A Total Maximum Daily Load Implementation Plan For Fecal Coliform Reductions

DRAFT

Submitted to
The Stakeholders of
Cedar Creek, Hall Creek, Byers Creek, and Hutton Creek Watersheds

On Behalf of
The Commonwealth of Virginia:
Department of Conservation and Recreation

Prepared by

MapTech

July 10, 2001

Introduction

TMDL is an acronym for Total Maximum Daily Load, which is the maximum amount of pollutant that a water body can assimilate without surpassing the state water quality standard. If the water body surpasses the water quality standard 10% of the time during an assessment period, the water body is placed on the Commonwealth of Virginia's 303(d) List of Impaired Waters. Cedar Creek, Hall Creek, Byers Creek, and Hutton Creek were placed on this list because of violations of the fecal coliform (FC) bacteria water quality standard. After this listing, FC TMDL Plans were developed for each impairment. After TMDL plans are written, Virginia's 1997 Water Quality Monitoring, Information and Restoration Act states in section 62.1-44.19:7 that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters". In fulfilling the state's requirement for the development of a TMDL Implementation Plan, a framework was established for reducing FC levels and achieving the water quality goals for which TMDL allocations were developed. With successful completion of the implementation plan, Virginia will be well on the way to restoring these impaired waters and enhancing the value of this important resource. Additionally, development of an approved implementation plan will improve the localities chances for obtaining monetary assistance during implementation.

It has been documented time and again the detrimental affects of bacteria in food and water supplies. For example, May 2000, in Walkerton, Ontario a town of approximately 5000 people, there were seven confirmed deaths with four other deaths under investigation, and over 2000 poisonings all attributed to drinking water polluted by E. *coli* Type 0157:H7 (Raine, 2000)(Miller, 2000). Financially, the contamination resulted in a $250 million class action lawsuit filed against the Ontario government. The source of the pollution according to the Cattleman's Association was probably runoff from a feedlot located more than 5 miles from the wells used for the town's water supply. According to veterinarian Gerald Ollis, cattle are the "number one reservoir for this type of E. *coli* " and five to forty percent of cattle shed the bacteria at any given time. E. *coli* is a type of fecal coliform bacteria commonly found in intestines of humans and animals.

August 8, 1994 VDH was notified of campers and counselors at a Shenandoah Valley summer camp developing bloody diarrhea. E. *coli* 0157:H7 was confirmed as the causative agent. In Franklin County Virginia, 1997, an outbreak of illnesses involving 3 children was attributed to E. *coli* (0157:H7) in Smith Mountain Lake. The children were exposed to the bacteria while swimming in the lake and a two year old hospitalized almost died as a result of the exposure (Roanoke Times, 1997). In August of 1998, 7 children and 2 adults at a Day-care Center in rural Floyd County were infected with E. *coli* (0157:H7). Upon investigation, two of the properties' wells tested positive for total coliform (Roanoke Times, 1998). June 6, 2000, Crystal Spring, Roanoke Virginia's second largest water source was shut down by Virginia Department of Health for E. *coli* contamination.

Isolated cases? No. Throughout the U.S., the Center for Disease Control estimates at least 73,000 cases of illnesses and 61 deaths per year caused by this one fecal coliform pathogen (i.e. E. *coli* 0157:H7 bacteria) (CDC, 2001). Other fecal coliform pathogens (e.g. E. *coli* 0111) are responsible for similar illnesses. In addition, other bacterial and

viral pathogens are indicated by the presence of fecal coliforms. Whether the source of contamination is human or livestock 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. Water quality standards are society's implementation of legislative measures resulting from an assessment of the acceptable risks.

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

- τ Review of the TMDL Development Study;
- τ Description of Water Quality Monitoring;
- τ Process for Public Participation;
- τ Assessment of Needs; and
- τ Cost / Benefit Analysis, and Implementation.

This booklet is an abbreviated version of the full plan, which can be obtained by contacting the one of the offices listed on the back cover.

Review of TMDL Development Study

Cedar, Hall, Byers, and Hutton Creeks are located in Washington County, Virginia, approximately 10 miles east of Abingdon, and drain to the Middle Fork Holston River. Hall Creek becomes Byers Creek at its confluence with Indian Run. Byers Creek is a 2-mile long segment of creek that extends from this point to its mouth at the Middle Fork Holston River (Figure 1). The Hall/Byers Creek watershed was treated as one unit in the TMDL development. The Cedar, Hall/Byers, and Hutton Creek watersheds are predominantly comprised of agricultural land uses (79%, 67%, and 67%, respectively), but also include urban/residential landuses (13%, 13%, and 10%, respectively) and forest (18%, 18%, and 10%, respectively) (Figure 2). The total amount of land in each watershed is 4,629 acres, 9,991 acres, and 7,149 acres in the Cedar, Hall/Byers, and Hutton Creek watersheds, respectively.

Summary of the TMDL development included:

- Most/all livestock must be excluded from streams within all impairments;
- Most/all failing septic systems and straight pipes must be identified and corrected; and,
- A 10% reduction of FC in runoff from improved pasture/hayfields in the Hutton Creek watershed.

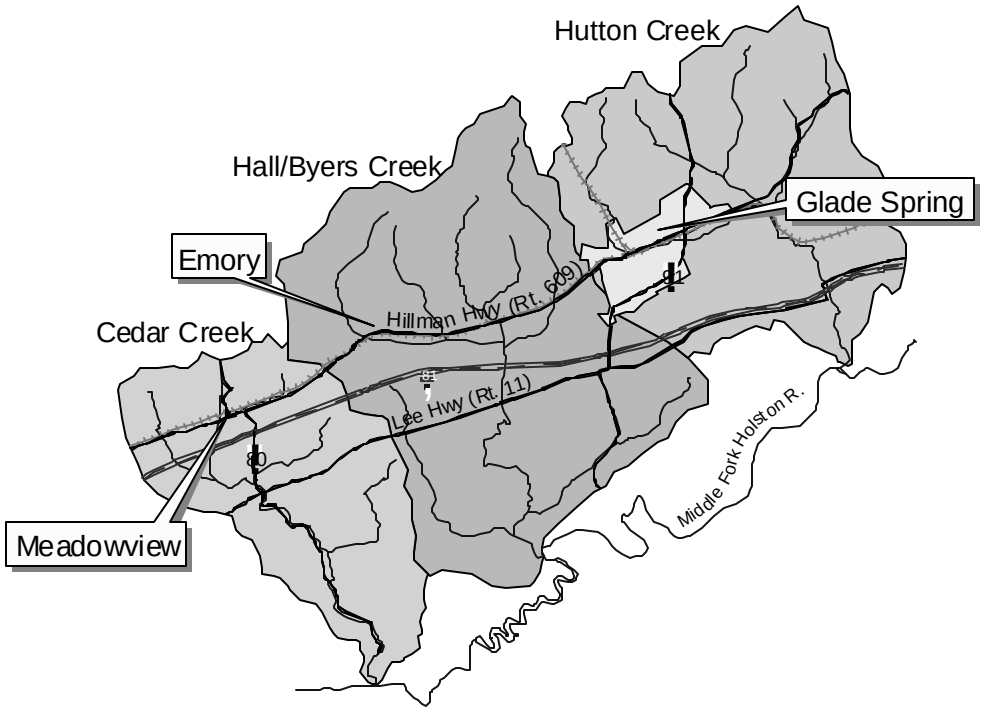


Figure 1 Cedar, Hall/Byers, and Hutton Creek watersheds.

