Water Quality Improvement Plan

Hays, Moffatts, Walker and Otts Creeks

A plan to reduce bacteria in the water

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Prepared by

The Virginia Department of Conservation and Recreation

In Cooperation with

Local Stakeholders

The Virginia Department of Environmental Quality

Department of Biological Systems Engineering,
Virginia Tech Center for Watershed Studies

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Rockbridge County

Upper James RC&D

Walkers Creek Volunteer Fire Department

Washington and Lee University

Photo: Stephanie Beebe

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Introduction

The Clean Water Act (CWA) requires that all of our streams, rivers, and lakes meet the state water quality standards.

The CWA also requires that states conduct monitoring to identify polluted waters that do not meet standards. Through our monitoring program, the state of Virginia has found that many streams do not meet state water quality standards for protection of the five beneficial uses: recreation, the production of edible and marketable natural resources, aquatic life, wildlife, and drinking. When streams fail to meet standards they are placed on the state's impaired waters list, and the state must then develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a stream, meaning that 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. Non-point source pollution occurs when pollutants are transported across the land to a body of water when it rains. Point source pollution occurs when pollutants are directly discharged into a stream. Through the TMDL process, states establish water-quality based controls to reduce pollution and meet water quality standards.

Water Quality Problems in Hays, Walker, Moffatts and Otts Creeks

A TMDL was completed for these creeks in January 2008 after water quality monitoring showed that they were violating the State's water quality standard for bacteria, which is based on the concentration of *E. coli* in the water. The *E. coli* standard states that the *E. coli* bacteria count should not exceed a geometric mean of 126 colony forming units (cfu) per 100 milliliters (mL) of water for two or more samples taken over a 30-day period, and it should not exceed 235 cfu per 100 mL at any time. When a creek continues to violate this standard, it becomes a human health concern since elevated concentrations of bacteria are a signal of an increased risk of illness or an infection after coming into direct contact with the water. The TMDL study identified the sources of bacteria in the watersheds and specified the maximum amount of bacteria that the creeks can handle and still meet the water quality standard.

Photo: Stephanie Beebe

Creating a TMDL Implementation Plan

Once a TMDL is developed for a stream, the next step is to create a plan that identifies how the pollutant reductions identified in the TMDL can be achieved. A TMDL Implementation Plan describes actions that can be taken by landowners in the watersheds that will result in improved water quality in the stream. There are nine components included in an implementation plan:

1. Causes and sources of bacteria and sediment that will need to be controlled to meet the water quality standards
2. Reductions in pollutants needed to achieve water quality standards
3. Management measures (BMPs) that will need to be implemented to achieve the pollutant reductions
4. Technical and financial assistance needed, associated costs, and the authorities that will be relied upon to implement the plan
5. An information/education component that will be used to enhance public understanding on the project and encourage participation in selecting and implementing best management practices
6. A schedule for implementation of the practices identified in the plan
7. Goals and milestones for implementing best management practices
8. A set of criteria for determining if bacteria and sediment reductions are being achieved and if progress is being made towards attaining water quality standards
9. A monitoring program to evaluate the effectiveness of the implementation effort

View of Jump Mountain in Hays Creek Watershed. Photo by Jay Gilliam

Review Of TMDL Studies

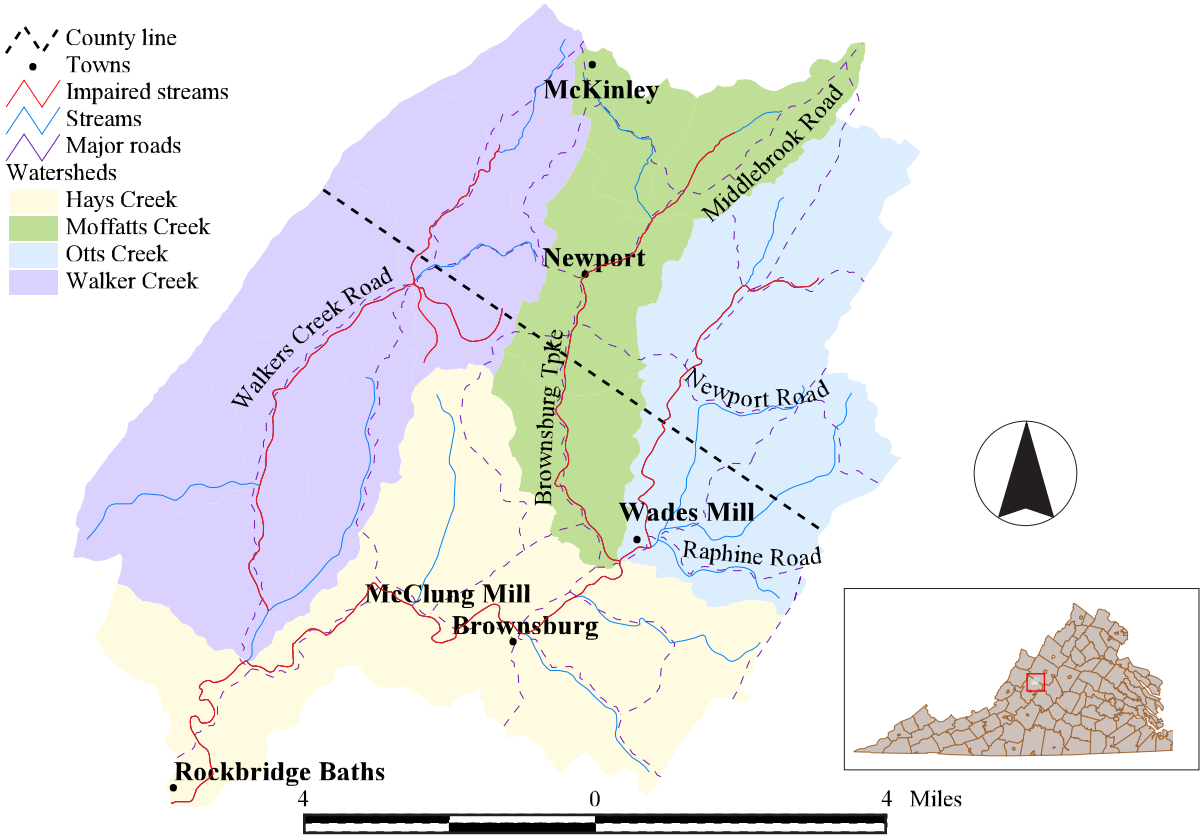


Figure 1. Location of the watersheds

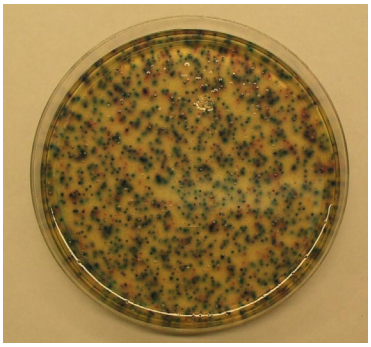
Watershed Characteristics

Hays Creek and its tributaries are located in Augusta and Rockbridge Counties in Virginia's James River Basin. Walker, Moffatts and Otts Creeks flow south into Hays Creek, which flows southwest into the Maury River. Land use in the watersheds is predominantly agricultural and forest. The watersheds total approximately 51,500 acres. According to the 2007 Census of Agriculture, Augusta County ranked second in the state for the total value of agricultural products sold while Rockbridge County ranked 39th out of 98 counties. The Augusta County also ranked second statewide for turkey and cattle/calve inventory, which were 1.5 million and 100,808 respectively. Turkey and cattle inventories were significantly lower in Rockbridge County (53,432 and 32,455, respectively).

The segment of Hays Creek impaired by bacteria extends from the confluence of Moffatts Creek to the confluence of the Maury River (11.99 miles). The impaired segment of Moffatts Creek begins at the headwaters and extends to the confluence with Hays Creek (7.66 miles). The impaired segment of Walker Creek stretches from the headwater tributaries to the confluence with Hays Creek (11.62 miles). The impaired segment of Otts Creek extends 5.13 miles from the confluence with an unnamed tributary at the Route 726 bridge crossing to the confluence with Moffatts Creek.

