Water Quality Improvement Plan

Tye River, Hat Creek, Rucker Run & Piney River

A plan to reduce bacteria in the water

June 17, 2014

Prepared by

The Virginia Department of Environmental Quality

In Cooperation with

Local Stakeholders

Department of Biological Systems Engineering,

Virginia Tech Center for Watershed Studies

ACKNOWLEDGEMENTS

We would like to acknowledge the following organizations for their support for and participation in the development of this plan:

Nelson County
Amherst County
Thomas Jefferson Soil and Water Conservation District
USDA Natural Resources Conservation Service
Massies Mill Ruritan Hall

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Photo: VADCR, Tye Scenic River Report

A landowner's guide to Tye River

Tye River is a truly beautiful stream. Most residents in Nelson and Amherst Counties know that the Tye River and its tributaries like Piney River offer wonderful opportunities for canoing, kayaking and fishing. The beauty of these streams was recognized by the Commonwealth in 2014 when a 12-mile segment of the Tye River was designated as a "scenic river." This designation recognizes the natural and historic value of the river. Despite the fact that large portions of the Tye River watershed remain pristine, the Tye, Piney River, Hat Creek and Rucker Run are all included on Virginia's list of impaired streams. Water quality monitoring has shown that these streams have high concentrations of bacteria, which means that people face an increased risk of illness or infection when coming into "primary contact" with the water (swimming and splashing water into your eyes or mouth).

A study of the streams and the sources of bacteria in their watersheds was completed by the VA Department of Environmental Quality in 2013. Bacteria sources include failing septic systems and straight pipes (pipes discharging untreated sewage into the stream), runoff of manure from pasture and cropland, livestock access to the streams, and wildlife. This plan has been developed in order to provide a road map to address these issues, working closely with landowners in the watersheds. A series of actions has been identified that will lead to restoration of these streams so that they are once again considered safe for primary contact. Examples of these actions include: repairing and replacing failing septic systems, excluding livestock from streams, implementing rotational grazing systems, and utilizing continuous no-till on cropland. It is expected that it will take about eight years to remove the streams from the Commonwealth's impaired waters list. Within 15 years, sufficient actions could be implemented to prevent the streams from ever violating the state's water quality standard for bacteria.

Many of the actions included in this plan have the potential to not only benefit water quality in the streams, but also offer economic gains to landowners who implement them. These may include reduced veterinary bills for farmers with livestock, and higher property values for homeowners with functional septic systems. However, the upfront cost of some of these practices (commonly called best management practices) can be considerable. The estimated cost to remove these streams from the impaired waters list is about $8.4M. The good news is that a large portion of this money would be returned to the


Photo: VADCR, Tye Scenic River Report

local economy through the use of local contractors to construct fences, install wells and repair septic systems. Outreach is critical to increasing landowner adoption of these management practices as well. It is estimated that one full time position and a part time position will be needed in order to work with landowners. The Thomas Jefferson and Robert E Lee Soil and Water Conservation Districts were identified as organizations that could house these positions should funding be located. Outreach efforts could include field days on local farms to highlight best management practices, development of a display and brochures to be distributed at local events such as health fairs and farmers markets, and informational mailings and farm visits to landowners.

Successful implementation of this plan will depend on strong partnerships. Key conservation partners include: Nelson and Amherst Counties, USDA Natural Resource Service, the Soil and Water Conservation Districts, the Nelson and Amherst County Health Departments, and most importantly, local landowners.

What is needed to remove the Tye River and its tributaries from Virginia's impaired waters list?

The list of actions below is an estimate of what it would take to remove Tye River, Hat Creek, Rucker Run and Piney River from Virginia's impaired waters list. While the list is long and the extent of work needed is large, it is important to remember that if everyone makes small changes in their daily lives, it will make a BIG difference in the Tye River.

Residential best management practices needed:

- 312 septic system repairs
- 12 connections to public sewer
- 156 replacements of failing septic systems with conventional septic systems
- 106 replacements of failing septic systems with alternative waste treatment systems
- 454 septic tank pumpouts

Agricultural best management practices needed:

- 56 miles of livestock stream exclusion fence (includes length of fence on both sides of the stream)
- 4,800 acres of improved pasture management
- 226 acres of riparian (streamside) buffers
- 126 acres of permanent vegetative cover on critical areas of pasture (highly eroded or denuded areas)
- 57 acres of reforestation of highly erodible pasture
- 223 acres of cover crops (annual acreage)
- 355 acres of continuous no-till

For information on how you can help:

- Technical and financial assistance with agricultural best management practices

  Thomas Jefferson Soil and Water Conservation District (Nelson County)
  website: http://tjswcd.org/ phone: (434)975-0224

  Robert E Lee Soil and Water Conservation District (Amherst County)
  website: www.releeconservation.com/ phone: (434)352-9405

- Information about septic system maintenance, repairs and replacements

  Nelson County Health Department
  website: www.vdh.virginia.gov/LHD/ThomasJefferson/ phone: (434)263-4297

  Amherst County Health Department
  website: www.vdh.virginia.gov/LHD/CentralVirginia/ phone: (434)946-9408

Photo: VADCR, Tye Scenic River Report

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 from multiple sources 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 Tye River, Hat Creek, Rucker Run & Piney River:

A TMDL was completed for the Tye River and its tributaries in 2013 after water quality monitoring showed that the creeks were violating Virginia's water quality standard for bacteria. This standard is based on the concentration of *E. coli* bacteria in the water, and is designed to minimize the risk of illness or infection after coming into contact with the water. The standard states that the *E. coli* bacteria count should not exceed a geometric mean of 126 cfu per 100 mL of water for two or more samples taken over a 30-day period, and that it should not exceed 235 cfu per 100 mL at any time. Table 1 shows the frequency at which the creeks were violating this standard based on monitoring by the Virginia Department of Environmental Quality (VADEQ).

Table 1. Monitoring stations in the Tye River and tributaries and violation rates of the *E.coli* water quality standard.

Station ID	Stream Name	# of samples	Violation rate	Sampling period
2-TYE000.30	Tye River	16	13%	2005-2012
2-RKR000.20	Rucker Run	13	23%	2010-2012
2-TYE008.77	Tye River	24	21%	2004-2012
2-TYE020.67	Tye River	57	15%	2002-2012
2-HAT000.14	Hat Creek	25	40%	2007-2012
2-PNY005.29	Piney River	91	31%	2002-2012

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

(VADCR & VADEQ, 2003)