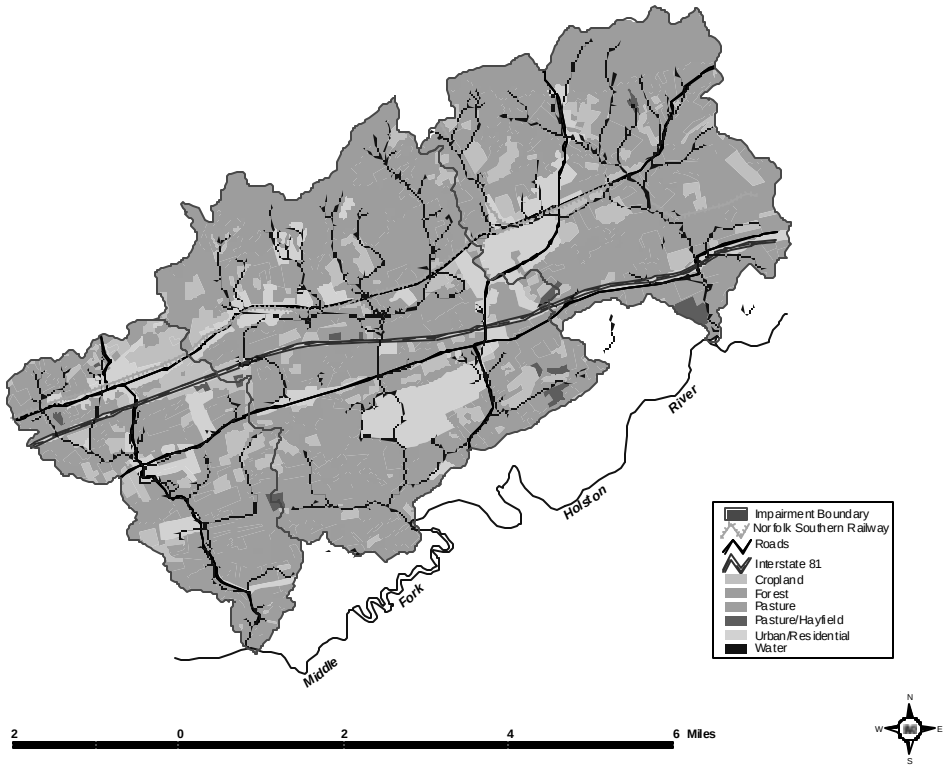
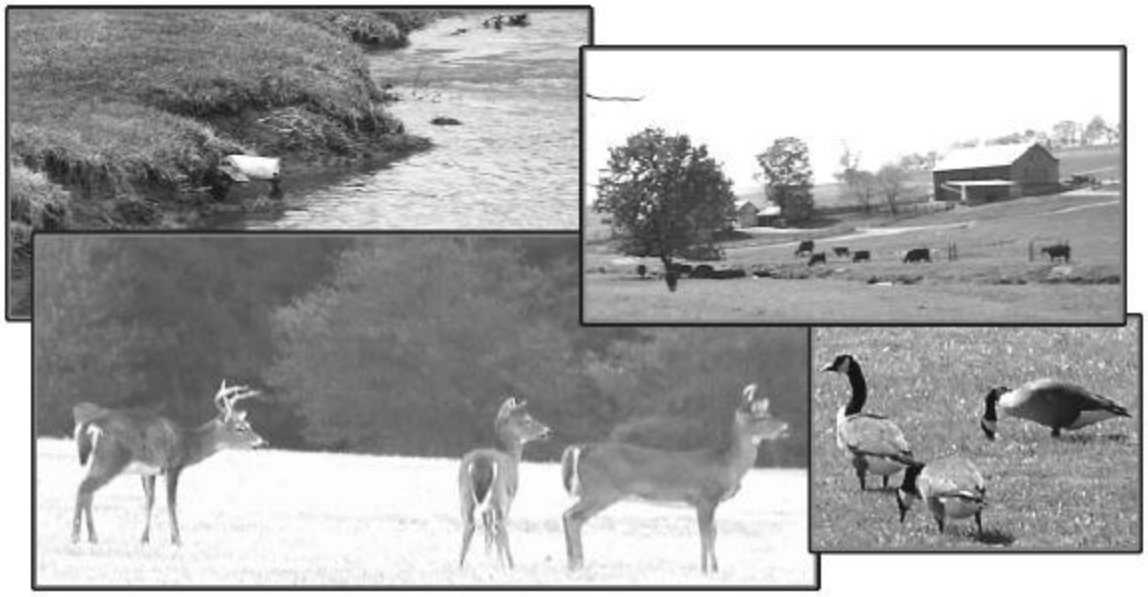


Figure 2 Land uses in the Cedar, Hall/Byers, and Hutton Creek watersheds.



Description of Water Quality Monitoring

Monitoring at 11 fixed sampling sites throughout Cedar Creek, Hall/Byers Creek, and Hutton Creek was performed monthly (Figure 3). The 11 fixed sampling sites were chosen based on land use and hydrography to represent areas of comparable size, equally distribute sites throughout the watershed, and to isolate influences from human, wildlife, and livestock. Sites were chosen as close to subwatershed outlets outlined in the TMDL development as possible. Three of the monitoring sites correspond to VADEQ (Virginia Department of Environmental Quality) sites that will be monitored during implementation at the outlets of the Cedar Creek, Hall/Byers Creek, and Hutton Creek watersheds. All water samples were analyzed for fecal coliform and fecal streptococcus. Bacterial Source Tracking was also run on each sample using Antibiotic Resistance Analysis, yielding the percentage of isolates classified as human, livestock, and wildlife. Based on stakeholder input, twelve additional water quality samples were collected at sites that help to refine the spatial distribution of sources (Figure 4). Three of the 12 were collected from springs that were suspected of fecal coliform contamination. The remaining 9 were located with the intent of isolating sources of human fecal coliform. Monitoring indicated a contribution of fecal coliform from livestock, human, and wildlife sources. The wildlife contribution alone was enough to push fecal coliform levels beyond the standard at five of the sampling sites. Human sources alone were also high enough to violate the standard at five of the sampling sites. Livestock sources were sufficient to violate the standard at eight of the eleven sampling sites. In the Cedar and Hutton Creek watersheds, livestock appears to be an issue throughout the watershed, while in the Hall/Byers Creek watershed, livestock problems appear limited to smaller tributaries (e.g. Indian Run and Tattle Branch). Human sources seem most significant in the Hall/Byers and Hutton Creek watersheds. Three of the additional sampling sites were located in the Hutton Creek watershed to try to spatially refine the distribution of sources.

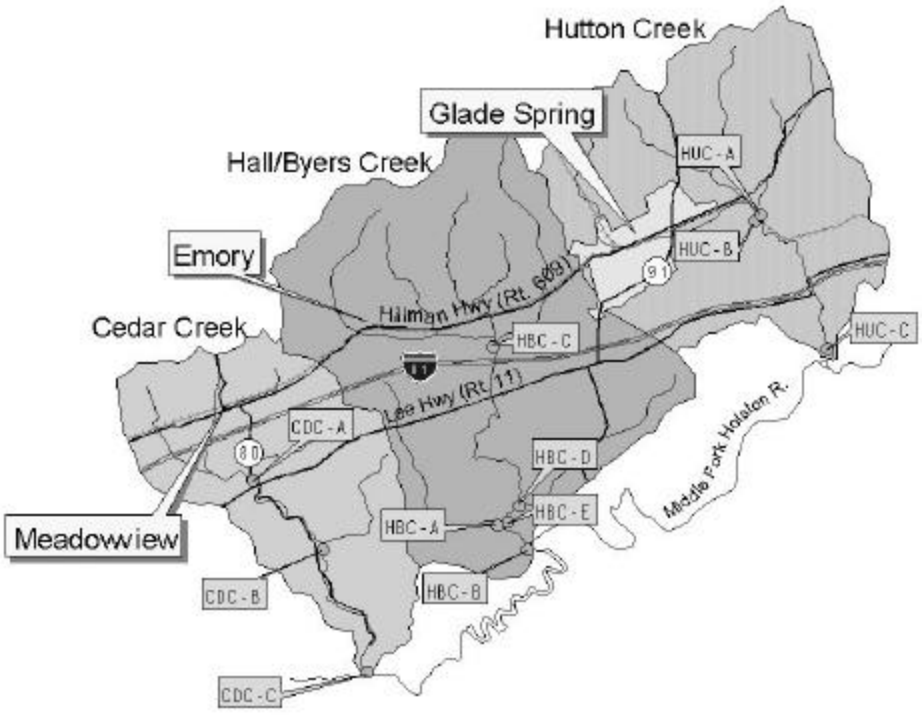


Figure 3 Fixed Monitoring Sites within Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds

