pollution control needs. BMPs include structural and nonstructural controls and operation and maintenance procedures.

Bioassessment. Evaluation of the condition of an ecosystem that uses biological surveys and other direct measurements of the resident biota.

cfu. colony-forming units.

Clean Water Act (CWA). The Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972), Public Law 92-500, as amended by Public Law 96-483 and Public Law 97-117, 33 U.S.C. 1251 et seq. The Clean Water Act (CWA) contains a number of provisions to restore and maintain the quality of the nation's water resources. One of these provisions is Section 303(d), which establishes the TMDL program.

Conventional pollutants. As specified under the Clean Water Act, conventional contaminants include suspended solids, coliform bacteria, high biochemical oxygen demand, pH, and oil and grease.

CREP. Conservation Reserve Enhancement Program.

CRP. Conservation Reserve Program.

CWSRF. Clean Water State Revolving Fund.

DMME. Virginia Department of Mines, Minerals, and Energy.

E. Coli (Escherichia coli). One of the groups of fecal coliform bacteria associated with the digestive tract of warm-blooded animals used as indicator organisms (organisms indicating presence of pathogens) to detect the presence of pathogenic bacteria in the water.

Ecoregion. A region defined in part by its shared characteristics. These include meteorological factors, elevation, plant and animal speciation, landscape position, and soils.

Ecosystem. An interactive system that includes the organisms of a natural community association together with their abiotic physical, chemical, and geochemical environment.

Effluent limitation. Restrictions established by a state or USEPA on quantities, rates, and concentrations in pollutant discharges.

Endpoint. An endpoint (or indicator/target) is a characteristic of an ecosystem that may be affected by exposure to a stressor. Assessment endpoints and measurement endpoints are two distinct types of endpoints commonly used by resource managers. An assessment endpoint is the formal expression of a valued environmental characteristic and should have societal relevance (an indicator). A measurement endpoint is the expression of an observed or measured response to a stress or disturbance. It is a measurable environmental characteristic that is related to the valued environmental characteristic chosen as the assessment endpoint. The numeric criteria that are part of traditional water quality standards are good examples of measurement endpoints (targets).

EQIP. Environmental Quality Incentives Program.

Fecal Coliform (FC). Indicator organisms (organisms indicating presence of pathogens) associated with the digestive tract.

FSA. Farm Service Agency.

FTE. Full-Time Equivalents.

Geometric mean. A measure of the central tendency of a data set that minimizes the effects of extreme values.

GIS. Geographic Information System. A system of hardware, software, data, people, organizations and institutional arrangements for collecting, storing, analyzing and disseminating information about areas of the earth. (Dueker and Kjerne, 1989).

GWG. Government Working Group.

GWLF. Generalized Watershed Loading Function. A watershed loading model developed to assess non-point source flow and sediment and nutrient loading from urban and rural watersheds.

HSPF. Hydrological Simulation Program – Fortran. A computer simulation tool used to mathematically model nonpoint source pollution sources and movement of pollutants in a watershed.

Impairment. A detrimental effect on the biological integrity of a water body that prevents attainment of the designated use.

Indicator organism. An organism used to indicate the potential presence of other (usually pathogenic) organisms. Indicator organisms are usually associated with the other organisms, but are usually more easily sampled and measured.

Margin of safety (MOS). A required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody (CWA Section 303(d)(1)(C)). The MOS is normally incorporated into the conservative assumptions used to develop TMDLs (generally within the calculations or models) and approved by the USEPA either individually or in state/USEPA agreements. If the MOS needs to be larger than that which is allowed through the conservative assumptions, additional MOS can be added as a separate component of the TMDL (in this case, quantitatively, a TMDL = LC = WLA + LA + MOS).

Memorandum of Understanding (MOU). A memorandum of understanding (MOU) may be used as a confirmation of agreed upon terms when an oral agreement has not been reduced to a formal contract. It may also be a contract used to set forth the basic principles and guidelines under which the parties will work together to accomplish their goals.

MS4. Municipal Separate Stormwater Sewer System.