REVIEW OF TMDL STUDY

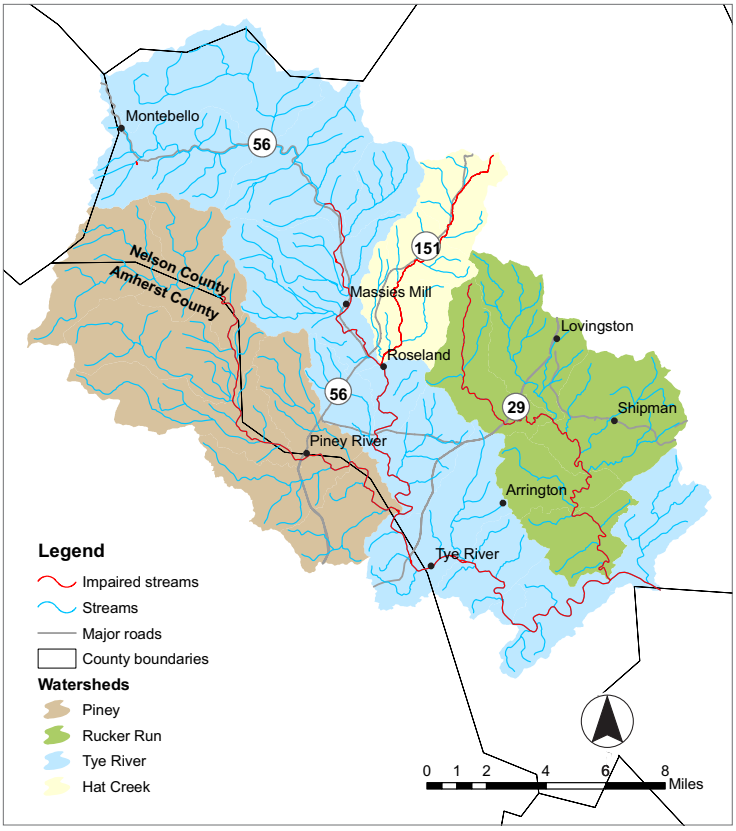


Figure 1. Location of the watersheds

Watershed Characteristics

The Tye River and its tributaries (Hat Creek, Rucker Run and Piney River) are located primarily in Nelson County, Virginia with a portion of the Piney River watershed in Amherst County. All four watersheds are part of the James River Basin. There are 353 miles of streams in the watershed, which totals approximately 169,082 acres (264 sq miles). Forest and pasture/hay are the predominant land uses in the watershed (77% and 16% respectively). According to the 2007 Census of Agriculture, the average farm in Nelson County is 158 acres, with over 60% of primary operators identifying their primary occupation as something other than farming. While the county ranked 4th in the state for the total sales of fruits, tree nuts and berries, the average net cash income for a farm in Nelson County was estimated at $3,579 (USDA, 2007).

As shown in Figure 1, the impaired segment of the Tye River extends 15.94 miles from the headwaters, past its confluence with Piney River, and down to its confluence with the James River. The impairments on Hat Creek and Rucker Run extend from their headwaters downstream to their confluence with the Tye River, 9.58 and 18.26 miles, respectively. The impaired segment on Piney River extends 13.3 miles upstream from its confluence with Tye River (VADEQ, 2004, 2006, 2008).

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, wildlife, and domestic pets. Point sources including individual residences can contribute bacteria to streams through their permitted discharges. There are currently four point source permitted to discharge bacteria in the watersheds: the Nelson County and Camp Blue Ridge Sewage Treatment Plants, the Montebello Fish Culture Station, and a single family home.

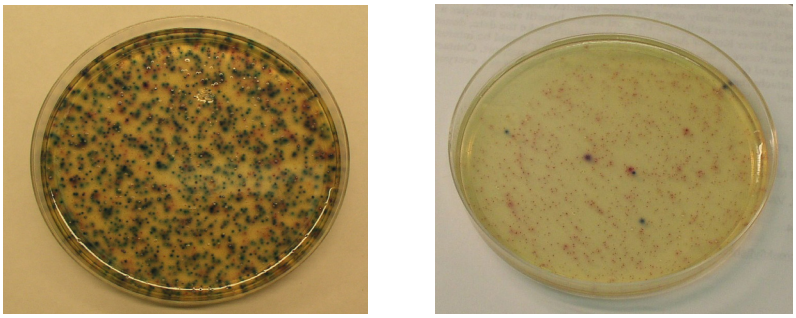


Photo shows coliscan plates, which reveal the presence and abundance of *E.coli* colonies (blue dots) and coliform bacteria colonies (red dots) in a stream where livestock have access (left) and where they have been excluded (right). Photo: Bobby Whitescarver, NRCS

Goals for Reducing Bacteria

The TMDL study completed for the creeks identified goals for reducing bacteria from the different sources in the watersheds. These goals (Table 1) are based on what it would take to remove the creeks from the impaired waters list. This can occur when the instantanous water quality standard for *E. coli* (235 cfu/100mL) is violated no more than 10.5% of the time. Greater reductions in livestock stream access and pasture runoff will be needed in order to achieve a 0% violation rate, which were also identified in the TMDL. In addition, reductions from wildlife are needed to meet the TMDL. Since even healthy streams violate the standard occassionally, and since the TMDL program does not address wildlife, the focus of planning efforts was on the goals shown below. While BMP implementation goals associated with meeting the 0% violation rate goal of the TMDL are shown throughout this plan, it is unlikely that this can be achieved without addressing wildlife contributions of bacteria.

Table 1. Bacteria reduction goals for removal of streams from the impaired waters list (VADEQ, 2013)

Watershed	**Fecal Coliform Reduction from Source Category (%)**				**% Violation of *E.coli* standard** (Instantaneous standard)
	Straight Pipes & Failing Septic	Livestock stream access	Pasture runoff	Cropland runoff	
Tye River	100%	10%	5%	5%	6%
Hat Creek	100%	75%	25%	5%	10%
Rucker Run	100%	65%	25	5%	10%
Piney River	100%	40%	25%	5%	10%

COMMUNITY 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 November 7, 2013 at the Massies Mill Ruritan 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 notices to local media outlets, email announcements, invitations mailed to riparian landowners, and flyers posted throughout the watersheds. The meeting included a presentation by VADEQ staff on current water quality issues in the watersheds and development of the implementation plan. This presentation was followed by break out sessions to collect local input on characteristics of the watersheds and ideas regarding what to include in the plan. Approximately 60 people attended the meeting. A final public meeting was held on May 15, 2014 at the Massie's Mill Ruritan 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 residential working group met twice during the development of this plan, while the agricultural working group had three meetings.

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 November, the group discussed the status of farming in the region and characteristics of typical farms in the watershed. It was noted that there has not been much land use conversion from agriculture to commercial or residential development for many years. The group also discussed livestock stream exclusion practices and obstacles to implementation. A Flexible Fencing Program modeled after what has been done in the Shenandoah Valley was identified as a potential strategy for overcoming some of these obstacles. A second meeting was held at the Ruritan Hall on December 12, 2013, during which the working group reviewed BMP implementation scenarios. The group felt that the emphasis of the plan should be more on lower cost BMPs like rotational grazing rather than high cost structural practices like waste storage facilities. In addition, the group discussed the importance of offering cost share for livestock exclusion practices where limited access to the stream for watering is allowed. Existing agricultural BMP cost share programs do provide cost share for exclusion systems where limited access is allowed. Good technical assistance was identified as a critical aspect of implementing this plan. SWCD and NRCS staff are covering a large area and do not have sufficient time to target these watershed to the extent that will be needed to achieve implementation goals without additional staff. During the third working group meeting on February 20th, the group identified a timeline for implementation of agricultural BMPs. Based on the 15-year timeline that the group selected, they determined that one staff person could most likely handle associated outreach and technical assistance if suitable administrative support was provided.

The primary role of the Residential Working Group was to discuss methods needed to reduce human sources of bacteria entering the creeks, recommend methods to identify and correct or replace failing septic systems and straight pipes, and provide input on the BMPs to include in the plan. At their first meeting on November 7th, the residential working group discussed the need for increased education and outreach regarding septic system maintenance. The group identified a number of strategies to reach the community with informational materials. In addition, estimates of repairs and replacements needed were reviewed. It was noted that there are not many alternative waste treatment systems in the watersheds. A second residential working group meeting was held on January 23, 2014 at the Massie's Mill Ruritan Hall. During this meeting, the group discussed opportunities for connections to public sewer and areas in the watershed where failing septic systems and straight pipes are most likely to be found. The working group discussed the costs associated with replacing a failing septic system and connecting to public sewer. In addition, they decided on a ten year timeline for implementation of residential septic practices. The group agreed that a septic tank pumpout program that provided some degree of financial assistance with pumping out your tank would be a great way to educate homeowners about septic system maintenance needs, and to identify failing septic systems.

The Steering Committee met on April 3rd at the Massie's Mill Ruritan Hall to discuss plans for the final public meeting and to review a draft of the implementation plan.