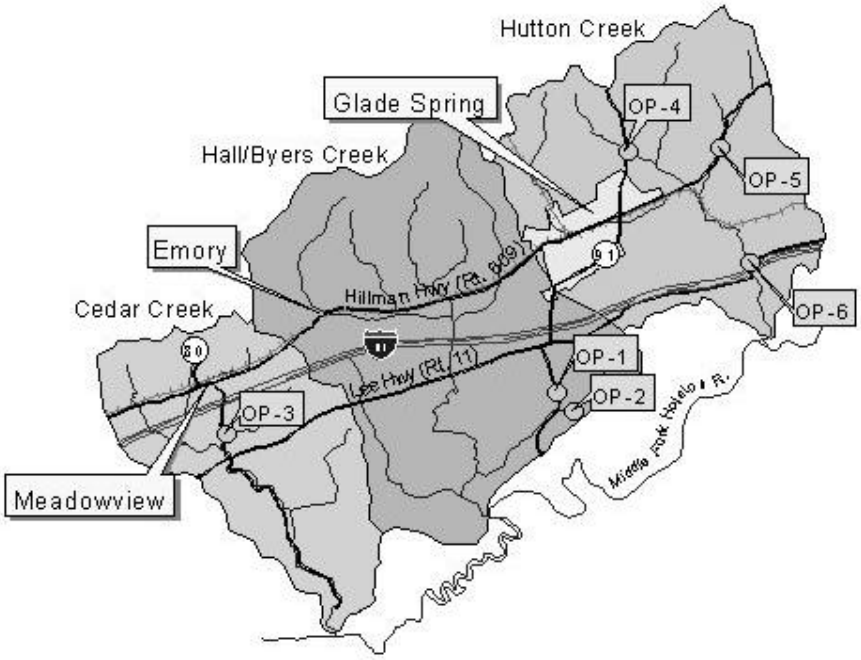


Figure 4 Additional Monitoring Sites within Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds

Table 1 Preliminary water quality monitoring results for Cedar, Hall/Byers, and Hutton Creeks.

Impairment	Station	% Violations (> 1,000 cfu/100ml)	Human (%)	Livestock (%)	Wildlife (%)
Cedar Creek	CDC-A	44	10	79	11
	CDC-B	33	17	57	26
	CDC-C	33	13	73	15
Hall/Byers Creek	HBC-A	33	9	72	19
	HBC-B	11	17	65	17
	HBC-C	33	40	37	23
	HBC-D	56	20	63	17
	HBC-E	33	42	28	31
Hutton Creek	HUC-A	33	17	63	20
	HUC-B	44	16	65	19
	HUC-C	67	23	44	33

Process for Public Participation

The actions and commitments described in this document are drawn together through input from citizens of the watersheds, the Washington County government, Washington County Board of Supervisors, Virginia Department of Conservation and Recreation (VADCR), Virginia Department of Environmental Quality (VADEQ), Virginia Department of Health (VDH), Virginia Cooperative Extension Service (VACES), Natural Resources Conservation Service (NRCS), Holston River Soil and Water Conservation District (HRSWCD), Virginia Department of Agriculture and Consumer Services (VDACS), Washington County Farm Bureau Association, and MapTech, Inc. Every citizen and interested party in the watersheds is encouraged to become involved in this initiative and contribute what they are able to help restore the health of the streams. Public participation took place on three levels. First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project, as well as, a forum for soliciting participation in the smaller, more-targeted meetings (i.e. focus groups and steering committee). The presentation given during the second of two public meetings is shown in Appendix A. Second, focus groups were assembled from communities of people with common concerns regarding the TMDL process and were the primary arena for seeking public input. The following focus groups were formed: Agricultural, Residential, and Governmental. A representative from VADCR, and MapTech attended each focus group in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from all of the focus groups, VADCR, VADEQ, and MapTech. Over 700 man-hours were devoted to attending these meetings by individuals representing agricultural, residential, commercial, environmental, and governmental interests on a local, state, and federal level.

Throughout the public participation process, major emphasis was placed on discussing best management practices (BMP) specifications, location of control measures,

education, technical assistance, and funding. A BMP Advisory Committee was formed by VADCR to address potential variances to the Virginia Agricultural Best Management Practices Cost-Share Program suggested by the Agricultural Focus Group and Steering Committee.

It was agreed by the Agricultural Focus Group, Steering Committee and the BMP Advisory Committee that appending BMP component specifications required in different programs should not be pursued. However, concern was expressed that there needed to be more flexibility in the timeline for installing practices, and the level of cost share. Members of the Agricultural Focus Group and the Steering Committee agreed that there was a potential constraint to farmers in that there are a limited number of contractors available for installing the required practices. Additionally, it may be an overwhelming thought for a landowner to install a complete system in a short period of time. It was generally accepted that greater incentives would be necessary to get the level of participation that is required (~100%), although many members of the Agricultural Focus Group and Steering Committee did not like the idea of "rewarding" those landowners who have not yet participated in existing programs by offering additional monetary incentives for installing BMPs. Additionally, the need for some level of cost share for alternative water supplies was pointed out by farmers and agency personnel. First, some landowners, who are concerned about the role that government plays in their lives, or are hesitant to allow the stream bank vegetation to grow after spending a lifetime trying to prevent it, may be willing to install their own fencing and manage it on their own terms if they get some help with the alternative water system. Second, and perhaps more importantly, technical personnel need to have something to offer the farmer when initiating a site visit. Being able to offer cost share on an alternative water source may allow them to start a conservation-planning dialog and perhaps convince the landowner to participate in higher-level BMP installation.

The Steering Committee members agreed that potential control measures identified through the implementation plan process would be practical, cost-effective, equitable, and based on the best science and research available. Implementation of the identified control measures should be administered in a timely manner to efficiently and economically target problem areas through stages. It was determined through Residential Focus Group and Steering Committee input that stream-walks must be performed during implementation to accurately identify straight pipes and failing septic systems. The group also recommended that landowners should be notified in advance and personnel in the field should ask permission upon arrival. Additionally, a pump-out and inspection program will aid in identifying failed septic systems. Emory & Henry College was suggested as one source of volunteers to perform stream walks during implementation.

All members of the Agricultural Focus Group, Residential Focus Group, Governmental Focus, and Steering Committee agree that education is key to getting people involved in implementation. There must be a proactive approach by agencies to contact farmers and residents to articulate exactly what the TMDL implementation means to them and what will most practically get the job done. Several education/outreach techniques will be utilized during implementation. Articles describing the TMDL process, the reasons why high levels of fecal coliform are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the

problem, and the potential ramifications of not dealing with the problem should be made available to the public through as many channels as possible (e.g. Farm Bureau newsletters, FSA newsletters, flyers included with water bills, and targeted mailings). Workshops and demonstrations should be organized to show landowners the extent of the problem, the effectiveness of control measures, and the process involved in obtaining technical and financial assistance.