Nonpoint sources (NPS). Pollution that originates from multiple sources over a relatively large area. Nonpoint sources can be divided into source activities related to either land or water use including failing septic tanks, improper animal-keeping practices, forest practices, and urban and rural runoff.

NRCS. Natural Resources Conservation Service.

OSTS. Onsite sewage treatment systems (e.g., septic systems and alternative waste treatment systems).

Phased/staged approach. Under the phased approach to TMDL development, load allocations and waste load allocations are calculated using the best available data and information recognizing the need for additional monitoring data to accurately characterize sources and loadings. The phased approach is typically employed when nonpoint sources dominate. It provides for the implementation of load reduction strategies while collecting additional data.

Point source. Pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants or industrial waste treatment facilities. Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river.

Pollutant. Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water. (CWA section 502(6)).

Pollution. Generally, the presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the Clean Water Act, for example, the term is defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water.

Public comment period. The time allowed for the public to express its views and concerns regarding action by the USEPA or states (e.g., a Federal Register notice of a proposed rule-making, a public notice of a draft permit, or a Notice of Intent to Deny).

Publicly owned treatment works (POTW). Any device or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature that is owned by a state or municipality. This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Rapid Bioassessment Protocol II (RBP II). A suite of measurements based on a quantitative assessment of benthic macroinvertebrates and a qualitative assessment of their habitat. RBP II scores are compared to a reference condition or conditions to determine to what degree a water body may be biologically impaired.

Riparian areas. Areas bordering streams, lakes, rivers, and other watercourses. These areas have high water tables and support plants that require saturated soils during all or part of the year. Riparian areas include both wetland and upland zones.

Riparian zone. The border or banks of a stream. Although this term is sometimes used interchangeably with floodplain, the riparian zone is generally regarded as relatively narrow compared to a floodplain. The duration of flooding is generally much shorter, and the timing less predictable, in a riparian zone than in a river floodplain.

Runoff. That part of precipitation, snowmelt, or irrigation water that runs off the land into streams or other surface water. It can carry pollutants from the air and land into receiving waters.

SE/R-CAP. Southeast Rural Community Assistance Project.

Sediment. In the context of water quality, soil particles, sand, and minerals dislodged from the land and deposited into aquate systems as a result of erosion.

Septic system. An on-site system designed to treat and dispose of domestic sewage. A typical septic system consists of a tank that receives waste from a residence or business and a drain field or subsurface absorption system consisting of a series of percolation lines for the disposal of the liquid effluent. Solids (sludge) that remain after decomposition by bacteria in the tank must be pumped out periodically.

Sewer. A channel or conduit that carries wastewater and storm water runoff from the source to a treatment plant or receiving stream. Sanitary sewers carry household, industrial, and commercial waste. Storm sewers carry runoff from rain or snow. Combined sewers handle both.

Source. An origination point, area, or entity that releases or emits a stressor. A source can alter the normal intensity, frequency, or duration of a natural attribute, whereby the attribute then becomes a stressor.

SPCA. Society for the Prevention of Cruelty to Animals.

Staged Implementation. A process that allows for the evaluation of the adequacy of the TMDL in achieving the water quality standard. As stream monitoring continues to occur, staged or phased implementation allows for water quality improvements to be recorded as they are being achieved. It also provides a measure of quality control, and it helps to ensure that the most cost-effective practices are implemented first.

Stakeholder. Any person with a vested interest in the TMDL development.

TMDL Implementation Plan. A document required by Virginia statute detailing the suite of pollution control measures needed to remediate an impaired stream segment. The plans are also required to include a schedule of actions, costs, and monitoring. Once implemented, the plan should result in the previously impaired water meeting water quality standards and achieving a "fully supporting" use support status.

Total Maximum Daily Load (TMDL). The sum of the individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources and natural background, plus a margin of safety (MOS). TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to a state's water quality standard.

TRC. Total Residual Chlorine. A measure of the effectiveness of chlorinating treated wastewater effluent.

TSWCD. Tazewell Soil & Water Conservation District (TSWCD).