Sources of Bacteria

Agricultural runoff, direct deposition of manure in streams by livestock, and wildlife have been identified as the primary sources of bacteria in the creeks. Non-point sources of bacteria in the watersheds include failing septic systems, livestock (including manure application loads), wildlife, and domestic pets. Point sources including individual residences can contribute bacteria to streams through their permitted discharges. There are currently two point sources permitted to discharge bacteria in the Moffatts Creek watershed.



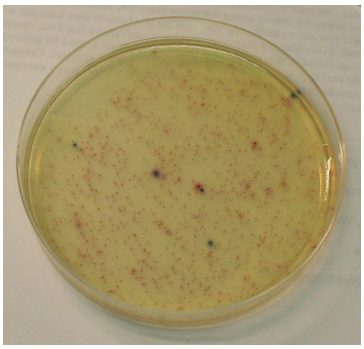


Photo shows coliscan plates, which reveal the presence and abundance of *E.coli* colonies (blue dots) and coliform bacteria colonies (red dots) in a tributary of Middle River in Augusta County where livestock have access to the stream (left) and where they have been excluded (right). Photo: Bobby Whitescarver, NRCS

Goals for Reducing Bacteria

The TMDL studies completed for the creeks identified goals for reducing bacteria from the different sources in the watersheds. These goals are based on what it would take to reach the point where the creeks would never violate the water quality standard for *E. coli* (Table 1).

Table 1. Goals for bacteria reductions. Note: DD=direct deposition

Watershed	Fecal Coliform Reduction from Source Category (%)					
	Cattle DD	Cropland	Pasture	Straight Pipes/Septic	Residential	Wildlife DD
Hays and Moffatts	90%	95%	95%	100%	0%	90%
Walker Creek	100%	95%	99%	100%	0%	30%
Otts Creek	65%	95%	95%	100%	0%	55%

Public Participation

Collecting input from the local community on conservation and outreach strategies to include in the TMDL Implementation Plan was a critical step in this planning process.

A public meeting was held on the evening of June 24, 2010 at the Rockbridge Baths Fire Hall to kick off the development of the implementation plan. This meeting served as an opportunity for local residents to learn more about the problems facing the creeks and work together to come up with new ideas to protect and restore water quality in their community. This meeting was publicized through a press release published in local papers, email announcements, invitations mailed to riparian landowners, and signs and flyers posted throughout the watersheds. The meeting included a presentation by DCR staff on current water quality issues in the watersheds and development of the implementation plan. Washington and Lee collaborators presented oral histories collected from local residents to share local knowledge about the creeks and land use in the watershed. Approximately 60 people attended the meeting. A final public meeting was held on December 2, 2010 at the Rockbridge Baths Fire Hall to present the completed draft plan to the public and collect local input.

Two working groups (agricultural and residential) were formed in order to discuss implementation and outreach strategies suitable for different land uses in the watersheds. Each working group was made up of stakeholders who were familiar with land use management issues specific to their particular working group focus area. The groups met 1-2 times during the development of this plan.

The role of the Agricultural Working Group was to review conservation practices and outreach strategies from an agricultural perspective. During the first agricultural working group meeting, which was held

as a break out session during the first public meeting in June, the group discussed existing obstacles to livestock exclusion including maintenance and cost issues. The group discussed potential solutions to obstacles and noted the need for good examples of practices in the watersheds. Several farmers noted that comprehensive farm management strategies that include cross fencing and stream fencing, off stream water sources and alternative shade for livestock are necessary. A second agricultural working group meeting was held at the Walkers Creek Fire Hall on July 26, 2010. The group reviewed summaries of the extent of BMP implementation that would be needed to remove the creeks from the impaired waters list. The cost of these BMPs was also discussed along with a potential timeline for implementation. The group discussed the different types of fencing that could be used to exclude livestock from streams and the need for additional flexibility to use different materials when participating in state and federal cost share programs. There was considerable discussion about flooding in the watersheds, particularly along Hays Creek. It was suggested that a farm tour should be held in order to educate state and local conservation professionals on the obstacles farmers commonly face when implementing best management practices. When discussing targeting strategies for implementing agricultural practices, it was recommended that highly visible or "billboard" landowners be targeted first.

The primary role of the Residential Working Group was to discuss methods needed to reduce human and pet sources of bacteria entering the creeks. The residential working group met during a break out session at the first public meeting in June. The group discussed potential outreach strategies to encourage homeowners to maintain their septic systems including local television spots, weekly columns in newspapers and postcard mailings. There was some discussion of the use of pet waste digesters; however, homeowners did not think that these could be widely used by homeowners in the watershed. A second residential working group meeting was held on August 11 at the Walkers Creek Fire Hall. VA Health Department staff provided feedback on septic system repair and replacement costs. The group also discussed estimates of the number of straight pipes in the watersheds.

The Steering Committee met on October 6 at the Natural Bridge Soil and Water Conservation District office to discuss plans for the final public meeting and to review feedback received from the working groups to date. There was some discussion of potential for a farm tour in the watershed, and it was determined that this could be held after the final public meeting for the project. The group also reviewed updated implementation scenarios detailing what would be needed in order to remove the creeks from the impaired waters list. A second steering committee meeting was held on November 18 at the Natural Bridge Soil and Water Conservation District office to review the draft implementation plan prior to the final public meeting on December 2, 2010.

Implementation Actions

Photo: Mike Phillips, NRCS

An important part of the implementation plan is the identification of specific actions that will improve water quality in the watersheds.

This section provides a summary of what is needed to achieve the bacteria reductions specified in the TMDL study. Since this plan is designed to be implemented by landowners on a voluntary basis, it is necessary to identify actions including management strategies that are both financially and technically realistic and suitable for this particular community. As part of this process, the costs and benefits of these actions must be examined and weighed. Once the best actions were identified for implementation, estimates of the number of each action that would be needed in order to meet water quality goals were developed.

Management Actions Selected through Stakeholder Review

While management actions such as livestock exclusion and correction of failing septic systems were directly prescribed by the TMDL, a number of additional measures were needed to control bacteria coming from land-based sources. Various scenarios were developed and presented to the working groups, who reviewed both economic costs and the water quality benefits. The majority of these best management practices (BMPs) are included in state and federal agricultural cost share programs that promote conservation. In addition, innovative management practices suggested by local producers and technical conservation staff were considered. The final set of practices identified and the efficiencies used in this study are listed in Table 4. It should be noted that an adaptive management strategy will be utilized in the implementation of this plan. BMPs that are easiest to implement, provide the greatest water quality benefits, and offer the greatest economic return to landowners will be implemented first. The effectiveness of these practices will be continually evaluated, and adjustments of actions will be made as appropriate. As new technologies and innovative BMPs to address bacteria become available, these practices should also be evaluated for implementation in the watersheds.

Table 4. Bacteria reduction efficiencies for best management practices

BMP Type	Description	Bacteria Reduction	Reference
Direct deposit	Livestock exclusion from waterway	100%	1
Pasture	Streamside buffer (35 feet)	50%	2
	Pasture management	50%	2,4
	Sediment retention, erosion or water control structure/surface water runoff impoundment	70%	5,6
	Reforestation of highly erodible pasture/crop-land	Land use change	4
Cropland	Poultry litter storage	99%	2
	Dry manure storage	75%	3
	Continuous no-till	70%	3
	Sod waterway	50%	2
	Cropland buffers/field borders	50%	2
Straight pipes and septic systems	Septic tank pumpout	5%	2
	Septic system repair	100%	1
	Septic system replacement	100%	1
	Alternative waste treatment system	100%	1

References

1. Removal efficiency is defined by the practice.

2. VADCR. 2003. Guidance manual for Total Maximum Daily Load Implementation Plans. Available at: www.VADEQ.state.va.us/tmdl/ipguide.html.

3. Non-Point Source Best Management Practices and Efficiencies currently used in Scenario Builder - http://archive.cheasapeakebay.net/pubs/NPS_BMP_Table1_5.pdf

4. Effectiveness quantified through land use change in Generalized Watershed Loading Function (GWLF) model simulations.

5. Center for Watershed Protection, Stormwater Manager's Resource Center. Stormwater Management Fact Sheet: Wet Pond. Available at: www.stormwatercenter.et. Accessed November 3, 2010.