IMPLEMENTATION ACTIONS


Photo: Bill Howard, Downstream Project

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 agricultural best management practices (BMPs) in this plan are included in state and federal agricultural cost share programs that promote conservation. The final set of practices identified and the efficiencies used in this study are listed in Table 2. 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 to 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 3. Bacteria reduction efficiencies for best management practices

BMP Type	Description	Bacteria Reduction	Reference
Livestock stream access	Livestock exclusion from waterway	100%	1
Pasture	Streamside buffer (35-100 feet)	LU Change+50%	2,3
	Improved pasture management	50%	2,3
	Permanent vegetative cover on critical areas	LU Change	4
	Reforestation of highly erodible pasture/cropland	LU Change	4
Cropland	Small grain cover crops	20%	3
	Continuous no-till	70%	3
Straight pipes and septic systems	Septic tank pumpout	5%	2
	Connection to public sewer	100%	1
	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 and VADEQ. 2003. Guidance manual for Total Maximum Daily Load Implementation Plans. Available at: www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDLImplementationPlanGuidanceManual.aspx
3. USEPA-CBP. 2006. Nonpoint source best management practices currently used in Scenario Builder for Phase 5.0 of the Chesapeake Bay Program Watershed Model. Revised 02/09/2011.
4. Quantified through land use change in Generalized Watershed Loading Function model simulations.

LIVESTOCK IN THE STREAMS


Photo: Mike Phillips, NRCS

A 10-75% reduction in the deposit of waste by livestock in the water is needed to de-list the streams, making some form of stream fencing necessary.

To estimate fencing needs, stream segments that flowed through or were adjacent to pasture were identified using GIS mapping. 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. It is expected that the majority of fencing will be accomplished through the VA Agricultural BMP Cost Share Program and federal NRCS cost share programs. Landowners have a growing number of options when it comes to installing livestock exclusion fencing through these programs. In order to determine the appropriate mix of fencing practices, tax parcel data was utilized in conjunction with local data from the VADCR Agricultural BMP Database to determine typical characteristics of livestock exclusion systems in the region (e.g., streamside fencing length per practice). In addition, input was collected from the Agricultural Working Group, NRCS and the Thomas Jefferson SWCD regarding typical components of each system, associated costs, and preferred fencing setbacks. Data on stream fencing already in place was collected and subtracted from the total fencing needed (Table 3). An estimated 56 miles of fencing (28 miles of stream) will be needed to remove the streams from the impaired waters list.

Table 3. Fencing needs assessment

Description	Linear Feet of Livestock Exclusion				
	Tye River *10% goal*	**Hat Creek** *75% goal*	**Rucker Run** *65% goal*	**Piney River** *40% goal*	**TOTAL**
Total potential fencing	314,099	129,412	156,058	201,434	801,003
Fencing installed to date	33,328	2,509	6,525	12,431	54,792
Remaining fencing needed	28,077	95,177	97,196	75,601	296,052

A summary of cost share programs available to farmers interested in installing fencing is provided on pages 35-38. Incentive payments vary based on the width of the streamside buffer that is installed between the fence and the stream. The portion of fencing that will be accomplished using different fencing practices was based on historical data and input from farmers and agricultural conservation professionals. Farmers who cannot give up 35 feet or more for a streamside buffer can receive 50% cost share for the installation of fencing with a 10-foot setback, cross fencing, and an alternative water source for their livestock. It is estimated that 20% of fencing in the watersheds will be installed using this 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 75%-85% for stream fencing, cross fencing and providing alternative water. It is estimated that 70% of the total fencing will be installed using this practice (codes LE-1T and SL-6T). In cases where a watering system already exists, a WP-2T system is a more appropriate choice. This system includes streamside fencing and a 35-ft buffer from the stream. This practice includes an up-front cost share payment of 50 cents per linear foot of fence installed to assist in covering fencing maintenance costs. Since financial assistance with development of alternative water sources is a significant incentive for farmers to install fencing, this practice is used infrequently because it does not provide cost share for the installation of a well. Consequently, it was estimated that only 5% of fencing in Tye River would be accomplished using this practice. For those who are willing to install a 35 foot buffer or larger and plant trees in the buffer, USDA-NRCS's Conservation Reserve Enhancement Program (CREP) is an excellent option. This practice provides cost share and incentive payments ranging from 50% to 115% for fencing and planting materials. This program has not been very popular in the watersheds to date; consequently, it is estimated that only 5% of fencing in the watersheds will be installed through CREP. Implementation of a "Flexible Fencing Program" in the watersheds using private funding was identified as a way to increase interest in livestock stream exclusion. The program that has been implemented in the Shenandoah Valley with support from the Chesapeake Bay Funders Network was identified as a good model. Typically a 5-year contract is required, and farmers are offered more flexibility with the materials that they use and where the fence is placed. Should funding become available, some of the fencing goals established in this plan would be met using this program.

Table 4. Livestock exclusion BMPs (feet and number of exclusion systems)

Watershed	Fencing by Exclusion System Type (linear feet and # of practices)							
	LE-1T/SL-6T		LE-2T		WP-2T		CREP	
	Feet	#	Feet	#	Feet	#	Feet	#
Tye River	19,654	5	5,615	3	1,404	1	1,404	1
Hat Creek	66,624	18	19,035	11	4,759	4	4,759	1
Rucker Run	68,038	18	19,439	11	4,860	4	4,860	1
Piney River	52,921	14	15,120	8	3,780	3	3,780	1

IMPLEMENTATION ACTIONS FOR PASTURE

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

Improved pasture management can prevent overgrazing by livestock, thereby reducing runoff, increasing filtration and vegetative uptake of pollutants, and allowing farmers to better utilize their pasture acreage. This practice includes: maintaining minimum forage height during growing season based on type of forage, application of lime and fertilizer when needed, following a nutrient management plan, controlling woody vegetation, distribution of manure through managed rotational grazing, sacrifice area for feeding during winter and summer droughts, and reseeding if necessary. Vegetated buffers are another excellent way to treat runoff from pasture. These buffers act as filters, trapping pollutants before they run into the stream. Farmers can utilize 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 5 shows the extent of pasture BMPs needed in order to reduce bacteria to a level at which the streams can be removed from the impaired waters list. It is expected that several of these practices will be implemented as part of larger livestock exclusion systems (e.g. improved pasture management with rotational grazing systems and riparian buffers).

Table 5. Pasture BMPs

BMP	BMP Acres				
	Tye River	Hat Creek	Rucker Run	Piney River	TOTAL
Improved pasture management	731	783	1,242	2,023	4,779
Permanent vegetation on critical areas	0	47	33	46	126
Reforestation of highly erodible pasture	0	24	33	0	57
Riparian buffers (35-100 feet)	21	73	74	58	226

IMPLEMENTATION ACTIONS FOR CROPLAND


Photo: Jeff Vanuga, USDA NRCS

Bacteria can run off of cropland when soils fertilized with manure are exposed to rainfall. Bacteria will make its way to the stream if the fertilized soil remains uncovered.

Bacteria from manure applied to cropland can end up in a stream unless the appropriate management practices are in place. This may include decreasing the source of the bacteria (spreading less manure or storing it longer so that bacteria will die off) or using practices that limit the amount of runoff that can occur. Reducing tillage of the soil, increasing soil organic content and allowing better cover will reduce the degree of runoff and soil loss from cropland during rain events. Many farmers in Amherst and Nelson Counties are already using some form of reduced tillage on cropland. In addition, a large proportion of farmers are planting cover crops to prevent soil loss and retain valuable nutrients in the winter. Consequently, this plan includes a modest amount of these practices since they are already commonly used in the region. Table 6 shows the estimated extent of cropland BMPs needed in order to remove the streams from the impaired waters list.

Table 6. Cropland BMPs needed

BMP	BMP Acres				
	Tye River	Hat Creek	Rucker Run	Piney River	TOTALS
Continuous no-till	90	25	225	15	355
Cover crops (annual acreage)	35	23	165	0	223

STRAIGHT PIPES AND FAILING SEPTIC SYSTEMS

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

Estimates of the percentages of households with failing septic systems and straight pipes (pipes directly discharging untreated sewage into the stream) in the watersheds are shown in Table 7. These estimates were developed as part of the TMDL study. 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 region. Based on existing conditions in the watersheds, it was estimated that approximately 30% of septic system replacements would be done with alternative waste treatment systems while the remaining 66% could be done using conventional septic systems. In addition, it was estimated that 2% of failing septic systems could be corrected by connecting the home to public sewer (except in Hat Creek where public sewer is not available). 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 7 are based on pumping out septic tanks for 25% of households.