For the agricultural community, field days, pasture walks, and presentations offered through local farm groups (e.g. grazing clubs) have been recommended. The emphasis was on having local farmers discuss their experiences with the cost-share programs, demonstrating the advantages of a clean water source and pasture management, and presenting monitoring results to demonstrate the problem. Small community meetings are recommended for educating homeowners about septic system maintenance. It was generally recognized that homeowners are unaware of the need for regular septic system maintenance. Demonstration septic pump-outs were recommended to show homeowners what was involved with having there system pumped and what they could do to facilitate the process. Additionally, educational tools, such as a model septic system that could be used to demonstrate functioning and failing septic systems, and video of septic maintenance and repair, would be useful in communicating the problem and needs to the public.

Traditionally, funding for residential issues have fallen on the landowner and funding for agricultural practices has been both voluntary and through the state's cost-share program. In addition to traditional sources of funding, approximately $1.6 million in 319 funding will be available this year for implementation in areas that have a state-approved implementation plan. In addition to the anticipated 319 funds, funding grants will be written during implementation. Suggestions to stimulate implementation included:

1.) 25% tax credit pursued statewide for the maintenance of stream exclusion fencing and associated watering systems;
2.) Tax credit equal to cost-share percentage (e.g. up to 75%);
3.) Cost share (e.g. 50%) for alternative water systems without streamside fencing; and,
4.) Additional 15% incentive payment applied to estimated or actual cost (whichever is less) in TMDL areas for full livestock exclusion systems.

Assessment of Needs

The quantity of control measures required during implementation was determined through spatial analyses of land use, stream-network, elevation, building-footprint, and soils maps along with regionally appropriate data archived in the DCR Agricultural BMP Database and TMDL Development documents. The map layers and archived data were combined to establish high and low estimates of control measures required overall, in each watershed, and in each subwatershed. Additionally, input from local agency representatives and contractors were used to verify the analyses. Estimates of control practices needed for full implementation in the four watersheds are listed in Table 2.

There are approximately 61 miles of stream in the three watersheds. The total length of fencing required for the three watersheds is expected to be 86 miles, predominantly in areas identified as pasture, but also in some woodland and cropland where cattle have access. Associated with the streamside fencing through pasture (and woodland adjacent to pasture) are 445 full livestock exclusion systems consisting of streamside fencing, cross fencing, and watering source. Streamside fencing of cropland will not require a full livestock exclusion system; instead, it is assumed that temporary poly-wire will be used to restrict livestock from entering stream. It has been estimated by Holston River Soil and Water Conservation personnel that approximately 12 miles of streamside fencing are already in place in these watersheds. The existing fencing was taken into account when estimating costs.

Table 2 Estimates of control measures, with unit cost, needed during implementation for agricultural and residential programs in Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds over a 5-year period of implementation.

Control Measure	Unit	Estimated Units Needed	Average Cost / Unit ($)
Agricultural Program:			
Full Exclusion System	system	445	7,471
Cropland Fencing	feet	7,000	1.10
Hardened Crossing	system	58	2,000
Technical Assistance	man-year	15.5	40,000
Residential Program:			
Sewer Connections	system	8	4,100
Septic System	system	67	2,500
Alternative Waste Treatment System	system	67	7,500
Drainfield Maintenance	system	67	1,500
Technical Assistance	man-year	2.5	40,000

In order to address the land reductions needed in the Hutton Creek watershed, the benefit of including a 25-ft. buffer with streamside fencing was calculated. The filtering effect of the 25-ft buffers appears to be adequate to achieve the required FC reductions. Additional improvements in runoff water quality should be realized due to increased vegetative cover resulting from improved pasture management that will be possible with installation of water systems. If water quality goals are not met after full livestock stream exclusion is accomplished in the Hutton Creek watershed, additional control measures will be explored. However, this circumstance does not appear to be likely at this time.

The number of failing private sewage treatment systems in the Cedar, Hall/Byers, and Hutton Creek Watersheds was estimated based on the 4% annual failure rate reported

in the TMDL, an estimate of the total number of private systems in these three watersheds, and proximity of systems to streams and sinkholes. For this analysis, a GIS map layer of building footprints was obtained from Washington County. The buildings that are currently served by the Emory/Glade Spring Waste Water Treatment Plant (WWTP) were identified based on their distance from the sewer line. The local ordinances state that any home/business within 300 ft of a gravity sewer line, that would not require pumping or crossing property lines to connect to the line, is required to pay the connection fee and be a user or pay the availability fee (currently $10.67). For the purposes of this study, buildings that were within 300 ft of the sewer line were assumed to be served by the WWTP. Based on this analysis, there are approximately 1,042 buildings in the study area, not served by the WWTP, and close enough to a stream or sinkhole to impact water quality. Applying the 4% annual failure rate yields a total of 42 homes that will need systems repaired/replaced/installed each year.

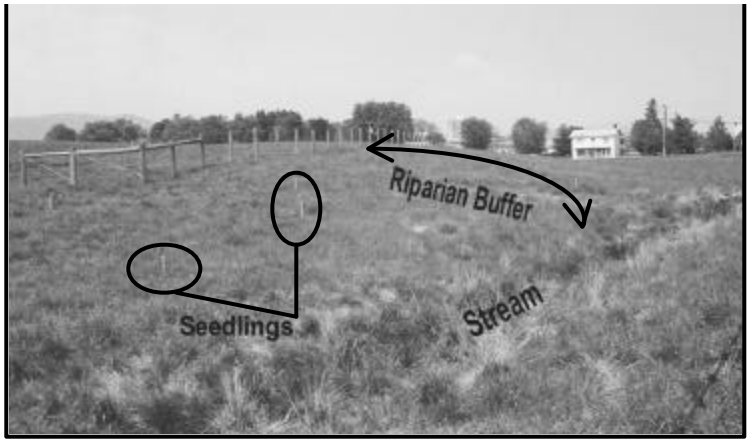
Of the buildings that are outside of the sewered area, 4% are close enough to the sewer line (i.e. within 500 ft) to make connection to the sewer system financially competitive with installing a septic system. It was consequently assumed that 4% of homeowners that will need to replace a failed septic system or straight-pipe during implementation will choose to connect to the sewer line. In the absence of reliable methods for determining the percentage of the remaining homes that would need system repairs vs. full system replacements vs. alternative systems, it was assumed that control measures were split evenly among these options.


Peat Moss Filter System

To determine the number of man-years necessary for agricultural technical assistance during implementation, the total practices needed to be installed per year during implementation was divided by the number of BMPs that a technician from HRSWCD has historically processed in a year. As a result, 15.5 man-years are needed to provide agricultural technical assistance through 5 years of implementation. Members of the Residential and Governmental Focus Groups estimated that 0.5 man-years would be required annually to provide residential technical assistance and educational outreach tasks identified during plan development. The number of man-years needed to provide technical assistance during implementation in the three watersheds is listed in Table 2.

Cost / Benefit Analysis

Associated cost estimates for full livestock exclusion systems needed were calculated by multiplying the unit cost by the number of units in each subwatershed (Table 2). As depicted in Table 3, the total cost to install control measures that will ensure full livestock exclusion from streams in the three watersheds is $3.45 million excluding technical assistance. The total cost of residential control measures (e.g. septic system repairs and replacements) was calculated in a similar manner, yielding a total cost estimate of $805,000 excluding technical assistance.



