Implementation Plan for the Hat Creek and Black Creek Watersheds
Nelson County, Virginia

A plan to reduce sediment and phosphorus

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Prepared by
VA Department of Environmental Quality

In Cooperation with
Local Stakeholders

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1. INTRODUCTION

1.1 Background

The Federal Clean Water Act (CWA) that became law in 1972 requires that all U.S. streams, rivers, and lakes meet their state's water quality standards. The CWA also requires that states conduct monitoring to identify polluted waters or those that do not meet standards. Through this required program, the state of Virginia has found that many streams do not meet state water quality standards for protection of the six beneficial uses: fishing, swimming, shellfish, aquatic life, wildlife, and drinking water supply.

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

Once a TMDL is developed, measures must be taken to reduce pollution levels in the stream. Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) states that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters". This plan, commonly known as an Implementation Plan (IP), describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented expeditiously to meet the water quality goals established by the TMDL.

1.2 Designated Uses and Applicable Water Quality Standards

Water quality standards are designed to protect the public health or welfare, enhance the quality of water, and serve the purposes of the State Water Control Law (§62.1-44.2 et seq. of the Code of Virginia) and the federal Clean Water Act (33 USC §1251 et seq.).” Virginia Water Quality Standard 9 VAC 25-260-10 (Designation of uses.) states:

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

1.2.1 Aquatic Life Water Quality Criterion (9VAC 25-260-20)

The following general standard protects the aquatic life use:

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

Specific substances to be controlled include, but are not limited to: floating debris, oil scum, and other floating materials; toxic substances (including those which bioaccumulate); substances that produce color, tastes, turbidity, odors, or settle to form sludge deposits; and substances which nourish undesirable or nuisance aquatic plant life. Effluents which tend to raise the temperature of the receiving water will also be controlled” (SWCB, 2011).

The Virginia Department of Environmental Quality’s (DEQ) biological monitoring program is used to evaluate compliance with the above standard. This program monitors the assemblage of benthic (bottom-dwelling) macro (large enough to see) invertebrates (insects, mollusks, crustaceans, and annelid worms) in streams to determine the biological health of the stream. Benthic macroinvertebrates are sensitive to water quality conditions, important links in aquatic food chains, major contributors to energy and nutrient cycling in aquatic habitats, relatively immobile, and easy to collect. These characteristics make them excellent indicators of aquatic health. Changes in water quality are reflected in changes in the structure and diversity of the benthic macroinvertebrate community. Currently, DEQ assesses the health of the benthic macroinvertebrate community using the Virginia Stream Condition Index (VSCI). This index was first developed by Tetra Tech (2003) and later validated by DEQ (VADEQ, 2006). The VSCI is a multimetric index based on eight (8) biomonitoring metrics. The index provides a score from 0-100, and scores from individual streams are compared to a statistically derived cutoff value based on the scores of regional reference sites. Hat and Black Creeks were originally listed as impaired due to water quality exceedance of the general aquatic life (benthic) standard in the 2012 and 2014 Virginia Water Quality Assessment 305(b)/303(d) Integrated Reports, respectively (VADEQ, 2012 and VADEQ, 2014). Hat Creek has been designated as impaired from its headwaters 9.52 miles downstream to its confluence with Tye River (stream segment VAV-H09R_HAT01A04). The Black Creek impaired segment extends from its headwaters 1.96 miles downstream to its confluence with the Tye River (stream segment VAV-H09R_BKC01A14).

In 2022, a stressor identification analysis study was conducted to determine the pollutants of concern contributing to the benthic impairments in the Hat and Black Creek watersheds. The stressor analysis study used a formal causal analysis approach developed by USEPA, known as CADDIS (Causal Analysis Diagnosis Decision Information System). The CADDIS approach evaluates 14 lines of evidence that support or refute each candidate stressor as the cause of impairment. In each stream, each candidate stressor was scored from -3 to +3 based on each line of evidence. Total scores across all lines of evidence were then summed to produce a stressor score that reflects the likelihood of that stressor being responsible for the impairment. The study found that sediment (measured as total suspended solids or TSS) was a probable stressor in both of the impaired creeks, while phosphorus was an additional stressor in Black Creek. As a result, sediment TMDLs were developed for Hat and Black Creeks and a phosphorus TMDL was developed for Black Creek to identify necessary pollutant reductions to restore the aquatic community.

1.3 Attainability of Designated Uses

Although the Hat and Black Creek TMDLs were developed for sediment and phosphorus (Black Creek), attainment of a healthy benthic community will ultimately be based on biological monitoring of the benthic macroinvertebrate community, in accordance with established DEQ protocols. If a future review should find that the reductions called for in these TMDLs based on current modeling are found to be insufficiently protective of local water quality, then revision(s) will be made as necessary to provide reasonable assurance that water quality goals will be achieved.

2 REQUIREMENTS FOR IMPLEMENTATION PLANS

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

2.1 State Requirements

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia), or WQMIRA. WQMIRA directs the State Water Control Board (SWCB) to "develop and implement a plan to achieve fully supporting status for impaired waters." In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. WQMIRA requires that IPs include the following (VADEQ and VADCR, 2003):

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

2.2 Federal Recommendations

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

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

Further recommendations are outlined in the *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (EPA, 2008). The handbook describes the steps used in the watershed planning and implementation process and integrates EPA's nine elements as described in the following section. It is strongly suggested that the EPA recommendations be addressed in the IP, in addition to the required components as described by WQMIRA.

2.3 Requirements for CWA Section 319(h) Fund Eligibility

The EPA develops guidelines that describe the process and criteria used to award CWA Section 319(h) nonpoint source grants to States. The guidance is subject to revision and the most recent version should be considered for IP development. The "Nonpoint Source Program and Grants Guidelines for States and Territories" (EPA, 2024) identifies the following nine elements that must be included in the IP in order to qualify for CWA Section 319(h) funds:

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

While IPs that include EPA's nine elements are not guaranteed CWA Section 319(h) funds, incorporating these elements opens the door to the possibility of receiving CWA Section 319(h) funds which are awarded annually to the State.

3 REVIEW OF TMDL DEVELOPMENT

3.1 Background

Hat and Black Creek was initially listed as impaired on Virginia's 2012 and 2014 303(d) Impaired Waters List, respectively, due to violations of the general standard for aquatic life. Both Black Creek and Hat Creek are impaired from their headwaters to their confluence with the Tye River (Table 3-1, Figure 3-1). Both impairments are for failure to support the aquatic life use (i.e., a benthic impairment). Black Creek was initially listed as impaired on Virginia's 2014 303(d) Impaired Waters List due to violations of the general standard for aquatic life based on data collected at DEQ monitoring stations 2-BKC001.43 and 2-BKC001.55. Hat Creek was listed as impaired on Virginia's 2012 303(d) Impaired Waters List due to violations of the general standard for aquatic life based on data collected at DEQ monitoring station 2-HAT000.14. Hat Creek was also listed starting in 2004 due to an exceedance of bacteria impairing recreational use. During the 2022 assessment window (January 1, 2015 to December 31, 2020), VSCI scores averaged 63.3 in Black Creek and 62.3 in Hat Creek. Though both watersheds have average VSCI scores above 60, the streams are still considered impaired because, while some scores fall above 60, DEQ biologists generally recommend two consecutive years of benthic monitoring above the VSCI threshold of 60 before delisting the stream segments.