USDA. United States Department of Agriculture.

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.

VADACS. Virginia Department of Agriculture and Consumer Services.

VADCR. Virginia Department of Conservation and Recreation.

VADEQ. Virginia Department of Environmental Quality.

VCE. Virginia Cooperative Extension.

VDH. Virginia Department of Health.

VDOF. Virginia Department of Forestry.

Watershed. A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

WHIP. USDA Wildlife Habitat Incentive Program. WHIP is a voluntary program for landowners and land users who want to develop or improve wildlife habitat on private agriculture-related lands.

WQIA. Water Quality Improvement Act.

WQMIRA. Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia), or NPS management measures.

WQMP. Water Quality Management Plan.

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APPENDIX A

Working Group and Steering Committee Minutes and Reports

Clinch River Nested TMDL Implementation Plan
Government / Industry Work Group Meeting
Cedar Bluff Town Hall
February 3, 2011 10:00 a.m. – 12:00 p.m.

SUMMARY
Meeting Attendees
Teresa Frazier, DEQ
Allen Newman, DEQ
Eddie Neel, VDH
Joey O'Quinn, DMME
Terisa Corell, TSWCD
Lenden Thompson, TSWCD
Martha Chapman, DCR

Introduction

A brief review of the TMDL, the purpose and role of the of the government work group were discussed.

Status of Implementation Plan Development

The first public meeting for the development of the implementation plan was held in conjunction with the final public meeting for the TMDL study on December 21. The first agriculture and residential/urban work group has scheduled for January 27, but was cancelled due to inclement weather. It has been rescheduled for March 1 at 6:00 p.m. at the Cedar Bluff Town Hall.

TMDLs and the Mine Permitting Process

The group reviewed a handout that summarized the needs for industrial best management practices in the Coal Creek watershed. DMME explained the increased timing of BMPs refers to mandatory pollutant reductions that are under time requirements. DMME has encouraged the increase of timing for the installation of these BMPs. The haul road stabilization reference in the handout includes gas well access roads. DMME allows increased stabilization on haul roads to be counted as offset credit in TMDL watersheds.

The group discussed the abandoned mine land features in the watersheds and DMME advised that most were low priority and would not qualify for their reclamation funds.

Proposed Roles/Responsibilities of Government Agencies in Plan Implementation

Natural Resource Conservation Service: administers the Conservation Reserve Enhancement Program (CREP) and the Environmental Quality Incentives Program (EQIP).

Tennessee Valley Authority: TVA's Clean Water Initiative builds partnerships with community residents, businesses, and government agencies to promote watershed protection.

TVA's Holston-Cherokee Douglas Watershed Team is responsible for carrying out the program. They focus on improving water and shoreline conditions so that people and aquatic life can benefit from having clean water.

Tazewell County: administer the county's erosion and sediment control program, provide mapping assistance. The County PSA provides sewerage collection and treatment for certain areas within the water shed and is currently constructing the major Baptist Valley collection system in this watershed.

Virginia Department of Environmental Quality: DEQ provides assistance with citizen monitoring and conducts follow-up ambient and biological monitoring to assess progress with the implementation against attainment of water quality standards. DEQ is the permitting agency for sewerage collection, treatment and discharge systems. In addition, DEQ permits single family home treatment and discharge units that may be used in implementation repair of some failing septic systems and straight pipes. The agency administers the Virginia Revolving Loan Program for sewerage collection and treatment projects and is funding the Baptist Valley collection system now being constructed by the Tazewell Co. PSA.

Virginia Department of Mines, Minerals, and Energy: DMLR will provide permit tracking through their TMDL offsets program as well as mining and remining permit inspection and oversight; Division of Gas and Oil will provide gas well permit inspection and oversight.

Virginia Department of Conservation and Recreation: provide assistance with grant writing and coordination of practices identified in implementation plan. DCR is responsible for administering Virginia's NPS reduction programs. DCR is also the lead agency in administering the Virginia Stormwater Management Program (VSMP) and Virginia's Erosion and Sediment Control Program (ESC).