The Holston River Soil and Water Conservation District (HRSWCD) has agreed to take on the responsibility of overseeing both the agricultural and residential programs during implementation. It was determined by the HRSWCD and DCR personnel that it would require $40,000 to support the salary, benefits, travel, and training of one technical man-year. With quantification analysis yielding a need for 15.5 technical man-years, the total cost to provide agricultural technical assistance during implementation is expected to be $620,000 (Table 3). For residential technical assistance, approximately $100,000 is needed to support 2.5 technical man-years during the 5-year course of implementation. (Table 3)

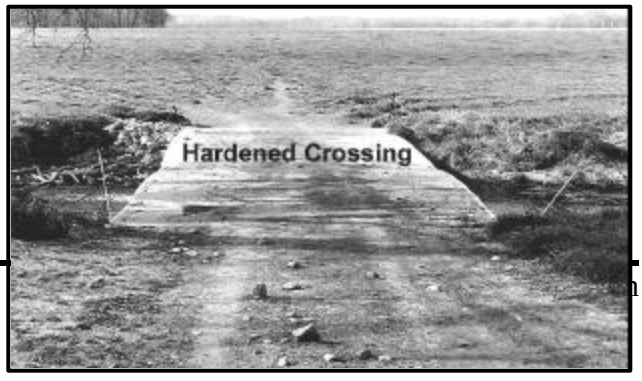
Table 3 Estimated total implementation cost for agricultural BMPs, residential BMPs, and technical assistance in Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds.

Control Measure	Average Total Cost (in million $)
Livestock Exclusion BMPs	3.45
Residential BMPs	0.81
Technical Assistance	
Agricultural Programs	0.62
Residential Programs	0.10
Total	4.98

The primary benefit of implementation is cleaner waters in Virginia. Specifically, fecal coliform concentrations in Cedar Creek, Hall/Byers Creek, and Hutton Creek will be reduced to meet water quality standards. It is hard to gage the impact that reducing fecal contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the reductions required, the incidence of infection from fecal sources, through contact with surface waters, should be reduced considerably. Additionally, because of stream-bank protection that will be provided through exclusion of livestock from streams, and restoration of the riparian area through implementation of the Conservation Reserve Enhancement Program (CREP) in some areas, the aquatic habitat will be improved and progress will be made toward reaching the General Quality standard (Benthic) in these waters. The vegetated buffers that are established will also serve to reduce sediment and nutrient transport to the stream from upslope locations. In areas where pasture management is improved through implementation of grazing-land-protection BMPs, soil and nutrient losses should be reduced, and infiltration of precipitation should be increased, decreasing peak flows downstream.

An important objective of the implementation plan is to foster continued economic vitality and strength. This objective is based on the recognition that healthy waters improve economic opportunities for Virginians and a healthy economic base provides the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the landowner, as well as, the expected environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, intensive pasture management, and private sewage system maintenance will each provide economic benefits.

A clean water source has been shown to improve weight gain and milk production in cattle. 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 (VCES, 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 (VCES, 1998b). A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills. In addition to reducing the likelihood of animals contracting waterborne illnesses by providing a clean water supply, streamside fencing excludes livestock from wet, swampy environments as are often found next to streams where cattle have regular access. Keeping cattle in clean dry areas has been shown to reduce the occurrence of mastitis and foot rot. The Virginia Cooperative Extension Service (1998a) reports that mastitis currently costs producers $100 per cow in reduced quantity and quality of milk produced. On a larger scale, mastitis costs the U.S. dairy industry about $1.7-2 billion annually or 11% of total U.S. milk production. While the spread of mastitis through a dairy heard can be reduced through proper sanitation of milking equipment, mastitis-causing bacteria can be harbored and spread in the environment where cattle have access to wet and dirty areas. Implementation of streamside fencing and well managed loafing areas will reduce the amount of time that cattle have access to these areas.



Taking the opportunity to instigate an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can

allow a producer to feed less hay in winter months, increase stocking rates by 30 - 40%, and consequently, improve the profitability of the operation. With feed costs typically responsible for 70-80 percent of the cost of growing or maintaining an animal, and pastures providing feed at a cost of .01-.02 cents/lb of total digestible nutrients (TDN) compared to .04-.06 cents/lb TDN for hay, increasing the amount of time that cattle are fed on pasture is clearly a financial benefit to producers (VCES, 1996). Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits, by allowing higher stocking rates and increasing the amount of gain per acre. A side benefit is that cattle are more closely confined allowing for quicker checking and handling.

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 with it. In terms of economic benefits to homeowners, an improved understanding of private sewage systems, including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. The average septic system will last 20-25 years if properly maintained. Proper maintenance includes; knowing the location of the system components and protecting them by not driving or parking on top of them, and 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 in comparison to repairing or replacing an entire system. Additionally, the repair/replacement and pump-out programs will benefit owners of private sewage (e.g. septic) systems, particularly low-income homeowners, by sharing the cost of required maintenance.

Implementation

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

- Federal Clean Water Act Section 319 Incremental Funds
- Virginia Agricultural Best Management Practices Cost-Share Program
- Virginia Agricultural Best Management Practices Tax Credit Program
- Virginia Agricultural Best Management Practices Loan Program
- Virginia Small Business Loan Program
- USDA Conservation Reserve Program (CRP)
- USDA Conservation Reserve Enhancement Program (CREP)
- USDA Environmental Quality Incentives Program (EQIP)
- USDA Wildlife Habitat Incentive Program (WHIP)
- USDA Wetland Reserve Program (WRP)
- Southeast Rural Community Assistance Project (SE/R-CAP)

One possible scenario for funding in the first year is presented in Table 4. This scenario represents 20% installation of needed agricultural systems addressing livestock exclusion

(i.e. full livestock exclusion system, cropland fencing, and hardened crossings), 20% of residential systems fixed/replaced (i.e. septic replacement/installations, alternative system replacement/installations, and drain-field maintenance), 1.5 agricultural technical man-years, and 0.5 residential technical man-years. Currently, there is one funded technician working for HRSWCD. Additionally, there is one full-time and one half-time technician working in the Abingdon NRCS office, all of whom will spend part of their time working in the three watersheds.

Table 4 One possible scenario for funding in the first year of implementation.

Funding Source	Agricultural ($)	Residential ($)	Total ($)
Landowner	59,000	84,000	184,000
Tax Credits	33,000	0	33,000
PL566	146,000	0	146,000
319 Incremental Funds			
Practices	275,000	93,000	368,000
Technical Assistance	120,000	20,000	140,000
EQIP	0	0	0
CREP	267,000	0	267,000
Southeast R-CAP	0	11,000	11,000
Total:	*941,000*	*208,000*	*1,149,000*

Progress toward end goals will be assessed during implementation through tracking of control measure installations and continued water quality monitoring. It is recommended that continued water quality monitoring be made based on the existing monitoring network and spatial distribution of the staged implementation plan. Water quality analysis should include fecal coliform enumerations, and BST analysis. BST will provide an indication of the effectiveness of specific groups of control measures, specifically agricultural and urban.

Implementation is scheduled to begin in July 2001 after which three milestones need to be met within the next ten years (Figure 5). The first milestone will be two years after implementation begins, whereby 50% of the livestock exclusion systems and 100% of the residential control measures will be installed with a 1% to 10% expected reduction in exceedances of geometric mean water quality standard (Table 5). After five years of implementation, 100% of the livestock exclusion systems will be installed resulting in a 100% anticipated reduction in exceedances. The final milestone will be delisting of the impaired segments from the Commonwealth of Virginia's 303(d) List of Impaired Waters, which is anticipated to occur by 2011 after 5 years of monitoring. Based on meeting the above milestones, a five-year implementation plan outline was formulated as depicted in Tables 6 and 7.

Table 5 Estimation of fecal coliform geometric mean water quality standard violations at each milestone in Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds.

Milestone	Cedar Creek (%)	Hall/Byers Creek (%)	Hutton Creek (%)
Existing	100	100	99
1	99	90	90
2	0	0	0
3	0	0	0

Implicit in the process of a staged implementation is targeting of control measures. Targeting ensures optimum utilization of resources. Targeting of critical areas for BMP installation was accomplished through analysis of land use, farm boundaries, stream network GIS layers, monitoring results, and survey responses. Monitored data collected during the development process was used together with spatial analysis results to identify subwatersheds where initial implementation resources would result in the greatest return in water quality improvement. Monitoring showed larger impact from livestock sources in the Cedar and Hutton Creek watersheds than in the Hall/Byers Creek watershed. The impact from human sources was greatest in the Hutton and Hall/Byers Creek watersheds. It was assumed that failed septic systems in close proximity to a stream would have a larger impact on water quality than an upland system. Therefore, spatial analysis was performed to identify residents within 300 feet of a stream. Using the results, efforts can be made to contact identified residents first during implementation to address septic system failures and straight pipes. Additionally, priority can be given to funding for these private sewage systems.