Table 3-1. Impaired stream segments (aquatic life use) in the Hat and Black Creek watersheds

TMDL Watershed	305(b) Segment ID/ATTAINS ID	Cause Group Code 303(d) Impairment ID	Listing Station	Year Initially Listed
Black Creek	VAV-H09R_BKC01A14 (1.96 mi)	H09R-05-BEN	2-BKC001.43/ 2-BKC001.55	2014
Hat Creek	VAV-H09R_HAT01A04 (9.52 mi)	H09R-02-BEN	2-HAT000.14	2012

The Black Creek watershed is approximately 3,100 acres, and the Hat Creek watershed is approximately 12,400 acres. Both watersheds are located in Nelson County, Virginia. The Black Creek watershed includes portions of the unincorporated community of Colleen, while the Hat Creek watershed includes portions of the unincorporated communities of Bryant, Jonesboro, and Roseland. The study watersheds are within VAHU6 watersheds JM23 and JM24, which corresponds to HUC12 020802030503 and HUC12 020802030504. Both Black Creek and Hat Creek are direct tributaries to the Tye River, which flows southeast through Virginia into the James River. The James River flows into the Chesapeake Bay and ultimately discharges into the Atlantic Ocean (Figure 3-1).

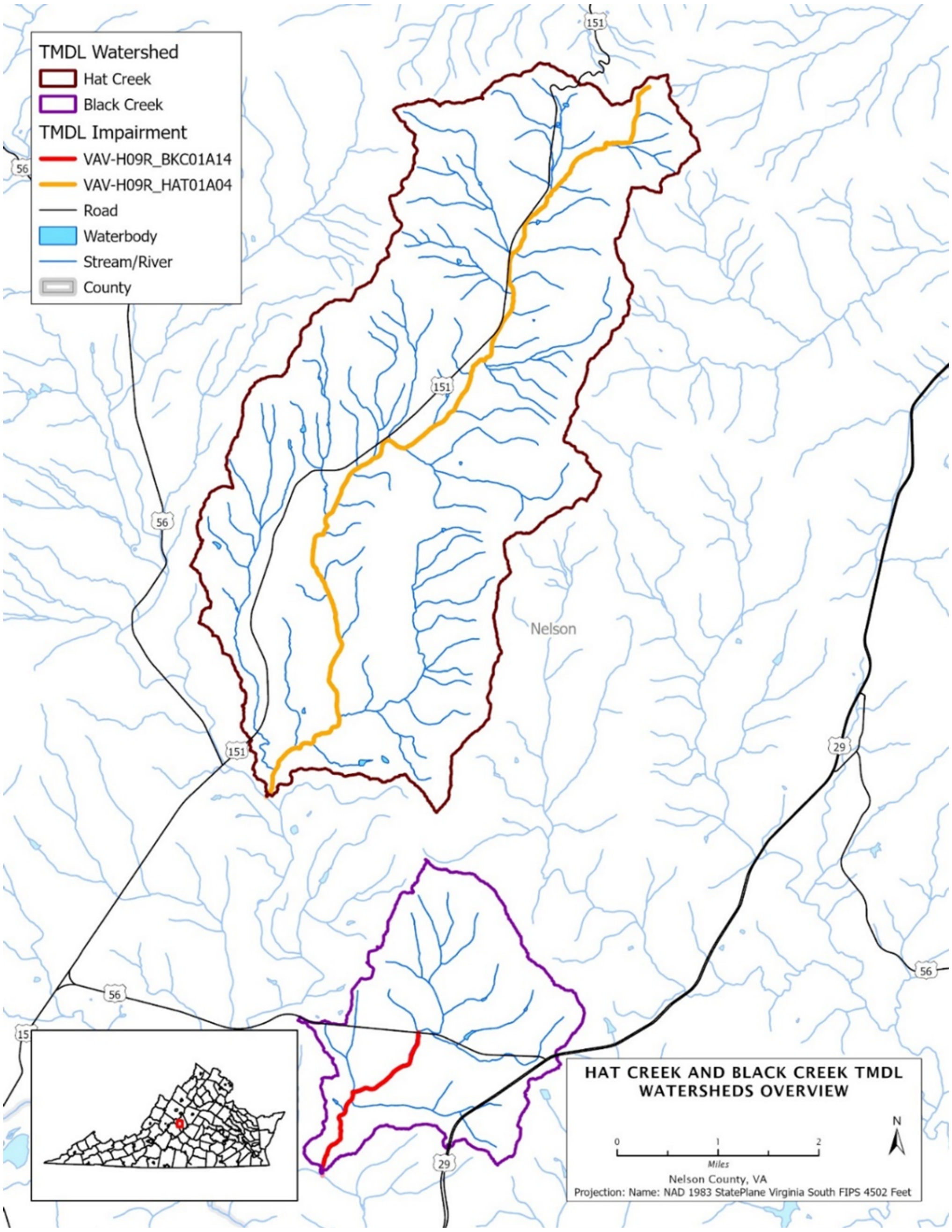

Figure 3-1. Location of Hat and Black Creek watersheds and impaired stream segments

The 2016 VGIN Virginia Land Cover Dataset (VLCD) land cover dataset was used to determine the land cover distribution throughout the watersheds. Table 3-2, Table 3-3 and Figure 3-2 summarize land cover distribution in the Hat and Black Creek watersheds. Forest comprises the greatest portion of both watersheds, followed by hayland.

Table 3-2. Land cover distribution in the Black Creek watershed.

Black Creek Watershed		
Land Cover Category	***Acres***	***%***
Cropland	-	-
Hay	483	15.5%
Pasture	232	7.4%
Vineyard	-	-
Forest	1,764	56.5%
Trees	333	10.7%
Shrub	8	0.3%
Harvested	16	0.5%
Water	10	0.3%
Wetland	1	0.0%
Gravel	3	0.1%
Turfgrass	165	5.3%
Developed pervious	9	0.3%
Developed impervious	100	3.2%
Total	***3,124***	***100.0%***

Table 3-3. Land cover distribution in the Hat Creek watershed

Hat Creek Watershed		
Land Cover Category	***Acres***	***%***
Cropland	23	0.2%
Hay	1,179	9.5%
Pasture	1,101	8.8%
Vineyard	157	1.3%
Forest	8,499	68.3%
Trees	889	7.1%
Shrub	23	0.2%
Harvested	26	0.2%
Water	19	0.2%

Hat Creek Watershed		
Land Cover Category	***Acres***	***%***
Wetland	2	0.0%
Gravel	9	0.1%
Turfgrass	366	2.9%
Developed pervious	10	0.1%
Developed impervious	138	1.1%
Total	*12,441*	*100.0%*