Table 7. Residential wastewater treatment BMPs

Watershed	Failing septic systems	Straight pipes	Connection to public sewer	Septic system repair	Alternative waste treatment system	Septic system replacement (conventional)	Septic tank pumpout
Tye River	266	10	6	133	45	93	363
Hat Creek	98	5	0	49	17	37	25
Rucker Run	131	2	3	66	21	44	33
Piney River	130	8	3	65	23	47	33
TOTALS	**625**	**25**	**12**	**312**	**106**	**156**	**454**

EDUCATION AND OUTREACH

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.

In order to get landowners involved in implementation, it will be necessary to initiate education and outreach strategies and provide technical assistance with the design and installation of various best management practices. There must be a proactive approach to contact farmers and residents to identify the practices that will help meet the goal of improved water quality while also meeting their needs as private landowners. Economic costs and benefits must be considered in this process. The working groups recommended several education/outreach techniques, which will be utilized during implementation.

The following additional education and outreach strategies were identified:

Agricultural Programs

- Make contact with landowners in the watersheds to make them aware of 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, provide examples of similar projects that have been successful.
- Organize educational programs for farmers including farm tours and field days in partnership with VA Cooperative Extension. Highlight practices that benefit water quality but also offer potential financial benefits to farmers.
- If progress is not being made during the first stage of implementation, consider conducting "cold calls" to farms to share information about cost share programs.
- Locate funds for a "Flexible Fencing Program" modeled after the program implemented in the Shenandoah Valley. Explore opportunities to partner with the Chesapeake Bay Funders Network or other organizations to secure private funds to support the program.

Residential Programs

- Identify straight-pipes and failing septic systems (e.g., contact landowners through mailings)
- Develop and distribute educational materials (e.g., septic system maintenance guide). Locations for distribution include: Southern States, Ace Hardware, and Colleen Feed and Seed. Provide septic system contractors and plumbers with materials to hand out to customers.
- Set up a display at the Health Fair held at Nelson County High school in July
- Partner with the Blue Ridge Medical Center to conduct outreach on human health impacts of exposure to *E. coli* and associated pathogens, work with the epidemiologist on staff at the Center and the Health Department.
- Partner with VA Cooperative Extension's Master Well Owner Network at the Amherst County clinic on well safety and potential drinking water contamination from failing septic systems in August 2014. Work to bring the program to Nelson County as well.
- Work with the Health Department to distribute the short articles on septic system maintenance.
- Set up an Enviroscape at the Nelson Center.
- Partner with Nelson and Amherst County's Community Development Departments and Habitat for Humanity to identify and eliminate straight pipes in the watersheds.
- Identify and reach out to absentee landowners with renters in case they are not aware of the presence of straight pipes or failing septic systems on their properties.

In addition, several ongoing community events were identified as excellent opportunities to conduct general outreach on water quality and BMP implementation including:

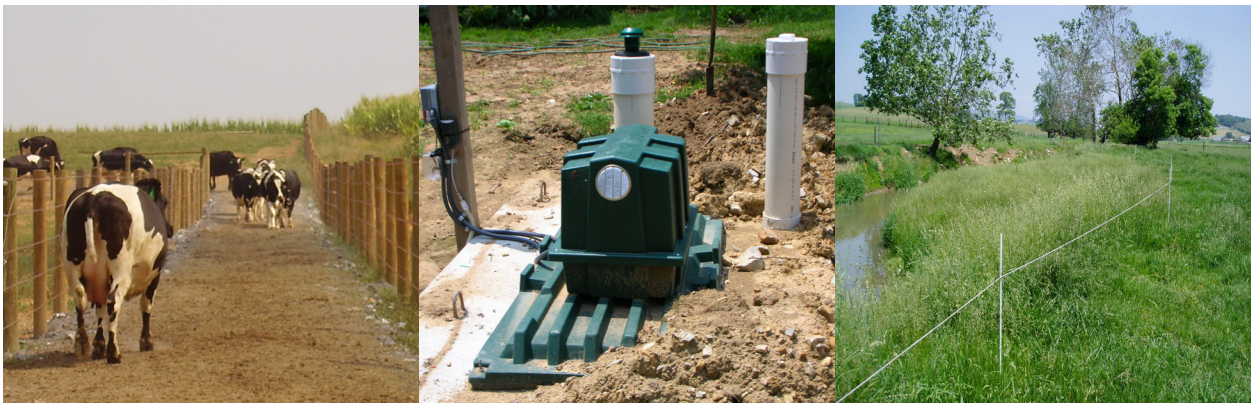
- Farmers Markets (Amherst and Nellysford)
- County fairs (Amherst and Nelson)
- Nelson County Kite Festival (April)
- Piney River Mini Triathalon (April)
- The Nelson Downriver Race (April, on Tye River)
- Nelson County Coummunity Day (April)

Staffing Needed for Outreach and Technical Assistance

A critical component in the successful implementation of this plan is the availability of knowledgeable 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 to implementation of practices. Consequently, technical assistance is a key component to successful BMP implementation. Technical assistance includes helping landowners identify suitable BMPs for their property, designing BMPs and locating funding.

The staffing level needed to implement this plan was estimated based on discussions with stakeholders and the staffing levels used in similar projects including the Rockfish River TMDL implementation project in Nelson County. It was determined that 1.5 positions would be needed for agricultural and residential implementation. The Thomas Jefferson or the Robert E Lee Soil and Water Conservation District could house both an agricultural and residential technician. Nelson or Amherst County could also potentially house a residential technician who would work on septic system outreach and maintenance.

IMPLEMENTATION COSTS



Costs: Agricultural BMPs

The costs of agricultural best management practices included in the implementation plan were estimated based on data for Nelson and Amherst Counties from the VADCR Agricultural BMP Database, the NRCS and Thomas Jefferson SWCD Cost Lists,input from SWCD and NRCS staff, and input from the agricultural working group (Table 8).

The total cost of livestock exclusion systems includes not only the costs associated with fence installation and maintenance, but also the cost of developing alternative water sources for SL-6T, LE-1T, LE-2T, and CREP practices. It should be noted that CREP does not pay for cross fencing to establish a rotational grazing system; however, this program is commonly combined with state programs that can cover these costs. The cost of fence maintenance was identified as a deterrent to participation. Financial assistance with maintaining fences is available through the WP-2T practice and includes an annual 25% tax credit for fence maintenance, and an up front incentive payment on $0.50 per linear foot. 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 this plan are included in state and federal cost share programs. These programs offer financial assistance with implementing the practices and may also provide landowners with an incentive payment to encourage participation. However, it should be noted that these programs typically cover 75% of the cost of a BMP and require that the landowner cover the full cost of the practice up front and then receive reimbursement. Reimbursements are usually issued quickly and there is a low interest loan program available through DEQ; however, this may still be an obstacle for some landowners interested in participating.

Table 8. Estimated agricultural BMP costs to achieve de-listing goal for Tye River, Rucker Run, Hat Creek and Piney River.

Practice	Cost share code	Units	Unit cost	Cost by watershed				TOTAL
				Tye River	Rucker Run	Hat Creek	Piney River	
Livestock exclusion with riparian buffers	CREP	system	$47,380	$19,563	$66,316	$67,723	$52,676	$206,278
	WP-2T	system	$8,500	$9,944	$33,709	$34,424	$26,775	$104,852
	LE-1T/SL-6T	system	$38,505	$199,152	$675,095	$689,417	$536,241	$2,099,905
Livestock exclusion with reduced setback	LE-2T	system	$27,305	$85,183	$288,757	$294,883	$229,366	$898,190
Livestock exclusion fence maintenance (15 yrs)	N/A	feet	$3.50	$9,827	$33,312	$34,019	$26,460	$103,618
Improved pasture management	EQIP (529, 512)	acres	$100	$73,100	$124,200	$78,300	$202,300	$477,900
Permanent vegetation on critical areas	SL-11	acres	$1,200	$0	$39,000	$56,400	$55,200	$150,600
Reforestation of erodible pasture	FR-1	acres	$130	$0	$4,225	$3,120	$0	$7,345
Continuous no-till	SL-15A	acres	$100	$9,000	$22,500	$2,500	$1,500	$35,500
Cover crops	SL-8B	acres	$30	$1,050	$4,950	$675	$0	$6,675
TOTAL ESTIMATED COST				$406,819	$1,315,340	$1,238,183	$1,130,159	$4,090,862

Costs: Residential BMPs

The costs of recommended residential BMPs shown in Table 9 were estimated using input from the Nelson County Health Department and the residential working group.