6. Winer, R. 2000. National Pollutant Removal Performance Database for Stormwater Treatment Practices: 2nd Edition. Center for Watershed Protection. Ellicott City, MD.

Livestock Direct Deposition

Photo: Mike Phillips, NRCS

The TMDL studies specify a 65-100% reduction in the direct deposit of waste into the stream by livestock, making some form of stream fencing necessary.

To estimate fencing needs, information on the stream network was compared with land use data. Stream segments that flowed through or were adjacent to pasture were identified. If the stream segment flowed through a pasture, it was assumed that fencing was needed on both sides of the stream. If a stream segment flowed adjacent to a pasture, it was assumed that fencing was required on only one side of the stream. Not every 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, meaning that livestock exclusion fencing should be installed. The VADCR Agricultural BMP Database was utilized in conjunction with input from SWCD and NRCS staff to determine typical characteristics (e.g., average length of fencing installed per fencing project) of the different livestock exclusion systems offered through the state and federal agricultural cost share programs so that the number of different systems needed could be accurately estimated. In addition, data on stream fencing already in place was collected for each watershed and subtracted from the total fencing needed (Table 5).

Farmers who wish to exclude their livestock from the stream have several options through state and federal cost share programs. A summary of cost share programs is provided on pages 32-35. Incentive payments vary based on the width of the streamside buffer that is installed between the fence and the stream, and the type of fencing that is installed. The portion of fencing that will be accomplished using a series of available fencing practices was based on historical data and input from farmers and agricultural conservation professionals.

Farmers who cannot afford to give up a significant amount of land for a streamside buffer can receive 50% cost share for the installation of exclusion fencing with a ten foot setback, cross fencing, and to provide an alternative water source for their livestock. It is estimated that 15% of total fencing in the watersheds will be installed using this particular practice (code LE-2T). If a landowner can afford to give up 35 feet for a buffer along the stream, then they are eligible to receive cost share at a rate of 85% to cover the costs of the stream fencing, cross fencing and providing alternative water. It is estimated that 25% of the total fencing in the watersheds will be installed using this particular practice (code LE-1T). In addition, it is expected that the Conservation Reserve Program (CRP) will be utilized by farmers. For farmers who are willing to install a moderate riparian buffer, there is the CRP practice, which requires a 20 foot setback from the stream in order to receive cost share for fencing and off stream watering. It is estimated that approximately 5% of fencing would be installed using the CRP practice. For those who are willing to install a 35 foot buffer or larger and plant trees in the buffer, the Conservation Reserve Enhancement Program (CREP) is an excellent option. This practice provides cost share and incentive payments ranging from 50% to 115% for fencing, planting materials, and alternative water source development. It is estimated that 55% of fencing in the watersheds will be installed through this program and the Environmental Quality Incentives Program (EQIP) (Table 6).

Table 5. Fencing needs assessment

Exclusion system	Linear Feet of Livestock Exclusion			
	Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
Total fencing possible	153,139	92,663	88,560	104,108
Fencing installed to date	51,993	14,091	7,727	11,597
Remaining fencing needed	101,146	78,572	80,833	92,511

Table 6. Livestock exclusion BMPs

Exclusion system		Linear Feet of Livestock Exclusion			
		Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
LE-1T		25,286	19,643	20,208	23,128
LE-2T		15,172	11,786	12,125	13,877
CRP		5,057	3,929	4,042	4,626
CREP & EQIP		55,630	43,215	44,458	50,881
TOTAL	Feet	101,146	78,572	80,833	92,511
	Miles	19	15	15	18

Implementation Actions for Pasture

Photo: Jay Gilliam

Runoff from pastures can carry with it bacteria from manure depositied on the pasture on its way to the stream.

Improved pasture management through the implementation of a prescribed grazing system can prevent overgrazing by livestock, thereby reducing runoff, increasing filtration and vegetative uptake of pollutants, and allowing farmers to better utilize their pasture acreage. Vegetated buffers are an excellent way to treat runoff from pasture. These buffers act as filters, trapping bacteria before it runs into the stream. The steering committee recommended that a riparian buffer maintenance program be included in the plan in order to provide farmers with assistance in invasive species control. While funding for such a program is not currently available through state and federal cost share programs, grant funding opportunities could be pursued to support such a program. Farmers can utilize state and federal cost share programs to convert highly erodible pasture such as areas with steep slopes and poor vegetative cover to forest. These types of pasture typically produce a lower yield of forage for livestock making them less optimal for grazing or cutting hay.

Table 7. Pasture BMPs

BMP		BMP Acres			
		Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
Riparian buffer	35 ft width	65	51	52	59
	20 ft width	4	3	3	4
	10 ft width	12	9	10	11
Improved pasture management		7,207	4,782	5,791	5,579
Conversion of highly erodible pasture to forest		360	239	290	112
Sediment retention, erosion or water control structure		1.1	0.75	0	0

Implementation Actions for Cropland

Photo: Jay Gilliam

Bacteria can run off of cropland when soils fertilized with manure are exposed to rainfall. The bacteria will make its way to the stream unless filtering practices like riparian buffers are in place to trap it.

Bacteria from the spreading of manure on cropland can end up in a stream unless the appropriate management practices are in place. Bacteria from manure spread on cropland can be reduced either by decreasing the source of the bacteria (spreading less manure or storing it longer so that bacteria will die off) or by the use of filtering practices like streamside buffer plantings (Table 8). Reducing tillage of the soil, increasing soil organic content and allowing better cover will also reduce the degree of runoff and soil loss from cropland during rain events.

Table 8. Cropland BMPs needed

BMP	Units	Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
Poultry litter storage	system	1	1	1	0
Beef manure storage	system	5	3	2	1
Cropland buffers	acres	25	11	8	29
Sod waterways	acres	17	11	15	6
Continuous no-till	acres	186	110	148	58

Straight Pipes and Failing Septic Systems

Since state law requires that failing septic systems and straight pipes be corrected once identified, a 100% reduction in bacteria from these sources is needed.

Estimates of the percentages of households served by failing septic systems and straight pipes (pipes directly discharging untreated sewage into the stream) in the watersheds are shown in Table 8. These estimates were developed as part of the TMDL studies. They are based on the age of homes in the watershed, and in the case of straight pipes, the proximity of homes to the stream. Estimates of needed repairs and replacements of failing systems with conventional and alternative systems were based on input from the Health Department and observations from septic system maintenance projects in the area. Based on existing conditions in the watersheds, it was estimated that approximately 60% of septic system replacements would be done with alternative waste treatment systems while the remaining 40% could be done using conventional septic systems. A septic tank pumpout program could be utilized to help educate homeowners in the watersheds about septic system maintenance and to locate and correct failing septic systems. This program could be implemented on a limited basis, targeting homes closest to streams. The estimates shown in Table 9 are based on pumping out septic tanks for 10% of households in each watershed.

Table 9. Residential wastewater treatment BMPs

Watershed	Failing septic systems	Straight pipes	Septic system repair	Alternative waste treatment system	Septic system replacement	Septic tank pumpout
Hays Creek	51	1	28	17	7	20
Moffatts Creek	34	2	17	11	8	18
Otts Creek	37	4	21	14	6	12
Walker Creek	43	3	24	15	7	16

Education and Outreach

Photo: Lynn Betts, NRCS (2000)

In order to get landowners involved in implementation, education and outreach and assistance with the design and installation of best management practices will be needed.

There must be a proactive approach to contact watershed 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 strategies that could be used. The steering committee also offered suggestions including the development of a website for the project. The agricultural working group suggested implementing a series of demonstration practices on farms in the watershed that illustrate whole farm management strategies including alternative water and off stream shade, rotational grazing and livestock exclusion. These demonstration projects should be located on highly visible properties in the watersheds. Farms tours were identified as another good way to reach farmers. In addition, presentations by large animal veterinarians on herd health and water quality were recommended as a good way to encourage area farmers to consider installing livestock exclusion practices. While significant efforts have been made to explain water quality benefits associated with agricultural BMPs, the working group thought that more effort is needed to highlight the management benefits to farmers.