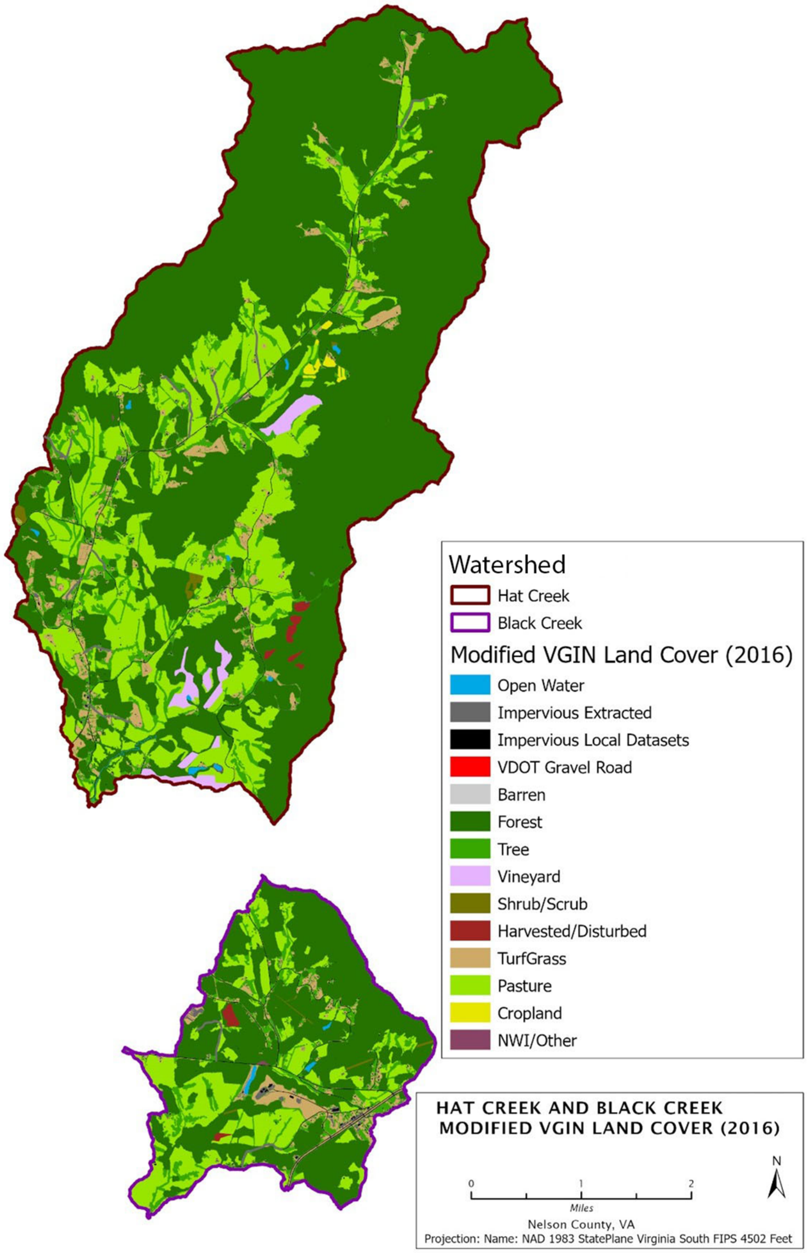

Figure 3-2. Land cover distribution in the Hat and Black Creek watersheds (2016 VGIN dataset).

Wetland Studies and Solutions Inc. (WSSI) was contracted by the DEQ to develop the Hat and Black Creek TMDL in 2022, and the TMDL study was completed in December 2024 (VADEQ, 2025). The implementation plan was developed concurrently with the TMDL study to maximize efficiencies of the process.

3.2 Water Quality Monitoring Data

Data collected from four benthic monitoring stations in the Hat and Black Creek watersheds were used to list these streams with a benthic impairment and to develop the sediment and phosphorus (Black Creek) TMDLs for the streams. Table 3-4 provides a summary of the data collected from these stations and Figure 3-3 shows the locations of the stations and Stream Condition Index scores.

Table 3-4. DEQ biological monitoring stations in the Hat and Black Creek watersheds.

Stream	Station	Years Sampled	Samples Collected	SCI Average	2022 WQA (2015-2020) SCI Avg.	2020 WQA Listing Status
Black Creek	2-BKC000.08	2020-2021	4	54.2	63.3	Impaired
	2-BKC001.43	2011-2013	4	29.3	N/A	Impaired
	2-BKC001.55	2011-2013	4	25.1	N/A	Impaired
Hat Creek	2-HAT000.14	2008-2021	10	58.7	62.3	Impaired

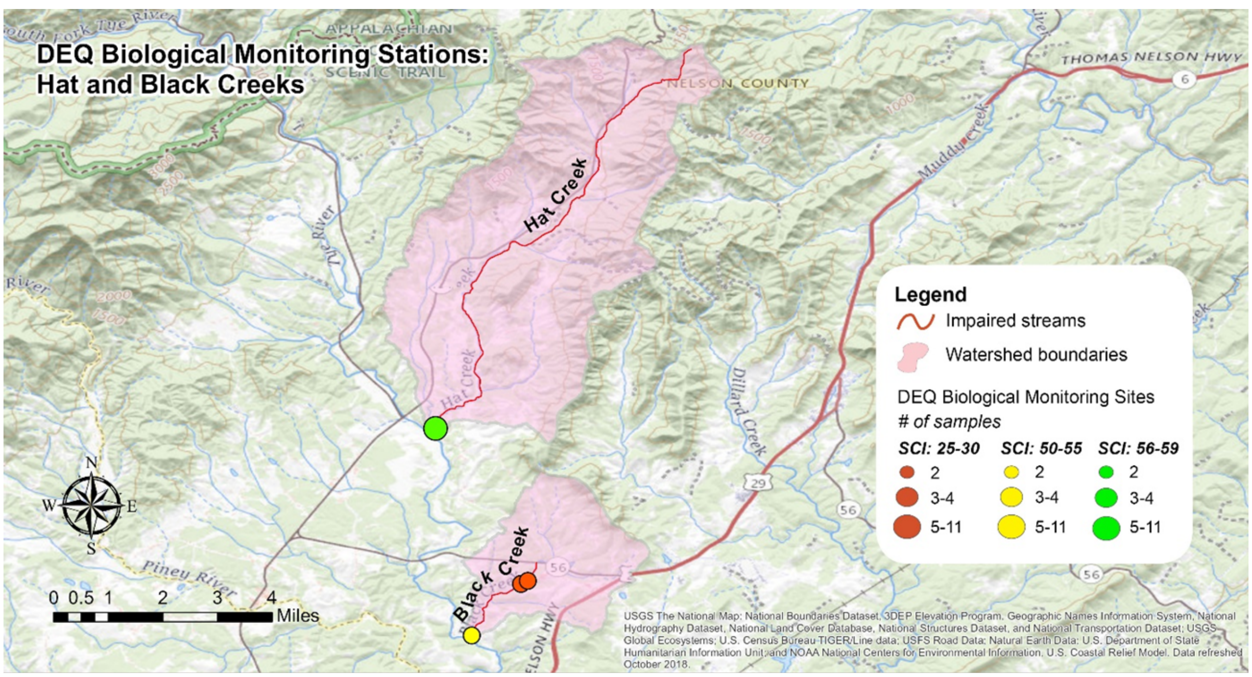

Figure 3-3. Average stream condition index (SCI) scores through 2021 for DEQ biological monitoring stations in Hat and Black Creeks.