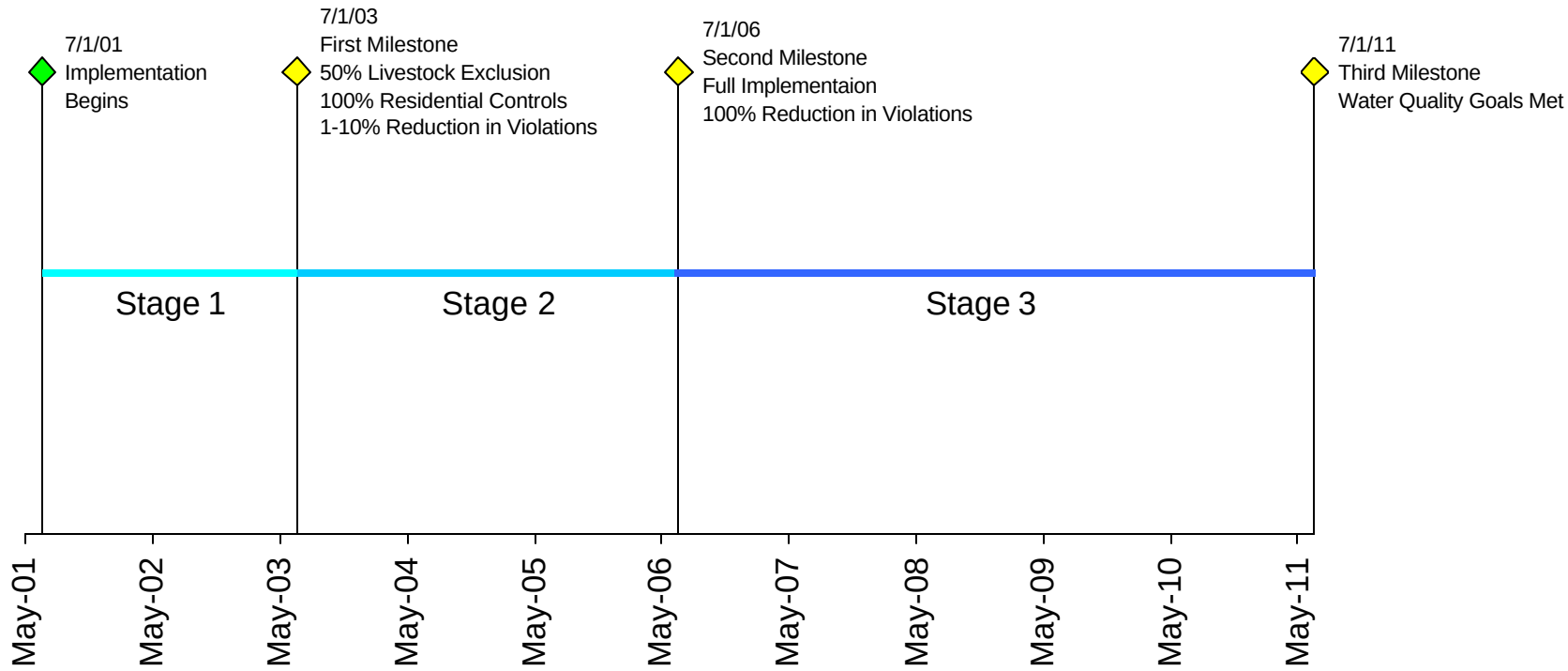


Figure 5 Implementation milestones for Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds.

Table 6 **Percentage of practices to be installed addressing livestock exclusion, failed septic systems, and straight pipes with amount of technical assistance needed in Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds.**

Date (year)	Livestock Exclusion (%)	Failed Septic & Straight Pipes (%)	Agricultural Technical Assistance (MAN-YEARS)	Residential Technical Assistance (MAN-YEARS)
1	20	20	3	0.5
2	30	20	3.5	0.5
3	20	20	3	0.5
4	20	20	3	0.5
5	10	20	3	0.5
Total	*100*	*100*	*15.5*	*2.5*

Table 7 **Cost associated with percentage of practices installed addressing livestock exclusion, land-applied reductions, failed septic systems, and straight pipes and technical assistance needed in Cedar Creek, Hall/Byers Creek, and Hutton Creek Watersheds.**

Date (year)	Livestock Exclusion ($)	Failed Septic & Straight Pipes ($)	Agricultural Technical Assistance ($)	Residential Technical Assistance ($)	Total Cost Per Year ($)
1	690,000	161,000	120,000	20,000	991,000
2	1,035,000	161,000	140,000	20,000	1,356,000
3	690,000	161,000	120,000	20,000	991,000
4	690,000	161,000	120,000	20,000	991,000
5	345,000	161,000	120,000	20,000	646,000
Total	*3,450,000*	*805,000*	*620,000*	*100,000*	*4,975,000*

Stakeholders' Roles and Responsibilities

Achieving the goals of this effort (i.e. improving water quality and removing these waters from the impaired waters list) is without a doubt dependent on stakeholder participation. Not only the local stakeholders charged with implementation of control measures, but also the stakeholders charged with overseeing our nation's human health and environmental programs must first acknowledge there is a water quality problem and then make changes in our operations, programs, and legislation to address these pollutants.

The US Environmental Protection Agency (USEPA) has the responsibility of overseeing the various programs necessary for the success of the Clean Water Act (CWA). However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are four state agencies responsible for regulating activities that impact water quality in Virginia. These agencies include: Virginia Department of Environmental Quality, Virginia Department of Conservation and Recreation, Virginia Department of Agriculture and Consumer Services, and Virginia Department of Health.

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

VADCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. One such program is Virginia's Erosion and Sediment Control Law. Under this provision, a person must have an approved erosion and sediment control plan and a certification that the plan will be implemented before they can obtain a building permit. However, most VADCR programs dealing with agricultural NPS pollution historically have been through education and voluntary incentive programs. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the TMDL-required 100% participation of stakeholders. To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentive programs must be reevaluated to account for 100% participation. It should be noted that VADCR does not have regulatory authority over the majority of issues addressed here except for the Erosion and Sediment Control program.

Through Virginia's Agricultural Stewardship Act, VDACS Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the

Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. The Agricultural Stewardship Act is entirely complaint driven. As of May of this year, 152 complaints, of which 38% were founded, had been received statewide since the initiation of the legislation. No fines have resulted from these complaints.

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

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

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

In 1989, concerned residents of Castile, Wyoming County New York filed suit against Southview Farm. Southview had around 1,400 head of milking cows and 2,000 total

head of cattle. Tests on citizen's wells found them contaminated with nitrates traced to irresponsible handling of animal wastes by Southview. In 1990, Southview was given a notice of violations under the Clean Water Act. Rather than change their farming practices or address the contaminated wells they ignored the warning. In 1995, after court hearings and an appeal, the case was finally settled. Southview had to donate $15,000 to the Dairy Farms Sustainability Project at Cornell University, pay $210,000 in attorney fees for the plaintiff, and employ best management practices (Knauf, 2001). Closer to home, on the Eastern Shore of Virginia, an aquaculture operation, raising clams and oysters, sued his neighbor, a tomato grower. The aquaculture operation owner claimed the agricultural runoff created from the plasticulture operation was carrying pollutants that were destroying his shellfish beds. The suit was settled out of court in favor of the aquaculture operation for an undisclosed amount.

Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role, of course, falls on the landowner. However, local, state and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. An important first step in correcting the existing water quality problem is recognizing that there is a problem and that the health of citizens, particularly those who are least able to protect themselves (i.e. children), is at stake. While it is unreasonable to expect that the natural environment (e.g. streams and rivers) can be made 100% free of risk to human health, it is possible and desirable to make what improvements we can. Virginia's approach to correcting NPS pollution problems has been and continues to be encouragement of participation through education and financial incentives. However, if voluntary approaches prove to be ineffective and the public "will" is to force compliance with existing laws through court actions, then landowners may be required to implement corrective actions without economic assistance from the state and may face punitive fines for non-compliance.

Appendix A:

Presentation at 2nd Public Meeting

Cedar Creek,
Hall/Byers Creek,
and Hutton Creek
TMDL Implementation Plan
7/19/2001

Acknowledgements

Participants of Stakeholder Meetings

&

Holston River Soil & Water Conservation District

New River Highlands RC&D

Washington County Farm Bureau

VADCR and VADEQ staff & volunteers

Total Maximum Daily Load

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

Presentation Outline

1. Review of TMDL Development
2. Water Quality Monitoring
3. Public Participation
4. Assessment of Needs
5. Cost / Benefit Analysis
6. Implementation

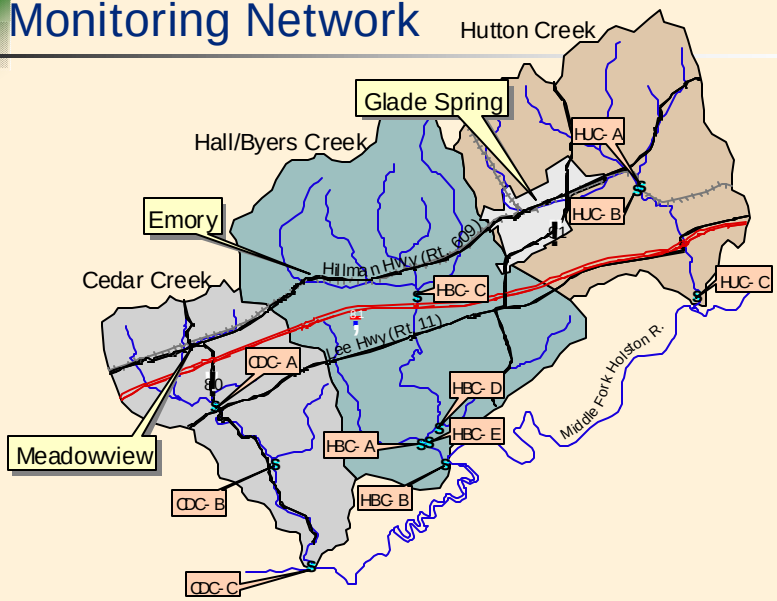
Summary of TMDL

- Submitted by CH2M Hill in April 2000
- Most/all livestock excluded from streams
- Repair or replace most/all failing septic systems (including “straight-pipes”)
- 10% reduction in loads from Hay Fields & Improved Pastures in Hutton Creek

Water Quality Monitoring

- Fecal Coliform
- Bacterial Source Tracking
  (Livestock, Wildlife, or Human)
- 1-year, monthly
- 11 fixed stations
- 12 additional samples

Monitoring Network



Water Quality Monitoring Summary

Impairment	Violations (> 1,000 cfu/100 ml)	Human	Livestock	Wildlife
Cedar Creek	37%	14%	68%	18%
Hall/Byers Creek	33%	25%	55%	20%
Hutton Creek	48%	19%	55%	25%

Public Participation

- Public Meetings
- Focus Group
- Steering Committee Meetings

Public Participation (Cont.)

- Summary
  - Challenges of Implementation
  - Changes to Current Agricultural Cost-Share Programs
  - Location of Control Measures
  - Education and Technical Assistance

Assessment of Needs

- Identification of Control Measures
- Quantification of Control Measures
  - Spatial Analysis
  - BMP Database Analysis
- Technical Assistance and Education
  - BMP Database Analysis

Assessment of Needs

Agricultural Control Measures

- Livestock Exclusion
  - 61 Miles Total Stream Length
  - 86 Miles of Streamside Fencing
  - 445 Full Exclusion System
  - 58 Hardened Crossings

Assessment of Needs
Residential Control Measures

- 42 Failing Septic Systems Annually
  - Includes “straight-pipes”
- Continued maintenance & repair

Assessment of Needs
Technical Assistance

- Agricultural
  - 15.5 Man-Years (over 5 years)
- Residential
  - 2.5 Man-Years (over 5 years)

Cost/Benefit Analysis

- Cost Analysis
  - Control Measures
  - Technical Assistance
- Economic Benefit Analysis
  - Agricultural Producer Benefits
  - Homeowner Benefits
  - Community Benefits

Implementation Total Cost

Agricultural BMPs	$3.45 million
Residential BMPs	$0.81 million
Technical Assistance	$0.72 million
TOTAL	$4.98 million

Livestock System: Scenario 1

Well + Plumbing + Troughs	$10,000 – 15,000
1,000' Streamside Fencing	$2,000
5,000' Cross-Fencing	$5,500
Hardened Crossing	$2,000 – 3,000
TOTAL	$22,500 – 30,500

Livestock System: Scenario 2

City Water + Plumbing + Troughs	$3,000 – 5,000
500' Streamside Fencing	$1,000
TOTAL	$4,000 – 6,000

Private Sewage System

Pump-Out & Inspect	$150 - 200
Septic System Repair	$1,000 - 2,000
Septic System Replacement	$2,000 – 3,000
Alternative System	$7,500 – 20,000

Benefit Analysis

- Economic Benefit
  - Agricultural Producer
  - Homeowner
  - Local Economy
- Environmental Benefit
- Community Benefit

Implementation

- Funding Sources
- Milestones Identification
- Timeline
- Targeting
- Stakeholder's Role in Implementation

Funding Sources

- Many funding sources:
  - 319 Incremental Funding
  - 319/WQIA
  - PL566
  - EQIP
  - CREP
  - SE/R-CAP
  - VADEQ Agricultural Loan Program
  - VADEQ Small Business Loan Program

Funding Sources

Livestock System: Scenario 1

State Cost Share Program:

Total Cost	$25,000
75% Cost-Share	-$18,750
15% TMDL Incentive	-$3,750
25% Tax Credit	-$625
Cost to Landowner	$1,875

Funding Sources

Livestock System: Scenario 1

CREP Program:

Total Cost	$25,000
75% Cost-Share	-$18,750
40% Incentive	-$10,000
Cost to Landowner	-$3,750

Landowner makes $3,750!

+ $76/acre rental payment.

Funding Sources

Livestock System: Scenario 1

If regulatory authority or court action forces participation:

Total Cost	$25,000
0% Cost-Share	-$0
Cost to Landowner	$ 25,000

Funding Sources

Residential Programs (SE/R-CAP)

- Southeast Rural Cooperative Assistance Program (SE/R-CAP)
- Financial assistance to provide water supply and waste treatment to households making less than 125% of the federal poverty level.