Table 9. Estimated residential BMP costs to achieve de-listing goal for Tye River, Hat Creek, Rucker Run and Piney River.

Practice	Cost share code	Units	Unit cost	Cost by watershed				
				Tye River	Hat Creek	Rucker Run	Piney River	TOTAL
Septic tank pumpout	RB-1	pumpout	$300	$108,975	$7,350	$9,825	$9,750	**$135,900**
Connection to public sewer	RB-2	connection	$9,000/ $12,000	$50,580	$0	$24,120	$34,080	**$108,780**
Septic system repair	RB-3	repair	$3,000	$399,000	$147,000	$196,500	$195,000	**$937,500**
Conventional septic system replacement	RB-4	system	$6,500	$452,303	$183,560	$215,621	$228,638	**$1,080,121**
Conventional septic system replacement w/pump	RB-4P	system	$8,000	$185,560	$69,680	$88,460	$93,800	**$437,500**
Alternative waste treatment system	RB-5	system	$25,000	$1,115,000	$426,250	$514,750	$581,500	**$2,637,500**
TOTAL ESTIMATED COST				$2,311,418	$833,840	$1,049,276	$1,142,768	$5,337,301

Table 10. Total estimated costs of BMP implementation to achieve de-listing goals.

BMP Type	Tye River	Hat Creek	Rucker Run	Piney River	TOTAL
Agricultural	$406,819	$1,315,340	$1,238,183	$1,130,159	$4,090,862
Residential septic	$2,311,418	$833,840	$1,049,276	$1,142,768	$5,337,301
TOTAL	$2,285,393	$2,163,318	$1,910,369	$2,052,773	$8,411,853

Costs: Technical Assistance

Technical assistance costs were estimated for 1.5 positions using a cost of $60,000/position per year. This figure is based on the existing staffing costs included in the Virginia Department of Environmental Quality's grant agreement with the Thomas Jefferson Soil and Water Conservation District for the Rockfish River implementation project in Nelson County. Based on the 8 year timeline for achieving de-listing goals (described in great detail in the Implementation Timeline section of this plan), this would make the total cost of technical assistance approximately $720,000. When factored in to the cost estimate for BMP implementation shown in Table 10, this would make the total cost of implementation approximately $9.1M. The cost of fully achieving the TMDL (never violating the water quality standard) including technical assistance is far greater at an estimated $14.8M (see Goals and Milestones section for additional information).

Photo: VADCR, Tye Scenic River Report

IMPLEMENTATION BENEFITS

The primary benefit of implementing this plan will be cleaner water in the Tye River and its tributaries. This may lead to enhanced quality of life for the local community as well as potential economic benefits.

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, rotational 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 prac-

tices 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 11 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 11. 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 $25,000).

Photo: VADCR, Tye Scenic River Report

In addition to the benefits to individual landowners, the local economy will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside of the watersheds. 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.

Benefits: Watershed Health

Focusing on reducing bacteria in the Tye River watershed will have associated watershed health benefits. 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 benefits to anglers and the local economy.

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 Funding Sources section).

GOALS AND MILESTONES

Photo: VADCR, Tye Scenic River Report

The end goal of implementation is restored water quality in the Tye River and its tributaries. It is expected that this will occur over a 8-year period.

Two types of milestones will be used to evaluate progress over the implementation 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.

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures and areas of highest interest first. For instance, the TMDL study indicated that runoff from pasture is the source of approximately 93% of total bacteria in the Tye River watershed. Concentrating on implementing pasture management practices within the first several years may provide the highest return on water quality improvement with less cost to landowners.

While the focus of this plan is to remove these streams from the impaired waters list, full achievement of the TMDL must also be demonstrated. This means that the BMPs needed to accomplish a 0% violation rate of the bacteria standard must be identified, along with associated costs and a timeline. Based on input from the working groups, it would take a total of 15 years to fully implement the TMDL. The overall timeline for implementation has been divided into two stages: 2015–2022 and 2023–2029. Implementation of practices included in Stage 1 is expected to result in removal of the streams from the impaired waters list, while Stage 2 goals demonstrate what it would take to meet the TMDL goal exclusive of the reductions in wildlife contributions called for in the study. Table 12 shows the cost of BMP implementation in each watershed at each stage while tables 13-16 show implementation and water quality improvement goals for each watershed in each implementation stage.

Table 12. BMP implementation costs by stage

Stage	Tye River	Hat Creek	Rucker Run	Piney River	TOTAL
Stage 1 (Years 1-8)	$2,285,393	$1,910,369	$2,163,318	$2,052,773	$8,411,853
Stage 2 (Years 9-15)	$2,656,288	$626,065	$973,311	$1,448,595	$5,704,260

Table 13. Timeline for implementation in the Tye River watershed

BMP Type	BMP	Units	Stage 1		Stage 2	
			Extent	% Land use treated	Extent	% Land use treated
Livestock stream access	Livestock exclusion w/riparian buffers	feet	24,462	8%	134,770	48%
	Livestock exclusion w/reduced setback	feet	5,615	2%	33,693	12%
Pasture	Improved pasture management	acres	731	10%	0	24%
	Riparian buffers	acres	21	0.3%	129	2%
	Permanent vegetation on critical areas	acres	0	0%	0	0%
	Reforestation of erodible pasture	acres	0	0%	0	0%
Cropland	Continuous no till	acres	90	2%	90	2%
	Cover crops	acres	35	1%	35	1%
Residential Septic	Septic tank pumpout	pumpout	345	24%	18	1%
	Connection to public sewer	connection	5	2%	1	0.02%
	Septic system repair	repair	106	40%	27	10%
	Conventional septic system	system	63	22%	7	3%
	Conventional septic system w/pump	system	21	7%	2	1%
	Alternative waste treatment	system	33	11%	11	4%
Average annual *E.coli* load (cfu/yr) Existing=7.94 x10^{14} cfu/yr			6.67 x 10^{14}		6.28 x 10^{14}	
% Violation of Instantaneous *E. coli* standard (235 cfu/100mL) Existing= 10.2% violation rate			6.5%		4.93%	
% Violation of Geometric mean *E. coli* standard (126 cfu/100mL) Existing= 16.7% violation rate			10.42%		6.25%	

Table 14. Timeline for implementation in the Rucker Run watershed

BMP Type	BMP	Units	Stage 1		Stage 2	
			Extent	% Land use treated	Extent	% Land use treated
Livestock stream access	Livestock exclusion w/riparian buffers	feet	77,758	28%	40,673	28%
	Livestock exclusion w/reduced setback	feet	19,439	13%	10,168	7%
Pasture	Improved pasture management	acres	1,242	38%	291	9%
	Riparian buffers	acres	74	2%	39	1%
	Permanent vegetation on critical areas	acres	32.5	1%	0	0%
	Reforestation of erodible pasture	acres	32.5	1%	0	0%
Cropland	Continuous no till	acres	225	8%	225	8%
	Cover crops	acres	165	6%	165	6%
Residential Septic	Septic tank pumpout	pumpout	31	24%	2	1%
	Connection to public sewer	connection	2	2%	0	0%
	Septic system repair	repair	52	40%	13	10%
	Conventional septic system	system	30	22%	3	3%
	Conventional septic system w/pump	system	10	7%	1	1%
	Alternative waste treatment	system	15	11%	5	4%
Average annual *E.coli* load (cfu/yr) Existing=1.20 x10^{14} cfu/yr			8.26×10^{13}		6.90×10^{13}	
% Violation of Instantaneous *E. coli* standard (235 cfu/100mL) Existing= 19.16% violation rate			9.58%		4.11%	
% Violation of Geometric mean *E. coli* standard (126 cfu/100mL) Existing= 22.92% violation rate			16.67%		6.25%	