3.3 Water Quality Modeling

The model selected for development of the sediment and phosphorus (Black Creek) TMDLs in the Hat and Black Creek watersheds was the Generalized Watershed Loading Functions (GWLF) model, developed by Haith et al. (1992), with modifications by Evans et al. (2001), Yagow et al. (2002), and Yagow and Hession (2007). GWLF is a continuous simulation model that operates on a daily timestep for water balance calculations and outputs a monthly sediment and phosphorus yield for the watershed. The model allows for multiple different land cover categories to be incorporated, but spatially it is lumped. Observed daily precipitation and temperature data is input, along with land cover distribution and a range of land cover parameters, which the model uses to estimate runoff and sediment and phosphorus loads. The hydrology in the model is simulated with a daily water balance procedure that considers different types of storage within the system. The model considers flow inputs from both surface water and groundwater. To clearly identify sources of sediment and phosphorus, Black Creek was divided up into three smaller subwatersheds. The sources and their respective sediment and phosphorus contributions were identified for each smaller subwatershed based on land use and climate data. Hat Creek was not divided into smaller subwatersheds for model development. The GWLF model was then used to simulate the transport of these pollutant loads to the streams.

3.4 Sediment and Phosphorus Source Assessment

3.4.1 Point Sources

A TMDL's waste load allocation accounts for the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Various point sources of sediment and phosphorus exist within the Hat and Black Creek watersheds. These point sources are permitted under the Virginia Pollutant Discharge Elimination System (VPDES) program and include one individual VPDES permit in Black Creek, and one domestic sewage general permit in Hat Creek. There were no active Virginia Stormwater Management Program General Permits (VSMP) in either of the watersheds at the time of TMDL development, and none had been issued within the previous 10 years. Therefore, VSMP permits did not receive a wasteload allocation, with the expectation that allocations for future permits may be taken from the future growth set aside. Point sources of sediment and phosphorus in the watersheds are listed in Table 3-5, along with their waste load allocations in the TMDLs. The waste load allocation for each point source was set using established methodology for each permit type as described in the TMDL report.

Table 3-5. Permitted sediment and phosphorus point sources in the Hat and Black Creek watersheds.

Permit type	Permit No.	Facility Name	Watershed	Sediment WLA (lbs/yr)	Phosphorus WLA (lbs/yr)
Domestic sewage general permit	VAG408483	Private residence	Hat Creek	91	NA
Individual VPDES permit	VA0089729	Nelson County Regional Sewage Treatment Plant	Black Creek	20,118	685

3.4.2 Nonpoint sources

3.4.2.1 Surface runoff

Sediment and phosphorus can be transported from both pervious and impervious surfaces during runoff events. Between rainfall events, sediment and attached phosphorus accumulate on impervious surfaces and can then be washed off these impervious surfaces during runoff events. On pervious surfaces, soil particles are detached by rainfall impact and shear stress from overland flow and then transported with the runoff water to nearby streams. Various factors including rainfall intensity, storm duration, surface cover, topography, tillage practices, soil erosivity, soil permeability, and other factors all impact these processes.

VGIN 2016 land cover data was used to determine the distribution of different land cover types in the watersheds (Figure 3-2). Values for various parameters affecting sediment and phosphorus loads were gleaned from literature guidance (CBP, 1998; Haith et al., 1992; Hession et al., 1997). Land cover distributions and associated sediment and phosphorus loading rates were input into the GWLF model, which was then used to simulate pollutant transport to the streams (Table 3-6 and Table 3-7).

3.4.2.2 Streambank erosion

Increases in impervious areas and impacts to riparian (streambank) vegetation from livestock access and other management practices can cause streambank erosion. As impervious surface increases in a watershed, so does the amount and rate of flow in streams following rainfall events. This is often the cause of the entrenchment, or downcutting, of urban streams – disconnecting higher flow events from the surrounding floodplain.

Additionally, impacts to riparian (streambank) vegetation from livestock access and other management practices weaken the stability of the streambanks themselves as root system matrices break down. Weakened streambanks are more easily eroded by storm flows and can lead to excessive channel migration and eventual channel over-widening. Increasing channel width decreases stream depth which can lead to increased sediment deposition and increased water temperatures, which both negatively impact aquatic life.

The GWLF model was used to calculate streambank and channel erosion in the Hat and Black Creek TMDLs. This model uses and algorithm that estimates average annual streambank erosion as a function of cumulative stream flow, fraction of impervious cover in the watershed, and livestock density in the watershed with the area-weighted curve number and soil erodibility factors and the mean slope of the watershed (Evans et al., 2001).

Table 3-6. Annual existing sediment load in Hat Creek watershed by source.

Hat Creek		
Land Cover Category	**TSS (lbs/yr)**	**% total load**
Cropland	12,919	0.6%
Hay	102,648	4.8%
Pasture	1,173,980	54.7%
Vineyard	15,794	0.7%
Forest	364,329	17.0%
Trees	57,301	2.7%
Shrub	5,220	0.2%
Harvested	17,614	0.8%
Wetland	176	<0.1%

Hat Creek		
Land Cover Category	**TSS (lbs/yr)**	**% total load**
Gravel	3,028	0.1%
Turfgrass	28,358	1.3%
Developed pervious	2,191	0.1%
Developed impervious	87,040	4.1%
Streambank	275,435	12.8%
Permitted	91	<0.1%
Total	***2,146,121***	***100%***

Table 3-7. Existing sediment and phosphorus loads in the Black Creek watershed.

Black Creek				
Land Cover Category	**TSS (lbs/yr)**	**% total load**	**TP (lb./yr)**	**% total load**
Cropland	-	0.0%	-	0.0%
Hay	59,586	10.7%	188.6	12.0%
Pasture	253,951	45.4%	81.4	5.2%
Vineyard	-	0%	-	0.0%
Forest	87,308	15.6%	17.9	1.1%
Trees	32,305	5.8%	8.6	0.6%
Shrub	2,666	0.5%	0.4	<0.1%
Harvested	14,012	2.5%	2.5	0.2%
Wetland	453	0.1%	0.1	<0.1%
Gravel	908	0.2%	0.4	<0.1%
Turfgrass	15,476	2.8%	27.7	1.8%
Developed pervious	1,789	0.3%	1.2	0.1%
Developed impervious	67,858	12.1%	149.3	9.5%
Groundwater	-	0.0%	168.0	10.7%
Septic	-	0.0%	-	-
Streambank	21,197	3.8%	7.4	0.5%
Permitted*	1,613	0.3%	914	58.3%
Total	***559,124***	***100%***	***1,568***	***100%***

**Existing permitted loads for Individual VPDES Permit VA0089729 were calculated using reported Discharge Monitoring Report (DMR) data. This included an average discharge rate of 0.12 MGD, an average TSS concentration of 4.41 mg/L, and an average TP concentration of 2.5 mg/L.*

3.5 TMDL Allocation Scenarios

3.5.1 Setting Target Sediment and Phosphorus Loads

The TMDL includes sediment and phosphorus (Black Creek) reduction scenarios needed to meet the aquatic life use standard. Since sediment does not have a numeric criterion, the "all-forest load multiplier" (AllForX) approach was used to establish endpoints in the Hat and Black Creek TMDLs (Table 3-8). AllForX is the ratio of the simulated pollutant load under existing conditions to the pollutant load from an all-forest simulated condition for the same watershed. In other words, AllForX is an indication of how much higher current sediment loads are above an undeveloped condition. These multipliers were calculated for TMDL study subwatersheds and 13 comparison subwatersheds of similar size and within the same ecoregion as the TMDL study watersheds. A regression was then developed between the Virginia Stream Condition Index (VSCI) scores at monitoring stations within these subwatersheds and the corresponding AllForX ratio calculated for each watershed.