Virginia Department of Health: responsible for maintaining safe drinking water by standards as set by EPA. VDH is also responsible for septic system regulation. Recently the VDH's Cumberland Plateau Health District has hired staff to inspect single family home discharging system once a year.

Tazewell Soil and Water Conservation District: provide state agricultural cost-share funds. The Natural Resource Conservation Service and the Virginia Department of Game and Inland Fisheries are also available to provide assistance. TSWCD has an extremely well developed education program which targets both school-aged children and adults.

Projected Growth & Planning

Plans identified that may be of use to the development of this implementation plan included: the Virginia Wildlife Action Plan, the Upper Tennessee Rive Roundtable's 5 Year Plan, the Nature Conservancy's Clinch Valley Program and the Clinch Powell Clean Rivers Initiative (CPCRI).

The Tazewell County Board of Supervisors is exploring the possibility of developing a zoning ordinance and associated zoning plan.

The Tazewell County PSA is currently constructing a large sewage collection system in the Baptist Valley service area of Tazewell County. Located north of the Town of Tazewell, this area includes Route 16 and Rouse 631 from with intersection with Route 16 to the Tennessee Valley Divide. This area has a history of issues with failing septic systems. The proposed project includes 15 miles of collection system and is expected to serve and estimated 694 customers. The total cost is approximately $10,200,000. The expected completion date is July 2011.

Monitoring During Implementation

Citizen Monitoring: No citizen monitoring activities are known in the watershed in the last two years. The SWCD has monitoring equipment available for Virginia Save-our-Streams monitoring, but it has not been used lately.

DEQ Biological and Ambient Monitoring:

Monitoring stations in the Upper Clinch River TMDL area include:

Stream	Station	Bacteria	Benthic
Big Creek	6BBIG000.12	X	
Big Creek	6BBIG000.99		X
Cavitts Creek	6BCAV000.02	X	
Cavitts Creek	6BCAV000.05		X
Clinch River	6BCLN315.11	X	
Clinch River	6BCLN320.91		
Clinch River	6BCLN321.13	X	
Coal Creek	6BCOL000.12	X	
Coal Creek	6BCOL001.93		X
Mudlick Creek	6BMCK000.11	X	
Mudlick Creek	6BMCK000.04		X
Middle Creek	6BMID000.20	X	X
Town Hill Creek	6BTHC000.03	X	
Town Hill Creek	6BTHC000.06		X

Stream	Station	Bacteria	Benthic
Clinch River	6BCLN346.60	X	
Clinch River	6BCLN346.80		X
Clinch River	6BCLN348.00	X	
Deskin Creek	6BDES000.06	X	
Johnson Branch	6BJNN001.35		
North Fork Clinch River	6BNCL000.30	X	
Plum Creek	6BPLU000.30		
Plum Creek	6BPLU000.40	X	
Plum Creek	6BPLU002.15	X	X
Pounding Mill Creek	6BPON000.04		
South Fork Clinch River	6BSFK000.77	X	

These stations will continue to be monitored in accordance with DEQ's ambient and biological monitoring programs. DEQ will conduct follow-up ambient and biological monitoring to assess progress with the implementation against attainment of water quality standards

Funding

The group discussed numerous funding opportunities primarily concerning the residential and urban portion of the implementation plan.

Steering Committee

It was mentioned that a member of the work group is needed to sit on the Steering Committee to provide the government work group summary at the steering committee meeting. The steering committee only meets one time after the draft of the plan is competed to discuss work group summaries, the draft plan, and the presentation planned for the final public meeting. Terisa Corell with the Tazewell Soil and Water Conservation District agreed to serve as the representative.

Clinch River Nested TMDL Implementation Plan
Agriculture and Residential/Urban Work Group Meeting
Cedar Bluff Town Hall
March 1, 2011 6:00 p.m. – 8:00 p.m.