The residential working group recommended running a series of articles on septic system maintenance in the local paper, partnering with Virginia Cooperative Extension and developing a program on septic system maintenance to offer in local schools. Postcard mailings were also suggested as a good way to reach out to homeowners. As of July 1, 2010, the Health Department began requiring the issuance of maintenance contracts with the installation of alternative waste treatment systems. This will also be helpful in increasing community awareness of septic system maintenance needs and preventing future failures. In order to encourage pet owners to pick up after their pets and prevent pet waste from running in to the creeks, a pet waste education program is recommended. This program could include the development and distribution of educational materials about the impact of pet waste on local streams. The residential working group recommended that outreach materials for the program be displayed at the post office, the Co-op in Fairfield and Boxerwood Gardens in Lexington.

The following tasks associated with outreach programs were identified:

Agricultural Programs

- Make contact with landowners in the watersheds to make them aware of implementation goals, cost-share assistance, and voluntary options that are available to agricultural producers interested in conservation
- Provide technical assistance for agricultural programs (e.g., survey, design, layout).
- Develop and distribute educational materials
- Organize educational programs (e.g., farm tours, presentations at VCE events or club events)

Residential Programs

- Identify straight-pipes and failing septic systems (e.g., contact landowners in older homes, septic pump-out program)
- Handle and track cost-share
- Develop educational materials & programs
- Organize educational programs (e.g., demonstration septic pump-outs, pet waste control)
- Distribute educational materials (e.g., informational pamphlets on TMDL IP and on-site sewage disposal systems).
- Assess progress toward implementation goals

Staffing Needed for Outreach and Technical Assistance

A critical component in the successful implementation of this plan is the availability of knowledgable staff to work with landowners on implementing conservation practices. While this plan provides a general list of practices that can be implemented in the watershed, property owners face unique management challenges including both design challenges and financial barriers to implementation of practices. Consequently, technical assistance from trained conservation professionals is a key component to successful BMP implementation. Technical assistance includes helping landowners identify suitable BMPs for their property, designing BMPs and locating funding to finance implementation.

The staffing level needed to implement the agricultural and residential components of the plan was estimated based on discussions with stakeholders and the staffing levels used in similar projects. Staffing needs were quantified using full time equivalents (FTE), with one FTE being equal to one full-time staff member. It was determined that 2 FTEs would be needed to provide the technical assistance needed for agricultural and residential implementation. The Natural Bridge Soil and Water Conservation District has a conservation technician position that is partially dedicated to working with landowners in the Hays Creek watershed, while the Headwaters Soil and Water Conservation District currently has a conservation technician position that is dedicated solely to TMDL implementation watersheds. Consequently, outreach and technical assistance with design and implementation of agricultural BMPs could be handled by existing staff at the SWCD's. However, there remains a need for a residential coordinator to conduct outreach and work with landowners to address failing septic systems and straight pipes in the watersheds. This position could be housed at one of the SWCD's or the local Health Departments.

Implementation Costs

Costs: Agricultural BMPs

The costs of agricultural best management practices included in the implementation plan were estimated based on data for Augusta and Rockbridge Counties from the VADCR Agricultural BMP Database and considerable input from SWCD and NRCS staff. When sufficient data were available, the search of the agricultural database for best management practices and their associated costs was limited to 2000 through 2010 so that estimates were as current as possible.

The total cost of livestock exclusion systems includes not only the costs associated with fence installation, repair, and maintenance, but also the cost of developing alternative water sources for LE-1T, LE-2T, CREP and CRP practices. 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 an up front incentive payment on $0.50 per linear foot to maintain stream fencing as part of the WP-2T practice; however, this practice has not been commonly used in the watershed since it does not provide cost share for alternative water systems. In addition, the average cost of fence maintenance is typically significantly higher. In developing the cost estimates for fence maintenance, a figure of $3.50/linear foot of fence was used. It was estimated that approximately 10% of fencing would need to be replaced over the timeline of this plan.

The majority of agricultural practices recommended in the implementation plan are included in state and federal cost share programs. These programs offer financial assistance in implementing the practices and may also provide landowners with an incentive payment to encourage participation. Consequently, when assessing costs it is important to consider both the potential cost to the landowner as well as the cost to state and federal programs. Table 10 shows total agricultural BMP costs by watershed.

Table 10. Estimated agricultural BMP costs by watershed.

Practice	Cost share code	Units	Unit cost	Cost by watershed			
				Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
Livestock exclusion with riparian buffers	CREP	system	$25,460	$270,000	$189,000	$189,000	$216,000
	CRP	system	$23,500	$70,500	$47,000	$47,000	$47,000
	LE-1T	system	$23,500	$305,500	$235,000	$235,000	$282,000
Livestock exclusion with reduced setback	LE-2T	system	$15,000	$120,000	$90,000	$90,000	$105,000
Livestock exclusion fence maintenance (20 yrs)	N/A	feet	$3.50	$35,400	$27,500	$28,291	$32,380
Improved pasture management	EQIP (529, 512)	acres	$100	$720,700	$478,200	$579,100	$557,880
Conversion of highly erodible pasture to forest	FR-1	acres	$180	$64,863	$43,040	$52,119	$20,084
Sediment retention, erosion or water control structure	WP-1	acres treated	$138	$6,210	$4,140	$0	$0
Cropland buffers	CP-33,WQ-1	acres	$258*	$6,450	$2,838	$2,149	$7,463
Sod waterways	WP-3	acres	$1,600	$27,200	$17,600	$24,629	$9,708
Continuous no-till	SL-15A	acres	$100	$18,600	$11,000	$14,840	$5,850
Poultry litter storage	WP-4,EQIP	facility	$38,000	$38,000	$38,000	$38,000	$0
Dry manure storage	WP-4,EQIP	facility	$58,000	$290,000	$174,000	$116,000	$58,000
TOTAL ESTIMATED COST				$1,973,423	$1,357,318	$1,416,128	$1,341,365

*CP-33 and WQ-1 practice cost average (50:50)

Costs: Residential BMPs

The costs of recommended residential BMPs were estimated using:

1) Cost data from other watersheds in Augusta, Rockingham and Shenandoah Counties where residential septic system maintenance programs have been implemented in the past 10 years.
2) Cost data from the Shenandoah Valley Soil and Water Conservation District, who completed a grant to distribute pet waste digesters to Rockingham County residents in 2008.
3) Input from the Augusta County Health Department and Residential Working Group.

These costs are shown for each watershed in Table 11.

Table 11. Estimated residential BMP costs by watershed.

Practice	Cost share code	Units	Unit cost	Cost by watershed			
				Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
Septic tank pumpout	RB-1	pumpout	$250	$5,000	$4,500	$3,000	$4,000
Septic system repair	RB-3	repair	$3,000	$84,000	$51,000	$63,000	$72,000
Conventional septic system	RB-4	system	$6,000	$42,000	$48,000	$36,000	$42,000
Alternative waste treatment system	RB-5	system	$18,000	$306,000	$198,000	$252,000	$270,000
Pet waste education program	N/A	program	$3,750	$938	$938	$938	$938
TOTAL ESTIMATED COST				$437,938	$302,438	$354,938	$388,938

Table 12. Total estimated costs of full BMP implementation

BMP Type	Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
Agricultural	$1,973,423	$1,357,318	$1,416,129	$1,341,365
Residential	$437,938	$302,438	$354,938	$388,938
TOTAL	$2,411,360	$1,659,756	$1,771,066	$1,730,303

Costs: Technical Assistance

Technical assistance costs were estimated for 2 full time positions using a cost of $50,000/position per year. This figure is based on the existing staffing costs included in the Virginia Department of Conservation and Recreation's grant agreement with the Headwaters Soil and Water Conservation District to provide technical assistance to landowners in TMDL implementation watersheds. Based on the 10 year timeline of this plan (described in great detail in the Implementation Timeline section of this plan), this would make the total cost of technical assistance approximately $1M. When factored into the cost estimate for BMP implementation shown in Table 12, this would make the total cost of implementation approximately $8.5M.