In Black Creek, average VSCI scores were used to calculate the regression. In Hat Creek, the 33rd percentile of scores was used. The results of the benthic stressor analysis for Hat Creek indicate a borderline impairment, with VSCI scores repeatedly falling above and below the threshold of 60. As a result, using average VSCI scores from other streams to develop the regression indicated that no reduction in sediment was necessary in Hat Creek. Given the findings of the benthic stressor analysis, it is clear that this is not the case.

Table 3-8. Target sediment loading rates for the Hat and Black Creek watersheds.

Impaired Stream	TSS All-Forested (lbs/yr)	All-Forested Regression Multiplier	TSS Target (lb./yr)
Black Creek	176,157	3.0	529,582
Hat Creek	806,839	2.8	2,268,489

AllForX was considered for establishment of a phosphorus endpoint in Black Creek; however, given the proportion of the phosphorus load in the watershed originating from the Nelson County STP (57.3%), this approach did not appear suitable for Black Creek. Alternatively, a concentration-based approach was used to establish the phosphorus endpoint. Hat Creek was identified as a suitable reference for Black Creek. While the stream had a borderline benthic impairment, phosphorus concentrations in the creek are not the cause of the benthic impairment. The TP endpoint for Black Creek was set to an average annual in-stream concentration of 0.092 mg/L (Table 3-9).

Table 3-9. Target phosphorus concentration and load for the Black watershed

Impaired stream	Existing Condition		TMDL Target	
	Mean In-Stream TP Concentration (mg/L)	Total Phosphorus Load (lbs/yr)	Mean In-Stream TP Concentration (mg/L)	Total Phosphorus Load (lb./yr)
Black Creek	0.16	1,568	0.092	1,368

3.5.2 Sediment and Phosphorus TMDL Equations

Total maximum daily loads are determined as the maximum allowable load of a pollutant among the various sources. Each TMDL is comprised of three components, as summed up in this equation:

$$TMDL = \sum WLA + \sum LA + MOS$$

Where :

ΣWLA is the sum of the wasteload allocations (permitted sources),
ΣLA is the sum of the load allocations (non-point sources), and
MOS is a margin of safety.

To account for uncertainties inherent in model outputs, a margin of safety (MOS) is incorporated into the TMDL development process. The MOS can be implicit, explicit, or a combination of the two. This TMDL includes both implicit and explicit MOSs. An allocation of 2% of the total load is specifically set aside for future growth within these TMDLs (Table 3-10 - Table 3-12)

Table 3-10. Annual average sediment TMDL components for Black Creek.

Impairment	Allocated Point Sources (WLA) (lbs/yr TSS)	Allocated Nonpoint Sources (LA) (lb./yr TSS)	Margin of Safety (MOS) (lbs/yr TSS)	Total Maximum Daily Load (TMDL) (lb./yr TSS)
Black Creek (VAV-H09R_BKC01A14)	**30,710**	**445,890**	**52,982**	**529,582**
VA0089729	*20,118*			
Future Growth (2% of TMDL)	*10,592*			

Table 3-11. Annual average sediment TMDL components for Hat Creek.

Impairment	Allocated Point Sources (WLA) (lbs/yr TSS)	Allocated Nonpoint Sources (LA) (lb./yr TSS)	Margin of Safety (MOS) (lbs/yr TSS)	Total Maximum Daily Load (TMDL) (lb./yr TSS)
Hat Creek (VAV-H09R_HAT01A04)	**45,461**	**1,996,178**	**226,849**	**2,268,489**
Domestic Sewage General Permits	91			
Future Growth (2% of TMDL)	45,370			

Table 3-12. Annual average phosphorus TMDL components for Black Creek

Impairment	Allocated Point Sources (WLA) (lbs/yr TP)	Allocated Nonpoint Sources (LA) (lb./yr TP)	Margin of Safety (MOS) (lbs/yr TP)	Total Maximum Daily Load (TMDL) (lb./yr TP)
Black Creek (VAV-H09R_BKC01A14)	**712**	**519**	**137**	**1,368**
VA0089729	685			
Future Growth (2% of TMDL)	*27*			

3.5.3 Sediment and Phosphorus Allocation Scenarios

Different scenarios were evaluated by local stakeholders to identify a fair and equitable approach to implementation that meets the sediment and phosphorus endpoints identified in the TMDLs. The total sediment and phosphorus loads available for allocation were distributed between point and non point sources, and reductions were identified based on existing and allocated loads. Stakeholders attending multiple community engagement meetings evaluated these allocation scenarios. Stakeholders selected a scenario in which the greatest sediment sources received the largest reduction goals, while smaller sources will need to make smaller reductions. The selected sediment and phosphorus allocation scenarios are shown in Table 3-13 through Table 3-15.

Table 3-13. Sediment allocation scenario for Black Creek.

Black Creek Sediment (2-BKC000.08)		**Allocation Scenario**	
Source	**Existing**	**Reduction**	**Allocation**
	TSS (lbs/yr)	***%***	***TSS (lb./yr)***
Hay	59,587	15%	50,649
Pasture	253,951	30.5%	176,496
Forest	87,308	-	87,308
Trees	32,305	-	32,305
Shrub	2,666	-	2,666
Harvested	14,012	-	14,012

Black Creek Sediment (2-BKC000.08)	Allocation Scenario		
Source	Existing	Reduction	Allocation
	TSS (lbs/yr)	*%*	*TSS (lb./yr)*
Wetland	453	-	453
Gravel	908	6%	854
Turfgrass	15,476	6%	14,547
Developed pervious	1,789	6%	1,681
Developed impervious	67,858	30%	47,501
Streambank Erosion	21,197	20%	16,957
VA0089729*	1,613	-	20,118
MOS (10%)			52,982
Future Growth (2%)			10,592
TOTAL	**559,124**		**529,123**