SUMMARY
Meeting Attendees
Teresa Frazier, DEQ
Bob Raines, Citizen
Les Clevinger, VDH
David Olinger, Citizen
Dawn Olinger, Citizen
Erwin Earnest, Tazewell County
Terisa Corell, TSWCD
Lenden Thompson, TSWCD
Martha Chapman, DCR

Introduction

A brief review of the TMDL, the purpose and role of the agriculture and residential/work groups were discussed.

Status of Implementation Plan Development

The first public meeting for the development of the implementation plan was held in conjunction with the final public meeting for the TMDL study on December 21. The government/industry work group was held on February 3.

Outreach Methods

Everyone agreed that notices in the paper would be the best way to get participation from the community. The Tazewell SWCD sent out letters to many of their clients in the watershed. Everyone said more frequent notices in the local papers would be better. The advertisement for this meeting appeared only one time and participation may be limited since many community members may have forgotten or did not get a chance to view the one announcement.

An agriculture work group questionnaire was also discussed. A similar effort was very helpful in 2008 during the development of the Bluestone River TMDL Implementation Plan. This has been a good way to get comments from community members who are unable to attend the work group meetings.

BMP Overview: Residential/Urban

It was the consensus of the group that if cost-share assistance were available for residential implementation practices, it would be greatly utilized by the community. However, even if residents were interested many would be unable to pay for their part. The group discussed the Clinch Valley Community Action Program which works in Tazewell County with the

Southeast Rural Community Action Project and can assist those who qualify with installation of septic systems and pay for pumping septic systems. It was the consensus of the group that many homes in the watershed with septic systems are not maintaining them. Everyone felt lack of awareness and financial limitations are responsible for the lack to septic system maintenance. Other identified constraints include high costs and fear of regulation.

During the discussion of residential BMPs one participant pointed out that sewage overflow was occurring from a manhole in the Middle Creek watershed. This overflow was reported to DEQ's Southwest Regional Office. DEQ staff investigated the reported overflow and found a grease plug. The problem was corrected by the Town of Cedar Bluff as soon as they became aware of the overflow.

The group also discussed the use of pet waste composters and the benefits of handmade ones versus ones that can be purchased from PetSmart or Cabela's.

The average cost of a sewer connection in Tazewell County is $700; anything that would be more is cost plus 10%.

BMP Overview: Agriculture

Martha Chapman reviewed the types of BMPs available through the Virginia Agricultural Cost-Share Program as identified on the meeting handout.

Excluding livestock from streams

Improved pasture management

Conservation tillage

Vegetated buffers for cropland

Other suggested BMPs included reforestation of erodible crop and pastureland.

The group agreed the largest constraint to agricultural implementation is high initial costs and long term maintenance. Other constraints identified include Tazewell County's real estate tax appraisals on the areas identified as buffers. The tax rate for buffers is the same as for pasture even though it is not usable as pasture.

Representatives from the Tazewell SWCD indicated that fence maintenance is included in the unit cost for BMPs. However, they usually recommend barbed wire rather than woven wire since maintenance issues with barbed wire are less.

Technical Assistance

A good estimate of technical assistance needs is outlined in the Upper Clinch River Benthic TMDL Implementation Plan. It was determined during the development of this implementation plan that it would require $60,000 per year to support the salary, benefits, travel, and training of one technical FTE during years 1-5 of BMP implementation. It was

the consensus of the group that two FTEs would be needed to address both agricultural and residential/urban implementation needs.

Steering Committee

It was mentioned that a member of the work group is needed to sit on the Steering Committee to provide the agricultural and residential/urban work group summary at the steering committee meeting. The steering committee only meets one time after the draft of the plan is competed to discuss work group summaries, the draft plan, and the presentation planned for the final public meeting. The group decided a steering committee representative would be chosen at the next work group meeting when more community members were present.

Clinch River Nested TMDL Implementation Plan

Agriculture and Residential/Urban Work Group Meeting

Cedar Bluff Town Hall

April 21, 2011, 6:00 p.m. – 7:00 p.m.