Photo: Stephanie Beebe

Implementation Benefits

The primary benefit of implementing this plan will be cleaner water in Hays Creek and its tributaries.

Specifically, *E. coli* contamination in the creeks will be reduced to meet water quality standards. It is hard to gage the impact that reducing *E. coli* contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, the incidence of infection from *E. coli* sources through contact with surface waters should be reduced considerably following the implementation of the measures outlined in this plan.

An important objective of the implementation plan is to foster continued economic vitality. 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, prescribed grazing, and private sewage system maintenance will each provide economic benefits to land owners. Additionally, money spent by landowners and other stakeholders in the process of implementing this plan will stimulate the local economy.

Benefits: Agricultural Practices

It is recognized that every farmer faces unique management challenges that may make implementation of some BMPs more cost effective than others. Consequently, costs and benefits of the BMPs recommended in this plan must be weighed on an individual basis. The benefits highlighted in this section are based on general research findings. Additional economic costs and benefits analyses of these practices at the local level was identified as a much needed outreach tool by the steering committee and agricultural working group.

Restricting livestock access to streams and providing them with clean water source has been shown to improve weight gain and milk production in cattle (Zeckoski et al., 2007). Studies have shown that increasing livestock consumption of clean water can lead to increased milk and butterfat production and increased weight gain (Landefeld et al, 2002). Table 13 shows an example of how this can translate into economic gains for producers. In addition, keeping cattle in clean, dry areas has been shown to reduce the occurrence of mastitis and foot rot. The VCE (1998) reports that mastitis costs producers $100 per cow in reduced quantity and quality of milk produced. Installation of streamside fencing and well managed loafing areas will reduce the amount of time that cattle have access to these areas. Implementing a prescribed grazing management strategy in conjunction with a providing livestock with a clean water source will also provide economic benefits for the producer. Standing forage utilized directly by the grazing animal is less costly and of higher quality than forage harvested with equipment and fed to the animal.

Table 13. Example of increased revenue due to installing off-stream waterers (Surber et al., 2005)

Typical calf sale weight	Additional weight gain due to off-stream waterer	Price	Increased revenue due to off stream waterer
500 lb/calf	5% or 25 lb	$0.60 per lb	$15 per calf

Note: Table from Zeckoski et al. (2007)

Benefits: Residential Practices

The residential program will play an important role in improving water quality since human waste can carry human viruses in addition to bacterial and protozoan pathogens. 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, 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 ($250 per pumpout) in comparison to repairing or replacing a system ($6,000 to $22,500).

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.

Watershed Health and Associated Benefits

Focusing on reducing bacteria loads in the Hays Creek watershed will have associated watershed health benefits as well. Overall herd health in the watershed is a significant associated benefit. Reductions in streambank erosion, excessive nutrient runoff, and water temperature are additional benefits associated with streamside buffer plantings. In turn, reduced nutrient loading and erosion and cooler water temperatures improves habitat for fisheries, which provides associated benefits to anglers and the local economy. The economic benefits of a thriving fishery including stocking operations (put-and- take and put-and-grow) are substantial. The Buffalo Creek Fishery near Collierstown is a great local example of a successful put-and-grow brown and rainbow trout fishery. According to a 2010 U.S. Fish and Wildlife Service Study of trout fishing in the United States, there were approximately 138,000 trout anglers (16 years or older) in Virginia in 2006, each of whom spent an average of 5 days a year fishing. This translated into considerable retail sales and state and federal tax revenues. Nationally, trout anglers spent an estimated $1.06 billion in 2006 on food and lodging for fish trips. In addition, anglers spent $32,362,000 and $18,654,000 on public and private land use fees respectively for fishing in 2006. Trout fishing related expenses generated $965,201,922 in federal tax revenues in 2006 and $807,005,252 in state and local tax revenues across the country (U.S. Fish and Wildlife Service, 2010).

Riparian buffers can also improve habitat for wildlife such as ground-nesting quail and other sensitive species. Data collected from Breeding Bird Surveys in Virginia indicate that the quail population declined 4.2% annually between 1966 and 2007. Habitat loss has been cited as the primary cause of this decline. As a result, Virginia has experienced significant reductions in economic input to rural communities from quail hunting. The direct economic contribution of quail hunters to the Virginia economy was estimated at nearly $26 million in 1991, with the total economic impact approaching $50 million. Between 1991 and 2004, the total loss to the Virginia economy was more than $23 million from declining quail hunter expenditures (VDGIF, 2009). Funding is available to assist landowners in quail habitat restoration (see pages 33-34).

Implementation Timeline

The end goal of implementation is restored water quality in Hays Creek and its tributaries. It is expected that this will occur over a 10-year period of implementation. Two types of milestones will be used to evaluate progress over the 10 year period: *implementation milestones and water quality milestones*. The implementation milestones establish goals for the extent of the different best management practices installed within certain time frames, while the water quality milestones establish the corresponding goals for improvements in water quality.

The timeline for implementation has been divided into two stages with Stage 1 spanning a period of eight years. Resources will be concentrated on the most cost-efficient best management practices first. Table 14 shows the cost of BMP implementation in each watershed at each stage while tables 15-17 show implementation and water quality improvement goals for each watershed in each implementation stage. In order to be removed from the impaired waters list, a stream cannot violate the *E. coli* standard more than 10.5% of the time. A violation rate below this cut-off was achieved for all the watersheds by the final stage of implementation. Achieving this goal in the Hays and Moffatts Creek watersheds was challenging due to bacteria contributions from wildlife. Without addressing wildlife contributions, it will not be possible to meet the water quality standard 100% of the time in these watersheds.

Table 14. BMP implementation costs by stage

Stage	Hays Creek	Moffatts Creek	Otts Creek	Walker Creek
Stage 1 (Years 1-8)	$2,287,901	$1,574,436	$1,675,918	$1,690,188
Stage 2 (Years 8-10)	$229,749	$156,179	$95,148	$40,115
Total	$2,411,360	$1,659,756	$1,771,066	$1,730,303

Table 15. Timeline for implementation in the Hays and Moffatts Creek watersheds

BMP Type	BMP	Units	Stage 1	Stage 2
Direct deposition	Livestock exclusion with riparian buffers	system	42	2
	Livestock exclusion with reduced setback	system	14	0
Pasture	Improved pasture management	acres	11,989	0
	Reforestation of highly erodible crop and pasture	acres	360	240
	Sediment retention, erosion or water control structure	ac-treated	0	75
Cropland	Cropland buffers	acres	36	0
	Sod waterways	acres	28	0
	Continuous no-till	acres	296	0
	Poultry litter storage	facility	0	2
	Dry manure storage	facility	8	0
Residential	Pet waste education prgm.	program	0	1
Septic	Septic tank pumpout	pumpout	38	0
	Septic system repair	repair	45	0
	Conventional septic system	system	15	0
	Alternative waste treatment	system	28	0
% Violation of Instantaneous E. coli standard			**10.5**	**10.2**
% Violation of Geometric mean E. coli standard			**18.8**	**18.8**

Table 16. Timeline for implementation in the Otts Creek watershed

BMP Type	BMP	Units	Stage 1	Stage 2
Direct deposition	Livestock exclusion w/riparian buffers	system	18	1
	Livestock exclusion w/reduced setback	system	6	0
Pasture	Improved pasture management	acres	5,791	0
	Reforestation of highly erodible crop and pasture	acres	116	174
Cropland	Cropland buffers	acres	8	0
	Sod waterways	acres	15	0
	Continuous no-till	acres	148	0
	Poultry litter storage	facility	0	1
	Dry manure storage	facility	2	0
Residential	Pet waste education program	program	0	1
Septic	Septic tank pumpout	pumpout	12	0
	Septic system repair	repair	21	0
	Conventional septic system	system	6	0
	Alternative waste treatment	system	14	0
% Violation of Instantaneous E. coli standard			**4.6**	**4.4**
% Violation of Geometric mean E. coli standard			**7.8**	**7.8**