Table 3-14. Sediment allocation scenario for Hat Creek

Hat Creek Sediment (2-HAT000.14)	Allocation Scenario		
Source	Existing	Reduction	Allocation
	TSS (lbs/yr)	*%*	*TSS (lb./yr)*
Cropland	12,919	3.5	12,467
Hay	102,647	3.5	99,055
Pasture	1,173,980	10.9	1,046,016
Vineyard	15,794	3.5	15,241
Forest	364,328	-	364,328
Trees	57,301	-	57,301
Shrub	5,220	-	5,220
Harvested	17,614	-	17,614
Wetland	176	-	176
Gravel	3,028	1.0	2,998
Turfgrass	28,358	1.0	28,074
Developed pervious	2,191	1.0	2,169
Developed impervious	87,040	1.0	86,169
Streambank Erosion	275,435	6.0	258,909
Domestic Sewage General Permits	91	-	91
MOS (10%)	-	-	226,849
Future Growth (2%)	-	-	45,370
TOTAL	**2, 146,121**	**-**	**2,268,047**

Table 3-15. Phosphorus allocation scenario for Black Creek

Black Creek Watershed		Allocation Scenario	
Source	**Existing TP (lbs/yr)**	**Reduction (%)**	**Allocation TP (lb./yr)**
Groundwater	168.0	-	168.0
Hay	188.6	30.0	132.0
Pasture	81.4	30.0	57.0
Forest	17.9	-	17.9
Trees	8.6	-	8.6
Shrub	0.4	-	0.4
Harvested	2.5	-	2.5
Wetland	0.1	-	0.1
Gravel	0.4	5.0	0.4
Turfgrass	27.7	25.0	20.8
Developed Pervious	1.2	5.0	1.2
Developed Impervious	149.3	30.0	104.5
Streambank erosion	7.4	25.0	5.6
VA0089729*	914.0	25.1	685.0
Future Growth (2%)	-	-	137
MOS (10%)	-	--	27
TOTAL	**1,568**		**1,368**

4 PUBLIC PARTICIPATION

Collecting input from the public on conservation and outreach strategies to include in the Implementation Plan was a critical step in this planning process. Since the plan will be implemented by watershed stakeholders on a voluntary basis, local input and support are the primary factors that will determine the success of this plan. The Hat and Black Creek Implementation Plan was developed concurrently with the TMDL study. While the first public meeting and the first two community engagement meetings were focused on development of the TMDL study, subsequent community engagement and public meetings were focused on both the TMDL and the IP.

4.1 Public Meetings

The first public meeting (32 attendees, January 30, 2023) was held at the Nelson Memorial Library in Lovingston, VA. This meeting introduced attendees to DEQ's water quality planning process, the TMDL purpose and process, reviewed benthic monitoring data collected in the study watersheds, discussed the impairments, reviewed the preliminary results of the stressor analysis, and solicited input on the benthic stressors identified in the benthic stressor analysis study.

The final public meeting was held on March 5, 2025 at the at The Nelson Center. During this meeting, participants received an overview of the TMDL process and were presented with summaries of both the TMDL report and the associated implementation plan. Approximately XX people attended.

4.2 Community Engagement Meetings

The first community engagement meeting (24 attendees, March 1, 2023) was held at the Nelson Memorial Library in Lovingston, VA to discuss the TMDL process and the benthic stressor analysis. In addition, the group discussed land cover estimates and loading rates assigned to each land cover type.

The second community engagement meeting (18 attendees, May 17, 2023) was held at the Nelson Memorial Library. Participants in this meeting discussed the changes in landcover distributions that were made based on the input from the members of the first stakeholder meeting, revisited a previous discussion about establishing a set aside for construction stormwater permits in the watershed, discussed the future growth allocation and margin of safety, reviewed the pollutant sources and BMPs in the impaired watersheds, and gathered input on the preferred sediment allocation scenario.

The third community engagement meeting was held on January 10, 2024 at the Nelson Memorial Library (18 attending). This meeting was focused on developing a phosphorus endpoint for Black Creek. The group discussed TMDL alternatives and agreed to change paths and shift to developing an advance restoration plan to address sediment and phosphorus targets in Hat and Black Creeks.

The fourth community engagement meeting was held on February 27, 2024 at the Nelson Memorial Library (9 attending). Participants prioritized a series of agricultural best management practices for inclusion in the advance restoration plan. Streambank restoration practices were also discussed and agreed on as a high priority for local stakeholders.

The fifth community engagement meeting was held on September 9, 2024 at the Nelson Memorial Library (11 attending). During this meeting, participants discussed the decision to pivot back to developing a traditional TMDL. The group also discussed the new path forward for the project and revisions to existing loads and reduction scenarios for the two watersheds.

The sixth and final community engagement meeting was held on December 3, 2024 at the Nelson Memorial Library (12 attending). During this meeting, the group reviewed implementation scenarios for best management practices in Hat and Black Creek. Participants reviewed cost estimates and assisted with development of a timeline for implementation efforts. Plans for the final public meeting were also discussed.

5 IMPLEMENTATION ACTIONS

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

5.1 Identification of Best Management Practices

Potential best management practices, their associated costs and efficiencies, and potential funding sources were identified through review of the TMDL, input from the community engagement meeting participants, and literature reviews. Measures that can be promoted through existing programs were identified, as well as those that are not currently supported by existing programs and their potential funding sources. Various scenarios were developed and presented to community engagement meeting participants, who considered both their economic costs and the water quality benefits that they produced. The majority of these practices are included in state and federal agricultural cost share programs that promote conservation. In addition, innovative and site-specific practices suggested by local producers and technical conservation staff were considered.

The final set of BMPs identified and the efficiencies used in this study to estimate needs are listed in Table 5-1.

5.2 Quantification of Control Measures

The quantity of control measures recommended during implementation was determined through spatial analyses, modeling alternative implementation scenarios, and using input from the stakeholder advisory group. Data on land use, stream networks, and elevation were used in spatial analyses to develop estimates of the number of control measures recommended overall, in each watershed, and within smaller subwatersheds. Data from the Virginia Department of Conservation and Recreation's (DCR) Agricultural BMP Database and the Thomas Jefferson Soil and Water Conservation District (SWCD) showing where best management practices are already in place in the watersheds were considered when developing these estimates. Estimates of the amount streamside fencing and number of full livestock exclusion systems were made through these analyses. The quantities of additional control measures were determined through modeling alternative scenarios and applying the related pollutant reduction efficiencies to their associated sediment and phosphorus loads.