  (Family of 3: $18,288)

Funding Sources

Residential Programs (SE/R-CAP)

- $1,500 toward Septic System
- $2,000 toward Alternative System
- $1,000 toward Tap Fee for Sewer Connection
- $2,000 toward Lateral for Sewer Connection
- $600 toward miscellaneous emergencies

Funding Sources

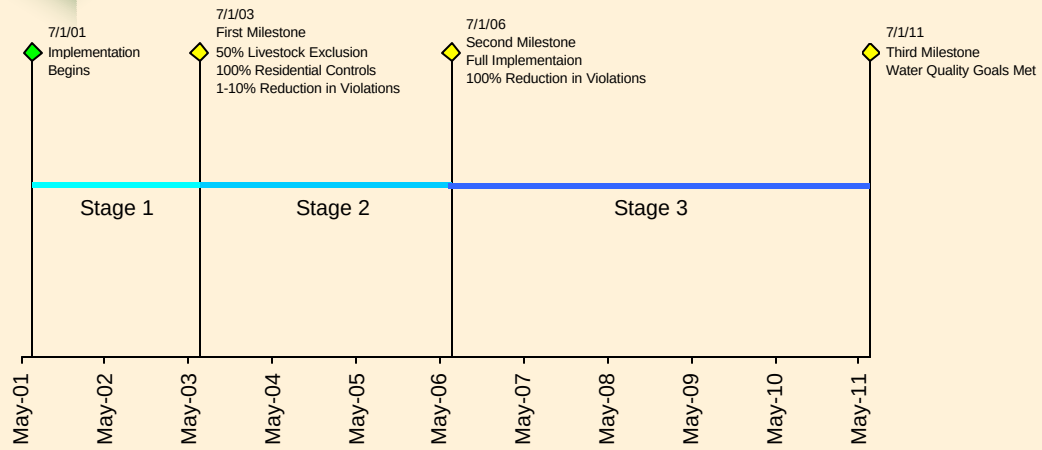
Residential Programs (319 Funds)

Percent of Median Income	Income	Percent of Population Earning Less	Percent of Cost-Share on Repair/Replacement
40%	$9,421	15%	80%
60%	$14,132	28%	70%
80%	$18,842	41%	60%
----	----	100%	50%

Milestones

- Implementation Milestones
  - Number of practices installed based on anticipated technical assistance and funding
- Water Quality Milestones
  - Determined through modeling

Milestones

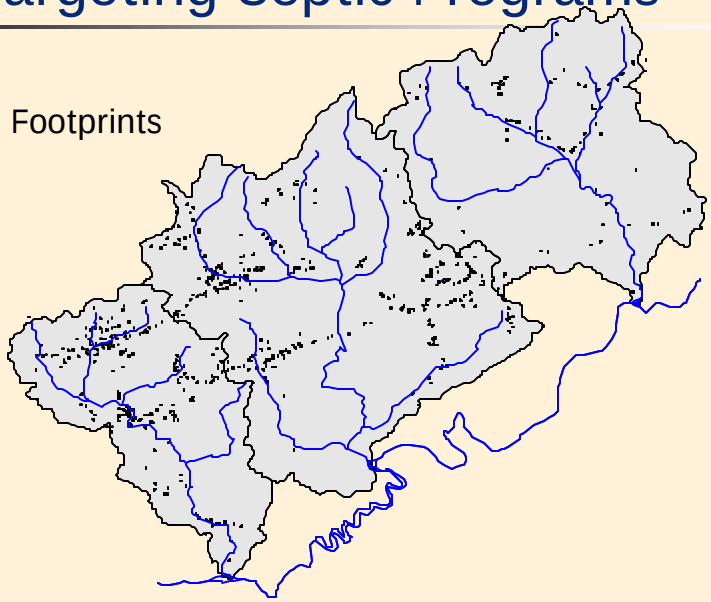


Targeting

- Spatial Analysis
- Monitoring Results
- Modeling

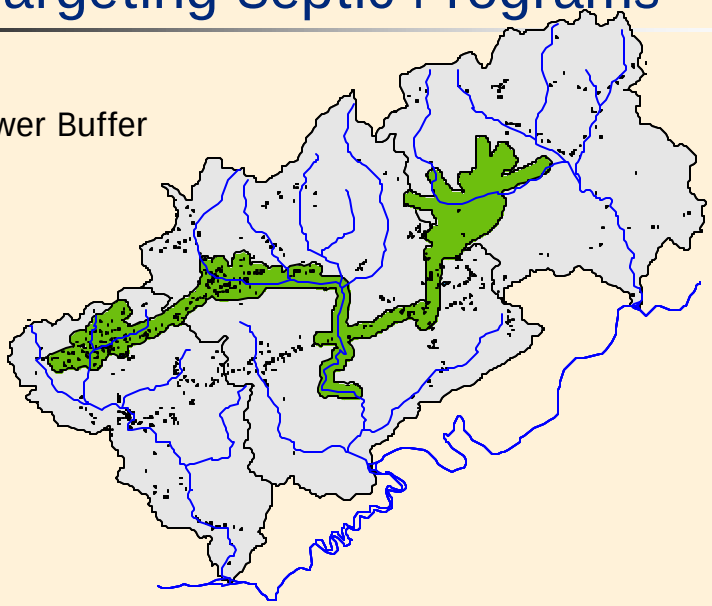
Targeting Septic Programs

Building Footprints



Targeting Septic Programs

300’ Sewer Buffer



Targeting Septic Programs

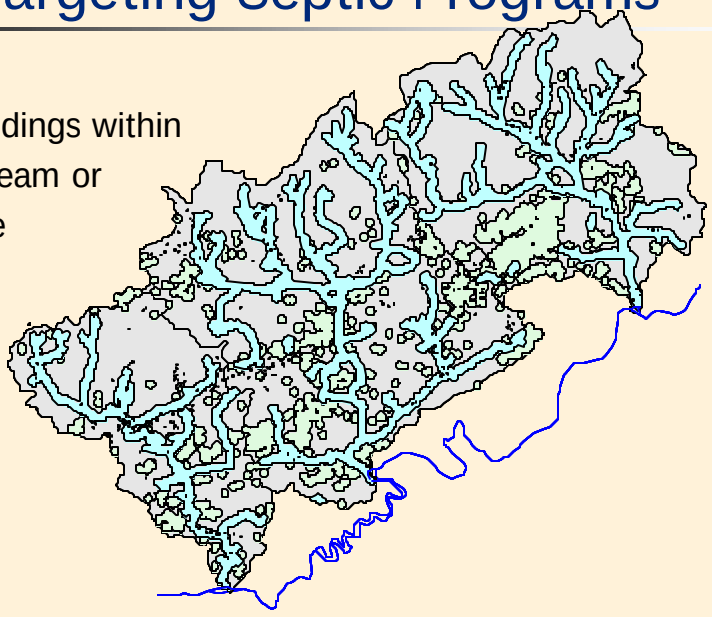
Non-Sewered Buildings
(1,363 Buildings)

Targeting Septic Programs

517 Buildings within 300' of Stream

Targeting Septic Programs

721 Buildings within 300' Stream or Sinkhole



Stakeholder's Role in Implementation

- Roles
  - Watershed Residents
  - HRSWCD
  - USEPA, VADCR, VADEQ
  - VA Department of Agriculture & Consumer Services
  - VA Department of Health
  - VA Cooperative Extension Service
  - USDA - Natural Resources Conservation Service
  - State and Local Government

Notes

Notes

Notes

LOCAL CONTACT INFORMATION

Virginia Department of Conservation and Recreation
252 West Main Street, Suite 3
Abingdon, VA 24210
(540) 676-5529

Virginia Department of Environmental Quality
355 Deadmore Street
P.O. Box 3000
Abingdon, VA 24212-1688
(540) 676-4802

Virginia Department of Health
Mount Rogers Health District
165 East Valley Street.
Abingdon, VA 24210
(540) 676-5474

Virginia Cooperative Extension Service
234 West Valley Street, Suite B
Abingdon, VA 24210
(540) 676-6309

Natural Resources Conservation Service
448 Commerce Drive
Abingdon, VA 24211-3829
(540) 676-8187

Holston River Soil and Water Conservation District
448 Commerce Drive
Abingdon, VA 24211-3829
(540) 676-8187

Virginia Department of Agriculture and Consumer Services
P.O. Box 1163
Richmond, VA 23218
(804) 786-3501

MapTech, Inc.
1715 Pratt Drive, Suite 3200
Blacksburg, VA 24060
(540) 961-7864