Table 17. Timeline for implementation in the Walker Creek watershed

BMP Type	BMP	Units	Stage 1	Stage 2
Direct deposition	Livestock exclusion w/riparian buffers	system	21	1
	Livestock exclusion w/reduced setback	system	7	0
Pasture	Improved pasture management	acres	5,579	0
	Reforestation of highly erodible crop and pasture	acres	33	78
Cropland	Cropland buffers	acres	29	0
	Sod waterways	acres	6	0
	Continuous no-till	acres	58	0
	Dry manure storage	facility	1	0
Residential	Pet waste education program	program	0	1
Septic	Septic tank pumpout	pumpout	16	0
	Septic system repair	repair	24	0
	Conventional septic system	system	7	0
	Alternative waste treatment	system	15	0
% Violation of Instantaneous E. coli standard			**3.0**	**2.9**
% Violation of Geometric mean E. coli standard			**3.1**	**3.1**

Targeting Implementation

Implicit in the process of a staged implementation is targeting of best management practices. Targeting ensures optimum utilization of limited technical and financial resources. In order to determine where outreach efforts should be focused in the early stages of implementation, subwatersheds were ranked with respect to implementation priority for BMPs and associated outreach efforts. Several segments of Hays Creek that are experiencing significant erosion and flooding were identified as high priority areas for livestock exclusion and vegetated streamside buffer projects. One of these reaches is highlighted in yellow in Figure 2. Several properties located along this reach are highly visible from the road and would serve as excellent demonstrations project sites.

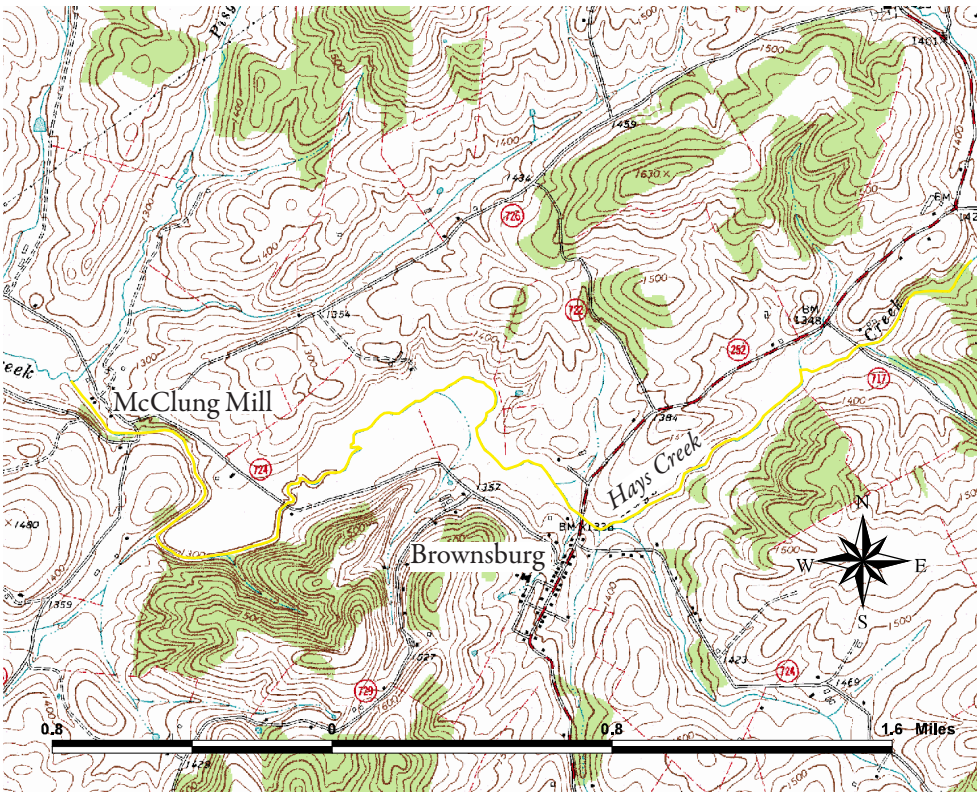


Figure 2. High priority reach of Hays Creek from McClung Mill past Brownsburg.

Fencing Prioritization by Subwatershed

Additional prioritization of livestock exclusion projects was accomplished through analysis of the amount of bacteria livestock are contributing through direct deposition of manure into the stream, and the length of fencing needed. Each watershed was divided up into a series of smaller subwatersheds, which were then ranked in descending order based on the ratio of bacteria loading per fence length and proximity to the headwaters of the creeks. If possible, effort should be made to prioritize resources for livestock exclusion in the following order of subwatersheds shown in Figure 3.

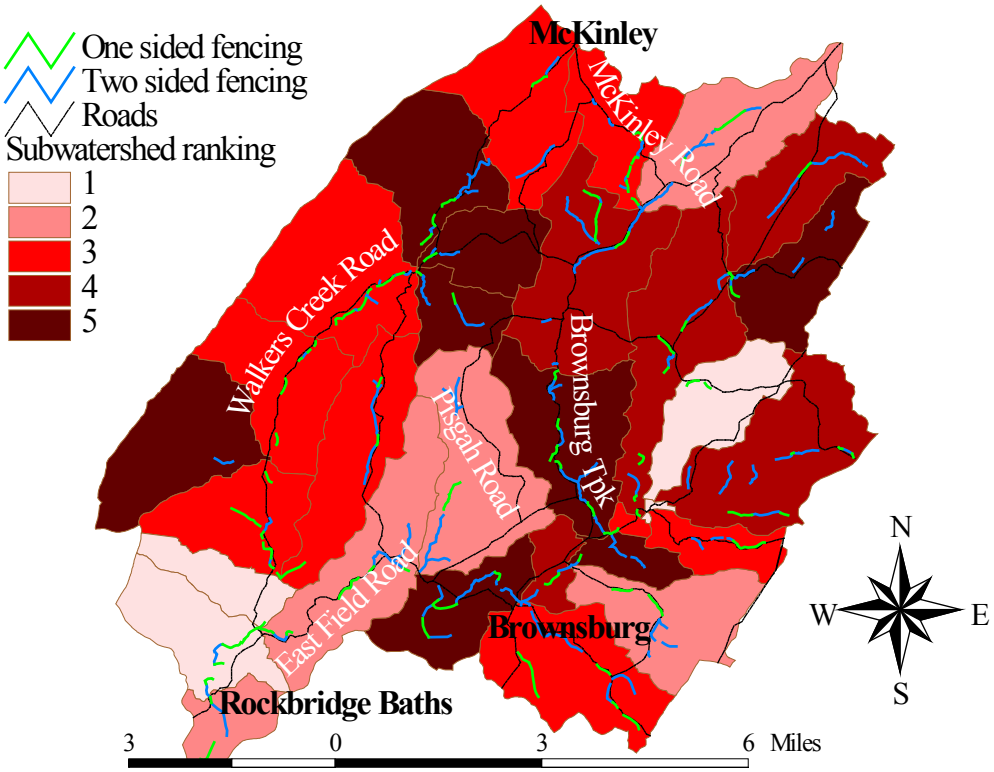


Figure 3. Fencing prioritization by subwatershed (1=highest priority)

Additional Targeting of Agricultural BMPs

Land use planning should also be considered when determining where to focus implementation efforts with respect to agricultural conservation practices. Land that is more likely to remain in agriculture should be assigned a higher priority for BMP implementation over land that is likely to be developed. According to the current county land use map, the portion of the watershed located in Rockbridge County falls within areas designated by the county as either rural or rural village areas. The future land use map featured in the 2007 Augusta County Comprehensive Plan shows similar designations for land within the watershed boundaries, which is designated as an agricultural or rural conservation area. Consequently, there does not appear to be significant development pressure in a specific portion of the watershed. The presence or absence of conservation easements and ag forestal districts is another indicator of the likelihood of land use conversion from agriculture to residential or commercial. The Middlebrook-Brownsburg Corridor has been a high priority region for outreach concerning land conservation by the Valley Conservation Council. As a result, there is significant acreage in the watershed, which falls nearly entirely within this corridor, that is under a conservation easement. Since these areas will remain in agricultural for perpetuity, implementing agricultural BMPs on these properties should be assigned the highest priority.