Table 5-1. Best management practices and associated pollutant reductions

BMP	Units	Sediment reduction (%)	Reference	Phosphorus reduction	Reference
Livestock Exclusion Practices					
CREP Stream Exclusion with Grazing Land Management (CRSL-6)	System	Land use change applied to riparian buffer area, 48% reduction applied to 2x's buffer width	1	Land use change applied to riparian buffer area, 36% reduction applied to 2x's buffer width	1
Stream Exclusion with Narrow Width Buffer and Grazing Land Management (SL-6N)	System	Land use change applied to riparian buffer area, 48% reduction applied to 2x's buffer width	1	Land use change applied to riparian buffer area, 36% reduction applied to 2x's buffer width	1
Stream Exclusion with Wide Width Buffer and Grazing Land Management (SL-6W)	System	Land use change applied to riparian buffer area, 48% reduction applied to 2x's buffer width	1	Land use change applied to riparian buffer area, 36% reduction applied to 2x's buffer width	1
Stream Protection (WP-2N, WP-2W, WP-2T)	System	Land use change applied to riparian buffer area, 48% reduction applied to 2x's buffer width	1	Land use change applied to riparian buffer area, 36% reduction applied to 2x's buffer width	1
Pasture Practices					
Precision Intensive Rotational/Prescribed Grazing (NRCS 528, SL-10)	Acres	30%	1	24%	1
Streamside Buffer: forested (FR-3)	Acres treated	Land use change + 48% applied to 2x's buffer width	1	Land use change + 36% reduction applied to 2x's buffer width	1
Streamside Buffer: grass/shrub (WQ-1)	Acres treated	Land use change + 48% applied to 2x's buffer width	1	Land use change + 36% reduction applied to 2x's buffer width	1
Permanent Vegetative Cover on Critical Areas (SL-11)	Acres	75%	2	78%	2
Afforestation of Erodible Pasture (FR-1)	Acres	Land use change	NA	Land use change	NA
Nutrient Management Plan	Acres	NA	NA	8%	1
Cropland Practices*					
Continuous No-Till (SL-15B)	Acres	70%	1	NA	NA

BMP	Units	Sediment reduction (%)	Reference	Phosphorus reduction	Reference
Cover Crop (SL-8B)		10%			
Permanent Vegetative Cover on Cropland (SL-1)		75%			
Hayland Practices					
Forest buffer	Acres	Land use change + 48% applied to 2x's buffer width	1	Land use change + 36% reduction applied to 2x's buffer width	1
Aforestation of hayland		Land use change	NA	Land use change	NA
Nutrient management plan		NA	NA	8%	1
Vineyard Practices					
Cover crops	Acres	10%	1	NA	NA
Permanent vegetative cover on critical areas		75%	1	NA	NA
Grass filter strips		48%	2	NA	NA
Residential/Urban Practices					
Bioretention Filters**	Acres treated	80%	3	75%	3
Bioswale**		80%	3	75%	3
Grassed channels		70%	3	45%	3
Wet ponds and wetlands		60%	1	45%	1
Tree planting	Acres	Land use change	NA	NA	NA
Nutrient management plan		NA	NA	4.5%	1
Conservation landscaping		NA	NA	25%	1
Gravel Road Practices					
Gradebreak installation	Number	86%	4	NA	NA
Drainage outlets	Number	79%	4	NA	NA

BMP	Units	Sediment reduction (%)	Reference	Phosphorus reduction	Reference
Streambank Stabilization (agricultural and urban/residential)	Lin. ft.	50%	5	50%	4

1. Chesapeake Bay Program. 2022. Chesapeake Bay Program Quick Reference Guide for Best Management Practices (BMPs): Nonpoint Source BMPs to Reduce Nitrogen, Phosphorus and Sediment Loads to the Chesapeake Bay and its Local Waters. CBP/TRS-323-18. Second edition. https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/BMP-Guide_Full.pdf
2. VA DEQ. 2017. Guidance Manual for Total Maximum Daily Load Implementation Plans. https://www.deq.virginia.gov/home/showpublisheddocument/6849/637511609521170000
3. Recommendations of the Expert Panel to Define Removal Rates for New State Stormwater Performance Standards, Revised January 20, 2015
4. A Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed, September 17, 2021.
5. Center for Dirt and Gravel Road Studies, Pennsylvania State University. 2008. Environmentally Sensitive Maintenance Practices for Unpaved Roads: Sediment Reduction Study. Prepared for Chesapeake Bay Commission. June 30, 2008.

** Phosphorus reductions are not needed on cropland in Black Creek; therefore phosphorus reduction efficiencies are not shown for cropland.*

*** Efficiency rates based on class B soils in Hat and Black Creeks*

5.2.1 Agricultural Control Measures

Livestock Exclusion BMPs

Excluding livestock from streams and establishing vegetated streamside buffers helps prevent streambank erosion and traps sediment and phosphorus from eroding pastures before it enters the stream. Consequently, this plan includes recommendations for livestock exclusion/riparian buffer practices implemented in conjunction with grazing land management. To estimate fencing needs, the perennial stream network was overlaid with land use using GIS mapping software (ArcPro version 3.3). Stream segments that flowed through or were adjacent to land use areas that had a potential for supporting cattle (*e.g.,* pasture) were identified using 2016 VGIN Orthophotography and the 2020 National Hydrography Dataset (NHD) streams layer. If the stream segment flowed through the land-use area, it was assumed that fencing was needed on both sides of the stream. If a stream segment flowed adjacent to the land-use area, it was assumed that fencing was required on only one side of the stream. Not every land-use area identified as pasture has livestock on it at any given point in time. However, it is assumed that all pasture areas have the potential for livestock access. Following GIS analyses of fencing needs, the VADCR Agricultural BMP Database was queried to identify the amount of livestock exclusion systems already in place in the watersheds (Table 5-2). Any fencing installed was subtracted from the length of potential fencing in the watershed. A map of potential streamside fencing for streams in the watersheds is shown in Figure 5-1.