SUMMARY

Meeting Attendees

Lenden Thompson, Tazewell SWCD

Terisa Corell, Tazewell SWCD

Rhonda Wimmer, Resident

Philip Wimmer, Resident

Allen Newman, DEQ

Martha Chapman, DCR

After Martha Chapman gave a brief review of the implementation plan development the group moved on to discuss stream fencing. Martha explained the two main fencing practices for which cost-share funding is available through the Ag BMP Program and asked if everyone thought the estimated number of systems was accurate. The group felt the estimated number for the Richlands area seemed slightly high. The group went on to discuss the stream protection practice which provides only permanent stream fencing hardened access. The group felt that an estimated number of these systems would be extremely low since most participants would prefer to have an alternate water supply.

The group also felt one of the main goals of implementation from the agriculture perspective would be to use aerial photography and visual surveys to verify livestock access in the watershed. Everyone agreed in the upper reaches of subwatersheds most streams are not subject to livestock access.

Mr. and Mrs. Phillip Wimmer attended to voice their opposition to the Tazewell Co landfill and its negative effects on WQ. They raised the following issues:

- Leachate discharging via the SW pond over a long period of time
- Failure of the pond overflow structure
- Suds and toxic chemicals in the stream in Lynn Hollow from the landfill

- Reduced property values
- Leachate escaping from the transfer station
- Poor operation and controls at the landfill over a long period of time

They ask about WQ data in the streams from the landfill.

Allen Newman, DEQ, responded with these comments:

First, he thanked them for attending and voicing their WQ concerns and indicated we would record his comments and share them with the DEQ Waste and Enforcement staff. Mr. Newman asked if they have contacted DEQ concerning their landfill issues. Mr. Wimmer stated that he has been in contact with Stacy Bowers, DEQ Waste, on a routine basis. Mr. Newman encouraged Mr. Wimmer to continue that dialog with DEQ on the issues that he believes are violation of the landfill permit. Mr. Newman asked if the Wimmer's have contacted County concerning their landfill issues. Mr. Wimmer responded in the affirmative. Mr. Newman then informed them that DEQ is addressing compliance issue at the landfill with the county and this discussion is ongoing. Mr. Newman informed them of the TMDL process which is to assess the WQ based on a host of sampling in the watershed. This sampling did not reveal and heavy metal or other toxic issues, the only WQ violation we found was bacteria.

It was mentioned that residents in the Lynn Hollow area of the county are concerned about recent issues with the counties landfill. Residents are concerned about the water quality in the area surrounding the landfill. Other concerns include failure of a pond overflow structure and leachate escaping from the transfer station. Residents in the Lynn Hollow area have been in contact with DEQ's Waste Division to raise their concerns. The group expressed interest in finding out the location of DEQ's closest sampling station to the landfill. Mr. Newman stated that he would provide the sampling location by email to the group.

In addition, Mr. Newman advised them that TMDL implementation would be accomplished in two ways: 1. Though permits at those facilities that have permits, such as the landfill, 2. Though co-operative efforts for NPS sites such as farms and urban areas that were not regulated directly by permits. In addition this particular meeting was to develop strategies for addressing NPS areas, (item 2 above). Finally, Mr. Newman invited him the final TMDL and IP public meeting on May 12 and stated that I would reply to them by email on the DEQ WQ sampling location closest to the landfill.

The group discussed selecting a steering committee representative. Everyone agreed that Mrs. Olinger, who attended the first work group meeting, would be a good selection. Tazewell SWCD staff agreed to speak with Mrs. Olinger about serving on the steering committee. The steering committee meeting is scheduled for May 12 at 3:30pm at the Cedar Bluff Town Hall. The final public meeting to present the implementation plan to the public is also scheduled for May 12 at 6:30pm.

Clinch River TMDL Implementation Plan Development
Steering Committee Meeting
Cedar Bluff Town Hall, Cedar Bluff, Virginia
May 12, 2011

Meeting Attendees

Lenden Thompson, Tazewell SWCD

Terisa Corell, Tazewell SWCD

Allen Newman, DEQ

Martha Chapman, DEQ

Rod Bodkin, MapTech-Inc.

Martha Chapman reviewed the working group minutes and they were accepted by the committee.