Partners And Their Role In Implementation

Agricultural and Residential Landowners

SWCD and NRCS conservation staff often consider characteristics of farms and farmers in the watersheds that will affect the decisions farmers make when it comes to implementing conservation practices. For example, the average size of farms is an important factor to consider, since it affects how much cropland or pasture a farmer can give up for a riparian buffer. The age of a farmer may also influence their decision to implement best management practices. Table 18 provides a summary of relevant characteristics of farms and producers in Augusta and Rockbridge Counties from the 2007 Agricultural Census. These characteristics were considered when developing implementation scenarios, and should be utilized to develop suitable education and outreach strategies.

Table 18. Characteristics of farms and farmers in Augusta and Rockbridge Counties.

Characteristic	Augusta	Rockbridge
Number of farms	1,729	805
Land in farms (acres)	286,195	138,315
Full owners of farms	1,118	577
Part owners of farms	652	200
Tenants	97	28
Operators identifying farming as their primary occupation	854	331
Operators identifying something other than farming as their primary occupation	732	474
Average age of primary operator	57.8	57.7
Average size of farm (acres)	166	172
Average value of farmland ($/acre)	$4,897	$4,353
Average net cash farm income of operation ($)	$20,338	$2,044
Average farm production expenses ($)	$96,292	$24,883
Farms with internet access	1,033	437
Farm typology (acres)		
Small family farms: retirement and residential/lifestyle	96,085	72,174
Small family farms: farming occupation	51,916	33,730
Large and very large family farms	96,633	16,955
Nonfamily farms	22,833	4,977

In addition to local farmers, participation from homeowners is also critical to the success of this plan. Though the amount of bacteria that is coming from failing septic systems and straight pipes is minimal compared to livestock, human waste carries with it pathogens that can cause health problems above and beyond those associated with livestock manure.

Headwaters and Natural Bridge SWCDs and Natural Resource Conservation Service

During the implementation project, the SWCDs and NRCS will continue to reach out to farmers in the watersheds and provide them with technical and financial assistance with conservation practices. Their responsibilities include promoting available funding and the benefits of BMPs and providing assistance in the survey, design, and layout of agricultural BMPs. The SWCD and NRCS staff will conduct outreach activities in the watershed to encourage participation in conservation programs. Such activities include mailing out newsletters and organizing field days. Both SWCDs have a conservation technician who has been designated to spend a portion of their time in the Hays, Moffatts, Otts and Walker Creek watersheds. It is recommended that these two conservation technicians work cooperatively in their efforts to increase local awareness of water quality issues in the creeks and make agricultural landowners aware of financial and technical assistance available for BMP implementation in the watersheds. Dedicated staff are currently not available to lead efforts to correct failing septic systems and straight pipes. Local watershed groups such as the Upper James RC&D could work with the Augusta and Rockbridge County Health Departments to implement such a program using grant funds. In partnership with the Augusta County Health Department and the Augusta County Service Authority, the Headwaters SWCD recently implemented such a program for the Middle River watershed. This program could serve as a model for similar efforts in Hays Creek and its tributaries.

Augusta and Rockbridge Counties

Decisions made by local governments regarding land use and zoning will play an important role in the implementation of this plan. Currently, both Augusta and Rockbridge Counties have zoning and land use policies in place that support the preservation of agricultural land and encourage good stewardship of natural resources. The location of the Hays Creek watershed and its tributaries within Augusta and Rockbridge Counties is such that it has not been subject to intense development pressures, making the predominant land uses in the watershed likely to remain in agriculture and forest. Local government support of this type of land conservation will become increasingly important as greater numbers of conservation measures are implemented across the watersheds.

Virginia Department of Environmental Quality

Improvements in water quality and implementation progress will be determined through monitoring conducted by the VA Department of Environmental Quality's ambient and biological monitoring programs. Each stream will be visited once a month by DEQ monitors (Figure 4). The steering committee recommended that DEQ work with project partners including Washington and Lee Universtiy faculty to provide the community with updates on water quality data. This could be accomplished through a website or through meetings and informational mailings.

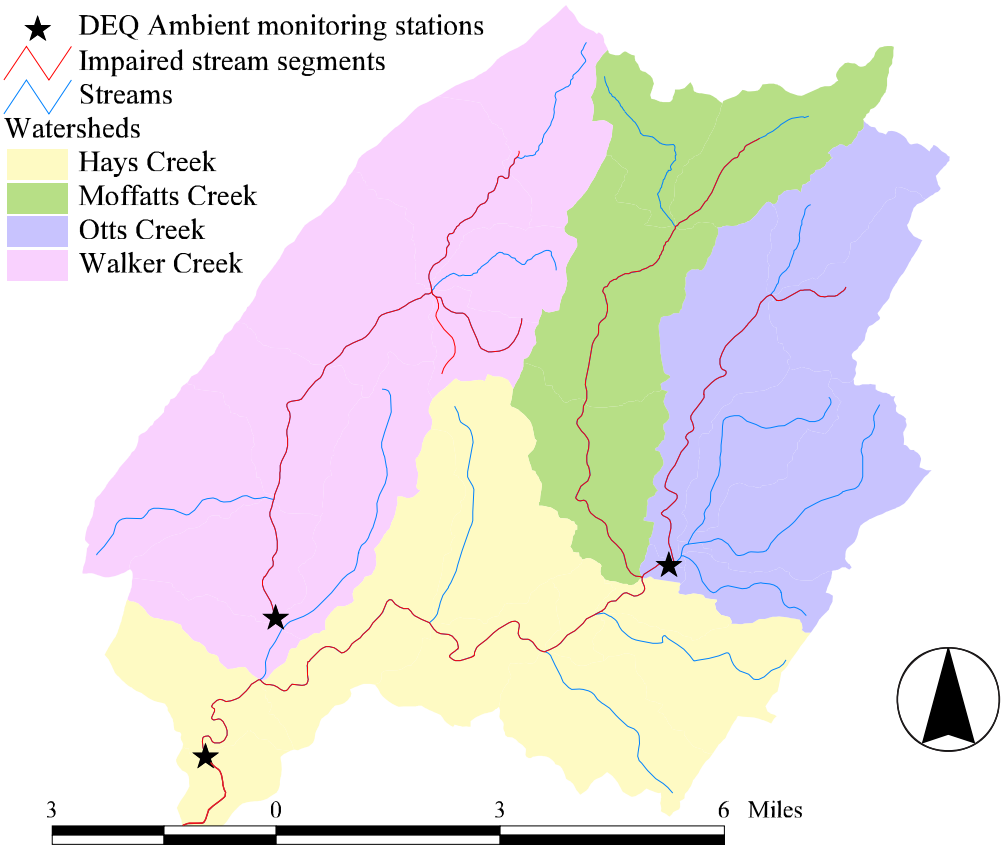


Figure 4. Virginia DEQ water quality monitoring stations in Hays Creek and its tributaries

Virginia Department of Conservation and Recreation

The Department of Conservation and Recreation (DCR) will work closely with project partners including the two Soil and Water Conservation Districts to track implementation progress and provide cost share for agricultural best management practices through the Virginia Agricultural Cost Share Program. In addition, DCR will work with interested partners on grant proposals to generate funds for projects included in the implementation plan that are not funded through state and federal cost share programs such as septic system repairs and replacements. When needed, DCR will facilitate additional meetings of the steering committee to discuss implementation progress and make necessary adjustments to the implementation plan.

Other Potential Local Partners

There are numerous opportunities for future patnerships in the implementation of this plan and associated water quality monitoring. A list of additional organizations and entities with which partnership opportunities should be explored is provided below:

- Washington and Lee University
- Rockbirdge Area Counservation Council
- Trout Unlimited (Trout in the Classroom)
- Rockbridge and Augusta County Master Naturalists
- Boxerwood Gardens
- Brownsburg Museum
- County schools
- Valley Conservation Council

Integration with Other Watershed Plans

Each watershed in the state is under the jurisdiction of a multitude of water quality programs and activities, many of which have specific geographic boundaries and goals. Coordination of the implementation project with these existing programs could make additional resources available and increase participation by local landowners.