Table 15. Timeline for implementation in the Hat Creek watershed

BMP Type	BMP	Units	Stage 1		Stage 2	
			Extent	% Land use treated	Extent	% Land use treated
Livestock stream access	Livestock exclusion w/riparian buffers	feet	76,142	60%	24,366	19%
	Livestock exclusion w/reduced setback	feet	19,035	15%	6,091	5%
Pasture	Improved pasture management	acres	783	33%	0	0%
	Riparian buffers	acres	73	3%	23	1%
	Permanent vegetation on critical areas	acres	47	2%	0	0%
	Reforestation of erodible pasture	acres	24	1%	0	0%
Cropland	Continuous no till	acres	25	3%	25	3%
	Cover crops	acres	23	3%	22	3%
Residential Septic	Septic tank pumpout	pumpout	23	24%	1	1%
	Connection to public sewer	connection	0	0%	0	0%
	Septic system repair	repair	39	40%	10	10%
	Conventional septic system	system	25	24%	3	3%
	Conventional septic system w/pump	system	8	7%	1	1%
	Alternative waste treatment	system	13	11%	4	4%
Average annual *E.coli* load (cfu/yr) Existing=5.97 x 10^{13} cfu/yr			3.59 x 10^{13}		3.16 x 10^{13}	
% Violation of Instantaneous *E. coli* standard (235 cfu/100mL) Existing= 25.94% violation rate			9.79%		5.06%	
% Violation of Geometric mean *E. coli* standard (126 cfu/100mL) Existing= 43.75% violation rate			16.67%		8.33%	

Table 16. Timeline for implementation in the Piney River watershed

BMP Type	BMP	Units	Stage 1		Stage 2	
			Extent	% Land use treated	Extent	% Land use treated
Livestock stream access	Livestock exclusion w/riparian buffers	feet	60,481	32%	75,601	41%
	Livestock exclusion w/reduced setback	feet	15,120	8%	18,900	10%
Pasture	Improved pasture management	acres	2,023	44%	0	0%
	Riparian buffers	acres	58	1%	72	2%
	Permanent vegetation on critical areas	acres	46	1%	0	0%
	Reforestation of erodible pasture	acres	0	0%	0	0%
Cropland	Continuous no till	acres	15	1%	15	1%
	Cover crops	acres	0	0%	0	0%
Residential Septic	Septic tank pumpout	pumpout	31	24%	2	1%
	Connection to public sewer	connection	3	2%	0	0%
	Septic system repair	repair	52	40%	13	10%
	Conventional septic system	system	32	22%	3	3%
	Conventional septic system w/pump	system	11	7%	1	1%
	Alternative waste treatment	system	17	11%	6	4%
Average annual *E.coli* load (cfu/yr) Existing=1.94 x 10^{14} cfu/yr			1.40×10^{14}		1.22×10^{14}	
% Violation of Instantaneous *E. coli* standard (235 cfu/100mL) Existing= 15.47% violation rate			9.58%		4.72%	
% Violation of Geometric mean *E. coli* standard (126 cfu/100mL) Existing= 20.83% violation rate			16.67%		0%	

Water Quality Monitoring

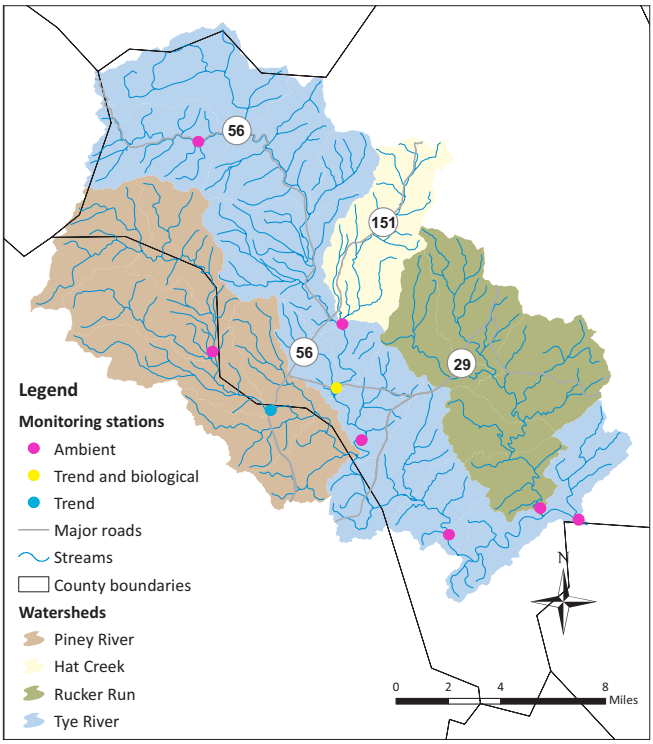


Figure 2. VA DEQ monitoring stations following implementation plan completion

Improvements in water quality will be evaluated through water quality monitoring conducted at VADEQ monitoring stations as shown in Figure 2. The map shows stations that are part of VADEQ's Ambient Monitoring Program, wherein bi-monthly watershed monitoring takes place on a rotating basis for two consecutive years. Trend stations are also highlighted on the map. These stations are part of a regular monitoring cycle and are not rotated off of the monitoring schedule. In cases where the monitoring station used to place a stream on the impaired waters list is a trend station (shown in green and blue), monitoring will continue as usual. For the other ambient monitoring stations (shown in pink), monitoring will begin no sooner than the second odd numbered calendar year following the initiation of TMDL implementation. This will help ensure that sufficient time has passed for BMPs to have become functional. At a minimum, the frequency of sample collections will be every other month for two years. After two years of bi-monthly monitoring an assessment will be made to determine if the segments are no longer impaired. Once full restoration has been achieved, monitoring will be suspended.

There is the potential for additional monitoring at a subset of stations in the watersheds where continual VADEQ monitoring is conducted on a bi-monthly basis beginning on the next odd number calendar year after the initiation of implementation. This will require additional funding and can only be accomplished with sufficient resources to support needs of the data users, and only if watershed conditions and stakeholder support are suitable to this strategy. These monitoring stations will be located in the watersheds based on TMDL implementation funds, either state, federal, or other sources, becoming available.

Targeting Implementation

Implicit in the process of a staged implementation is targeting of best management practices. Targeting ensures optimal utilization of limited technical and financial resources. The agricultural working group discussed potential targeting strategies for fencing practices and other agricultural BMPs. Citizen monitoring was identified as a good way to identify these areas. Citizen monitoring sample sites should be located on segements of the river where watershed residents have access and typically swim. These areas should be targeted for outreach in the event that monitoring shows high levels of *E. coli.* Generally, the agricultural working group felt that since participation in agricultural BMP cost share programs to date has been low in the watersheds, it would be best to throw a wide net with respect to outreach and promotion of BMP programs.

The residential working group identified areas in the watersheds that are most likely to have straight pipes and failing septic systems and should therefore be targeted for implementation first. These areas included homes along Dickie Road and upstream of it, about 50 homes between Lowesville and Woodson that were built in the 50's and 60's, and the area upstream of Woodson from the Sam Massies Bridge (Perkins Mill Road) up to the George Washington National Forest. Citizen monitoring was also identified as a good tool for improved targeting of outreach efforts for residential BMPs and locating failing septic systems and straight pipes.