Augusta County Comprehensive Plan

The Augusta County Comprehensive Plan includes a section on natural resources. Among the objectives established in this section of the plan are the protection of the county's water resources, the promotion of agricultural operations that protect water quality and, participation in state and regional programs to protect local waterways. County policies that support these objectives and other natural resource protection objectives include:

- Work with partner agencies, including the Headwaters SWCD and the Natural Resources Conservation Service, to promote agricultural BMPs and nutrient management planning.
- Consider providing incentives for agricultural and forestry BMPs whereby landowners that implement BMPs are offered tax or other financial incentives.
- Encourage proper use and maintenance of all on-site sewage disposal systems, including septic systems, through education and outreach. Educational materials should be distributed with building permits for properties that will use wells and on-site sewage disposal systems.
- Consider a mandatory septic pump-out program adapted from the requirements of the Chesapeake Bay Preservation Act and Regulations.
- Support ongoing source water protection efforts, including the source water protection ordinance developed by the Augusta County Service Authority.

In addition, the comprehensive plan features a table of performance standards that includes recommendations of 100 foot stream buffer zones and reforestation of flood plains in agricultural and rural conservation areas. These recommendations and the policies listed above clearly support the recommendations of this water quality improvement plan. When possible, efforts should be made to integrate these shared goals, thereby saving time and resources while achieving the same end result.

Augusta County Agricultural Task Force

In 2005, an Agricultural Task Force was formed in order to provide the County with a review of existing ordinances and policies with respect to their support of agriculture in the region. Several of the recommendations provided in this report should be integrated into implementation efforts including:

- Establishment of a mentorship program for younger producers – principles of conservation based farming could be included in this program
- Establish a Purchase of Development Rights Program – agricultural conservation efforts should be targeted in agricultural zones and protected lands
- In addition, the report includes a list of significant agricultural events in the area. This list should be used to identify opportunities to distribute information to farmers about the best management practices included in this plan:

- Virginia Cattleman's Convention
- Virginia Agricultural Expo
- Virginia Beef Expo
- Virginia Farm Show

Rockbridge County Land Use Plan

Photo: Jay Gilliam

One of the objectives of the county's land use plan is the "conservation of open space within the County and...long-term preservation and maintenance of valuable natural resource areas..." Several of the strategies listed in the plan that support this objective will also help to meet the goals of the water quality improvement plan and vice versa including:

- Define specific valuable natural resources (i.e. viewsheds, aquifer recharge areas, drainage ways and open space) which the County wants to preserve and identify these resources on a map to be used as a planning base map.
- Identify specific measures to aid the County in its ongoing efforts to preserve rivers and streams for the purpose of preserving their natural beauty and environmental attributes, while maximizing recreation potential and conservation opportunities, and locate specific geographic areas where these measures may be applied.
- Develop a wellhead protection program to safeguard public water supply systems.
- Coordinate environmental preservation efforts with neighboring jurisdictions and establish an action plan targeting environmental concerns that require a regional approach.

Additional Natural Resource Management and Conservation Planning

There are a number of organizations working to implement natural resource management and land conservation plans in the watersheds. The Virginia Department of Game and Inland Fisheries is currently working to implement the "Northern Bobwhite Quail Action Plan for Virginia," which includes a series of recommended management practices that will also help to improve water quality by reducing runoff and filtering out pollutants before they reach the stream. Trout Unlimited has a "Trout in the Classroom" program to engage local schools and students in learning about the importance of clean water and high quality aquatic habitat to support trout and other aquatic species. This type of outreach and education will also support the water quality improvement goals included in this plan. In addition, a number of organizations including Valley Conservation Council and the Rockbridge Area Conservation Council are working to preserve agricultural land in the watersheds through conservation easements. These easements can include some form of riparian buffer protection, and also help to ensure the longevity of efforts made to implement conservation practices on agricultural land. Whenever possible, efforts should be made to integrate the implementation of these and other conservation-related plans that will impact water quality with this plan for Hays Creek and its tributaries.

Funding for Implementation

A list of potential funding sources available for implementation has been developed. Detailed descriptions can be obtained from the Headwaters and Natural Bridge SWCDs, VADCR, Natural Resources Conservation Service (NRCS), and Virginia Cooperative Extension (VCE). While funding is being provided to the Headwaters SWCD for agricultural BMPs and technical assistance for farmers, an additional funding commitment is needed to implement the residential and urban practices included in the plan.

Virginia Agricultural Best Management Practices Cost-Share Program

The cost-share program is funded with state and federal monies through local SWCDs. SWCDs administer the program to encourage farmers and landowners to use BMPs on their land to better control 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. Cost-share is typically 75% of the actual cost, not to exceed the local maximum.

Virginia Agricultural Best Management Practices Tax Credit Program

For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, is 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. The amount of the credit cannot exceed $17,500 or the total amount of the tax imposed by this program (whichever is less) in the year the project was completed. 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, and grazing land protection systems. The loans are administered through 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 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. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act.

Virginia Water Quality Improvement Fund

This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible recipients include local governments, SWCDs, and individuals. Grants for point sources are administered through VADEQ and grants for nonpoint sources are administered through VADCR.

Conservation Reserve Program (CRP)

Through this program, cost-share assistance is available to establish cover of trees or herbaceous vegetation on cropland. 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. The payment to the participant is up to 50% of the cost for establishing ground cover.

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 and rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Additional federal incentives can bring the effective cost share rate up to 115% of eligible expenses. Pasture and cropland adjacent to streams, seeps, springs, ponds and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, and 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. The State of Virginia will make an additional payment to place a perpetual easement on the enrolled area.

Environmental Quality Incentives Program (EQIP)

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. 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.

Chesapeake Bay Watershed Initiative

This initiative was authorized in the 2008 Farm Bill for 2009-2012. It provides technical and financial assistance to producers to implement practices that reduce sediment and nutrients to help protect and restore the Chesapeake Bay. Prioirity has been given to the Shenandoah and Potomac River Basins and selected watersheds that have impaired streams due to high levels of nutrients and sediment. Producers who live in an NRCS high priority Cheasapeake Bay watershed receive additional consideration in the funding ranking process.

Wildlife Habitat Incentive Program (WHIP)

WHIP is a voluntary program for landowners who want to develop or improve wildlife habitat on private agricultural 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. 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. 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.

Wetland Reserve Program (WRP)

This program is a voluntary program to restore and protect wetlands on private property. Landowners who choose to participate in WRP may receive payments for a conservation easement or cost-share assistance for a wetland restoration agreement. The landowner will retain ownership but voluntarily limits future use of the land. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and may lease the land for hunting, fishing, or other undeveloped recreational activities.

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 staff across the region. They can provide (at no cost): 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.

National Fish and Wildlife Foundation

Grant proposals for this funding are accepted throughout the year and processed during fixed sign up periods. 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. Grants generally range between $10,000 and $150,000. Grants are awarded for the purpose of conserving fish, wildlife, plants, and their habitats.

Special grant programs are listed and described on the NFWF website (http://www.nfwf.org). If the project does not fall into the criteria of any special grant programs, a 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.

Virginia Natural Resources Commitment Fund

This fund was established in the Virginia Code as a subfund of the Water Quality Improvement Fund in 2008. Monies placed in the fund are to be used solely for the Virginia Agricultural BMP Cost Share Program as well as agricultural needs for targeted TMDL implementation areas. Watershed addressed in this water quality improvement plan are eligible for these funds, which are appropriated by DCR to Headwaters SWCD.

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.

Wetland and Stream Mitigation Banking

Mitigation banks are sites where aquatic resources such as wetlands, streams, and streamside buffers are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources. Mitigation banking is a commercial venture which provides compensation for aquatic resources in financially and environmentally preferable ways. Not every site or property is suitable for mitigation banking. Wetlands and streams are complex systems, and their restoration, creation, enhancement, or preservation often requires specialized ecological and engineering knowledge. Likewise, the mitigation banking process requires experience to efficiently navigate. Mitigation banks are required to be protected in perpetuity, to provide financial assurances, and long term stewardship. The mitigation banking processes is overseen by the Inter-Agency Review Team (IRT) consisting of several state and federal agencies and chaired by DEQ and Army Corps of Engineers. For more information, contact the Army Corps of Engineers or VADEQ's Virginia Water Protection Program.

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