Fencing Prioritization by Subwatershed

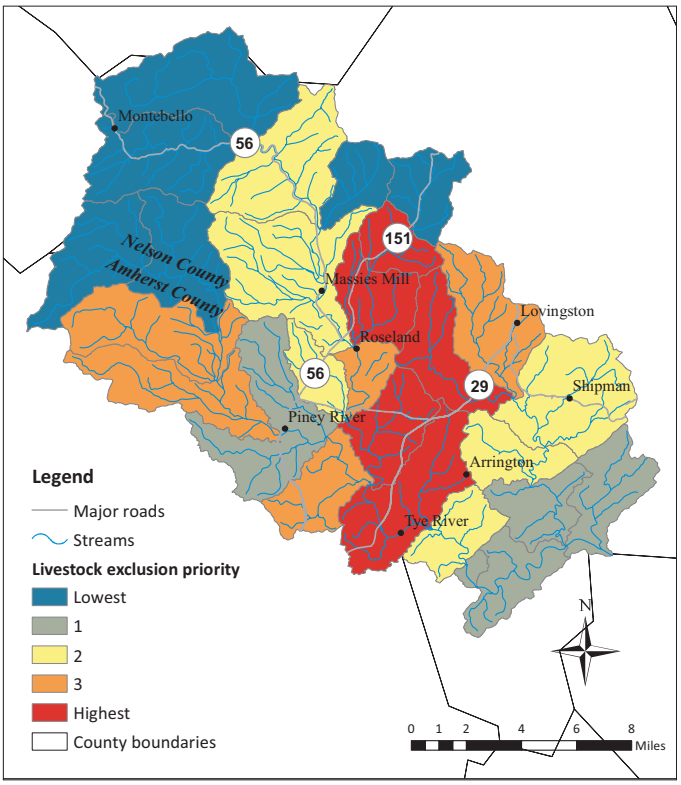


Figure 3. Livestock stream exclusion prioritization

The agricultural working group discussed additional methods for targeting of livestock stream exclusion practices. Since portions of the watershed are very steep and subject to greater erosion and runoff, it was suggested that slope be considered in development of targeting strategies. In order to prioritize segments of the stream of fencing, each watershed was divided up into a series of smaller subwatersheds, and an analysis of the water quality benefits of livestock exclusion was performed for each subwatershed based on 1) the extent of pasture next to the stream 2) the number of livestock in the watershed and 3) the slope of the watershed. The subwatersheds were then ranked in ascending order based on the ratio of bacteria loading per fence length and slope (Figure 3).

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 17 provides a summary of relevant characteristics of farms and producers in Nelson and Amherst 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 17. Characteristics of farms and farmers in Nelson and Amherst Counties, VA (USDA, 2007)

Characteristic	Nelson	Amherst
Number of farms	462	424
Land in farms (acres)	76,149	88,430
Full owners of farms	302	289
Part owners of farms	139	105
Tenants	21	30
Operators identifying farming as their primary occupation	151	179
Operators identifying something other than farming as their primary occupation	311	245
Average age of primary operator	58	59.3
Average size of farm (acres)	158	209
Average market value of farmland and buildings ($/acre)	$4,685	$3,063
Average net cash farm income of operation ($)	$3,579	-$2,201
Average farm production expenses ($)	$28,467	$22,344
Farms with internet access	269	212
Farm typology (acres)		
Small family farms: retirement and residential/lifestyle	328	322
Small family farms: farming occupation	39	45
Large family farms	6	1
Nonfamily farms	23	10
Farm operations: partnerships		

In addition to local farmers, participation from homeowners, local government staff and elected officials is critical to the success of this plan. Elected officials and local government staff make important decisions with respect to land use and development that are likely to affect water quality. It is critical

that the goals of this plan are considered as these decisions are evaluated and made. Residential property owners will need to ensure that their septic systems are regularly pumped and inspected (every 3-5 years). 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.

Thomas Jefferson and Robert E. Lee SWCDs and Natural Resource Conservation Service

Both the SWCDs and NRCS are continually reaching out to farmers in the watersheds and providing them technical assistance with conservation practices. Currently, dedicated staff is not available to work solely in the four watersheds that are covered in this plan, meaning that agricultural BMP implementation goals cannot be met without additional resources. SWCD and NRCS staff responsibilities include promoting available funding and the benefits of BMPs, and providing assistance in the design and layout of agricultural BMPs. SWCD and NRCS staff can assist with conducting outreach activities in the watersheds to encourage participation in conservation programs; however, staff time for very targeted outreach is limited. Such activities include mailing out newsletters and organizing field days. The SWCDs will 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. Should funding for additional staff become available, the SWCDs will work together to ensure adequate coverage of the project area across their coverage boundaries.

Dedicated staff is currently not available to lead efforts to correct failing septic systems and straight pipes as well. Watershed groups such as the Middle James Roundtable could work with the Nelson and Amherst County Health Departments to implement such a program using grant funds. In addition, the Thomas Jefferson SWCD is currently implementing a residential septic program in the nearby Rockfish River watershed. Since they have trained and experienced staff, they could take the lead in administering a residential cost share program as well should funding become available.

Nelson and Amherst Counties

Decisions made by local governments regarding land use and zoning will play an important role in the implementation of this plan. This makes the Nelson and Amherst County Boards of Supervisors and the Planning Commissions key partners in long term implementation efforts. Currently, both Nelson and Amherst 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 Tye River watershed and its tributaries within Nelson and Amherst Counties is such that it has not been subject to intense development pressures, making it likely that the predominant land uses in the watershed will remain agriculture and forest. Local government support of land conservation will become increasingly important as greater numbers of conservation measures are implemented across the watersheds. Ensuring that land remains in agriculture and forest will allow the practices installed to continue to benefit water quality. The Nelson and Amherst County Service Authorities are another key local government partner with respect to identifying opportunities to connect homes with failing septic systems to public sewer.

Virginia Department of Environmental Quality

The Virginia Department of Environmental Quality has a lead role in the development of TMDL implementation plans. VADEQ also provides available grant funding and technical support for TMDL implementation. VADEQ will work closely with project partners including the Thomas Jefferson and Robert E Lee Soil and Water Conservation Districts to track implementation progress for best management practices. In addition, VADEQ will work with interested partners on grant proposals to generate funds for projects included in the implementation plan. When needed, VADEQ will facilitate additional meetings of the steering committee to discuss implementation progress and make necessary adjustments to the implementation plan.

VADEQ is also responsible for monitoring state waters to determine compliance with water quality standards. VADEQ will continue monitoring water quality in the Tye River and its tributaries in order to assess water quality and determine when restoration has been achieved and the streams can be removed from Virginia's impaired waters list.

Virginia Department of Conservation and Recreation

The Virginia Department of Conservation and Recreation (VADCR) administers the Virginia Agricultural Cost Share Program, working closely with Soil and Water Conservation Districts to provide cost share and operating grants needed to deliver this program at the local level and track implementation. In addition, VADCR administers the state's Nutrient Management Program, which provides technical assistance to producers in appropriate manure storage and manure and commercial fertilizer

Virginia Department of Health

The Virginia Department of Health (VDH) is responsible for adopting and implementing regulations for onsite wastewater treatment and disposal. The Sewage Handling and Disposal Regulations require homeowners to secure permits for handling and disposal of sewage (e.g. repairing a failing septic system or installing a new treatment system). VDH staff provide technical assistance to homeowners with septic system maintenance and installation, and respond to complaints regarding failing septic systems and straight pipes.

Other Potential Local Partners

There are numerous additional opportunities for future partnerships in the implementation of this plan. Additional potential partners in implementation include:

- VA Cooperative Extension (VCE)
- Blue Ridge Medical Center
- Master Well Owner Network (through VCE)
- Blue Ridge Chapter of the Sierra Club
- Blue Ridge Chapter of VA Master Naturalists
- Keep Nelson Beautiful
- VA Department of Forestry
- Central VA Land Conservancy
- Habitat for Humanity
- Chesapeake Bay Foundation

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 implementation efforts with these existing programs could make additional resources available and increase participation by local landowners.

Nelson County Comprehensive Plan

The Nelson County Comprehensive Plan includes a section on "Natural, and Scenic, and Historic Resources." Among the objectives established in this section of the plan are the protection of the county's water resources, and recognition that the county's waterways are significant environmental resources, offering opportunities for recreation and requiring protection. The plan also recognizes the prevalence of steep slopes in the watersheds and encourages limiting clearing, grading, and overgrazing on these areas due to their potential for increased runoff. The plan encourages implementation of management techniques that protect rivers and streams in addition to a wellhead protection program. A series of watershed protection design standards developed by the Center for Watershed Protection for incorporation into local ordinances are featured in the plan. Examples include using natural vegetation to mitigate stormwater runoff such as riparian buffers and minimizing paving requirements. These standards along with the other recommendations for the protection of the county's natural resources included in the comprehensive plan will directly support implementation efforts in the Tye River watershed. In addition, the comprehensive plan features a greenway plan that extends along the Tye and Piney Rivers. The proposed greenway is designed to capitalize upon the county's natural resources and tourism potential, making restoration of these streams to support primary contact recreation increasingly important.

Amherst County Comprehensive Plan

The Amherst County Comprehensive Plan includes a section on "Environment," which outlines techniques available for protecting the county's natural resources. Low Impact Development is noted as one of these techniques. This form of development helps to reduce stormwater runoff from developed areas, thereby protecting water quality. While the Tye River watershed does not include a large amount of developed land for Low Impact Development "retrofits," employing this method of development in the future will help to avoid exacerbating the existing water quality impairments in the streams. The plan also mentions the Conservation Reserve and Conservation Reserve Enhancement Programs as tools available to protect natural resources. Perhaps most importantly, it is noted in the plan that land preservation and environmental protection were emphasized more than any other topics by citizens who participated in developing the plan. It is stated that these issues should serve as cornerstones of the comprehensive plan, and that streams should receive more attention for protection.

Tye River Scenic River Designation

The Scenic River Act was enacted in 1970 as a means of recognizing Virginia's scenic rivers and their immediate surrounding environments. In order to be eligible for this designation, a river must have notable natural, scenic, historical, and recreational attributes. A 12.7 mile section of the Tye River received this designation in 2014 (Figure 4). This section extends from Route 738 to the confluence with the James River. This designation gives local governments and citizens a greater voice in planning and implementation of federal and state projects that might affect the river. In addition, it requires that the Federal Energy Commission consider the impact of hydropower projects on the river. The General Assembly must also authorize the construction, operation and maintenance of any structure that will impede the flow of the river (such as a dam).

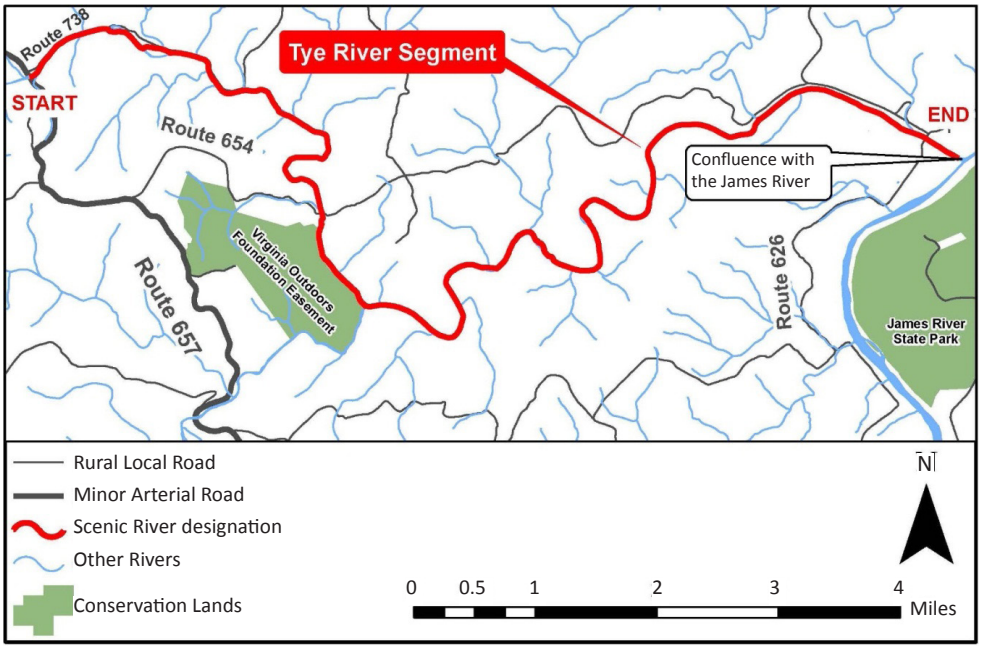


Figure 4. Tye River Scenic River designation. Map from Tye Scenic River Report (VADCR, 2014)

Virginia's Phase II Chesapeake Bay Watershed Implementation Plan

Virginia's Watershed Implementation Plan (WIP) outlines a series of BMPs, programs and regulations that will be implemented across the state in order to meet nitrogen, phosphorous, and sediment loading reductions called for in the Chesapeake Bay TMDL, completed in December 2010. The TMDL is designed to ensure that all pollution control measures needed to fully restore the Bay are in place by 2025, with at least 60 percent of the actions completed by 2017. A number of the BMPs included in this implementation plan are also found in Virginia's WIP. Consequently, Nelson and Amherst Counties will be able to track and receive credit for progress in meeting Phase II WIP goals while also working towards implementation goals established in this plan to improve local water quality. For more information about Virginia's Phase II WIP, please visit VADEQ's Bay TMDL webpage: http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay.aspx

FUNDING FOR IMPLEMENTATION

A list of potential funding sources available for implementation has been developed. Detailed descriptions can be obtained from the Lord Fairfax SWCD, VADCR, Natural Resources Conservation Service, and Virginia Cooperative Extension. While funding is being provided to the Lord Fairfax SWCD for agricultural BMPs and technical assistance for farmers, an additional funding commitment is needed to fully implement the agricultural, 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 repayment terms based on the borrower's ability to repay and the 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 and nonpoint sources are administered through VADEQ.

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 Farm Service Agency (FSA) CRP Continuous Signup. It has been "enhanced" by increasing the rental rates, and offering incentive payments to place the enrolled area under a 10-15 year contract. The average cost share payment in this program is 75%; however, additional incentives are available to raise this rate if a landowner is willing to install addtional control measures. 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. Federal cost-sharing (50%) 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 Lord Fairfax SWCD also provides a cost share payment. The State of Virginia will make an additional payment to landowners who elect 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 up to 10-year contracts to landowners and farmers to provide financial assistance, 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.

EPA Section 319 Grant Project Funds

Through Section 319 of the Federal Clean Water Act, Virginia is awarded grant funds to implement

NPS programs. The VADEQ administers the money annually on a competitive grant basis to fund TMDL implementation projects, outreach and educational activities, water quality monitoring, and technical assistance for staff of local sponsor(s) coordinating implementation. In order to meet eligibility criteria established for 319 funding, all proposed project activities must be included in the TMDL implementation plan covering the project area. In addition, this plan must include the nine key elements of a watershed based plan identified by EPA (see Guidance Manual for TMDL Implementation Plans, VA Departments of Conservation and Recreation and Environmental Quality, July 2003).

Regional Conservation Partnership Program (RCPP)

RCPP was authorized through the 2014 Farm Bill. This 5-year program promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and through program contracts or easement agreements. The RCPP competitively awards funds to conservation projects designed by local partners specifically for their region. The Chesapeake Bay watershed is one of eight "Critical Conservation Areas" identified in this program. These areas receive 35% of program funding.

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 (SER-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 (NFWF)

NFWF administers the Chesapeake Bay Stewardship Fund, which is dedicated to the protection and restoration of the Chesapeake Bay. The Stewardship Fun is supported through partnerships with government agencies and private corporations, and typically awards $8 million to $12 million per year through two competative grant programs (Innovative Nutrient and Sediment Reduction Grants and Small Watershed Grants) and a technical assistance program. A request for proposals is typically issued in the spring and awards are made in the fall. Additional information is available at: www.nfwf.org/chesapeake/Pages/home.aspx.

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.

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 knowledge. 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 state and federal agencies and chaired by VADEQ and the Army Corps of Engineers (ACOE). For more information, contact the ACOE or VADEQ's Water Protection Program.

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