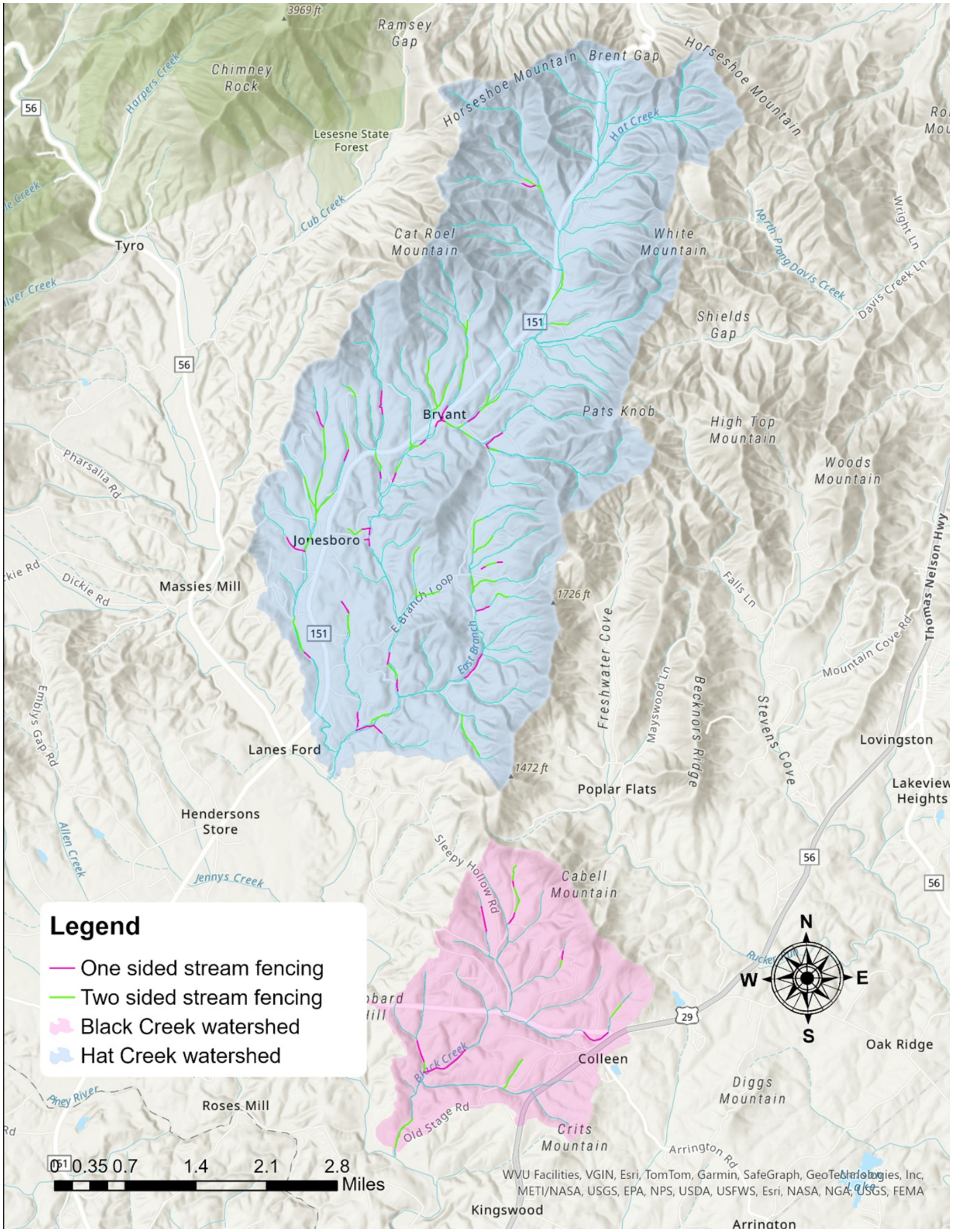

Figure 5-1. Livestock exclusion fencing needed in the Hat and Black Creek watersheds

Table 5-2. Livestock exclusion systems in the watershed tracked through the VADCR Agricultural BMP database: *January 2002 – December 2021.* NOTE: Table does not include data from systems that were not installed through government cost share programs. CRP and EQIP data were not available.

Watershed	Practice	Number of practices	Extent of fence (lin. ft)
Hat Creek	Stream Exclusion With Grazing Land Management (SL-6)	2	7,372
	Livestock Exclusion with Riparian Buffers for TMDL Implementation (SL-6T)	1	2,620
Black Creek	Stream Exclusion With Grazing Land Management (SL-6)	1	11,000
	Livestock Exclusion with Riparian Buffers for TMDL Implementation (SL-6T)	1	1,050

Table 5-3. Stream fencing needed in the Hat and Black Creek watersheds. *Note: Total potential fencing includes all unfenced pasture adjacent to streams in the watersheds.*

Watershed	Total possible fencing (linear feet)	Existing fencing (linear feet)	Remaining possible fencing (linear feet)
Hat Creek	108,772	9,992	98,780
Black Creek	25,957	12,050	13,907

It is expected that the majority of livestock exclusion fencing will be accomplished through the VA Agricultural BMP Cost Share Program and federal Natural Resource Conservation Service (NRCS) cost-share programs. Some applicable cost-shared BMPs for livestock exclusion in the programs are the SL-6W (Stream Exclusion with Wide Buffer Width and Grazing Land Management Practice), the SL-6N (Livestock Exclusion with Narrow Buffer Width and Grazing Land Management), the WP-2 (Livestock Exclusion with Reduced Setback for TMDL Implementation), and CREP (the Conservation Reserve Enhancement Program). To determine the appropriate mix of these practices to include in the implementation plan, tax parcel data was utilized in conjunction with local data from the Agricultural BMP Database to determine typical characteristics (e.g., streamside fencing length per practice) of livestock exclusion systems in the region. In addition, input was collected from the local stakeholders, NRCS and the Thomas Jefferson SWCD regarding typical components of each system, associated costs, and preferred fencing setbacks. These characteristics were then utilized to identify the mix of fencing practices available through state and federal cost share programs to include in the implementation plan (Table 5.4).

The Stream Exclusion with Wide Buffer Width and Grazing Land Management Practice (SL-6W) offers cost share for off stream watering, establishment of a rotational grazing system, stream crossings, and stream exclusion fencing with a minimum 35-foot setback. Cost share rates for this practice vary depending on the contract term. Landowners may also receive a buffer payment for the land within the fencing setback. Cost share and payment rates are shown in Table 5-4. This practice is most commonly selected by farmers in the area, so it was estimated that 83% of fencing in Black Creek would be installed using the SL-6W practice and 73% in Hat Creek.

Table 5-4. Cost share and buffer payment rates for SL-6W practice in the Virginia Agricultural Cost Share Program (VACS)

Minimum fence setback	Lifespan	Cost-share rate	Buffer payment rate	Buffer payment cap
35’	10 years	85%	$80/ac/yr	$12,000/contract
	15 years	90%		$18,000/contract
50’	10 years	95%		$12,000/contract
	15 years	100%		$18,000/contract

The SL-6N practice (Livestock Exclusion with Narrow Buffer Width and Grazing Land Management) is very similar to the SL-6W except that the practice allows for a reduced fencing setback. Landowners may choose a 10’ setback with a 10- or 15-year contract to receive 60% or 65% cost share, respectively. In order to increase their cost share rate, they may elect to set the fence back 25’ with a 10-to-15-year contract, making them eligible for 70% or 75% cost share, respectively. Due to the lower cost share rate, this practice is used far less frequently than the SL-6W practice. Consequently, it was estimated that approximately 5% of fencing in Black Creek would be installed using this practice and 8% in Hat Creek.

The WP-2 system includes streamside fencing, hardened crossings, and a 35-ft buffer from the stream. In cases where a watering system already exists, a WP-2 system is a more appropriate choice. This practice is seldom used because it does not provide cost share for the installation of a well, this was reflected in the number of systems noted in the Ag BMP Database in Nelson County. Consequently, it was estimated that only 2% of fencing in Black Creek and 3% in Hat Creek would be accomplished using the WP-2 practice.

Fencing through the Conservation Reserve Enhancement Program (CREP) was also included in implementation scenarios. For those who are willing to install a 35-foot buffer or larger and plant trees in the buffer, NRCS's CREP is an excellent option. State and federal cost BMP programs each offer 50% cost share for this practice, bringing the total cost share rate to 100%. Additional rental payments and sign-up incentive payments bring financial assistance to over 100% of the project cost. It is estimated that 10% of fencing in Black Creek and 16% in Hat Creek will be installed through CREP.

Table 5-5. Estimate of streamside exclusion fencing systems needed in the Hat and Black Creek watersheds.

Watershed	Stream exclusion fencing target	Fencing needed	SL-6W	SL-6N	WP-2	CRSL-6
		Feet				
Black Creek	97%	13,212	11,126	695	278	1,391
Hat Creek	31%	29,930	22,522	2,470	988	4,939

Land Based Agricultural BMPs

In order to meet the sediment and phosphorus reductions outlined in the TMDL, best management practices to treat land-based sources of sediment and phosphorus must also be included in implementation efforts. Table 5.5 provides a summary of land based agricultural BMPs by watershed needed to achieve water quality goals. It is expected that funding assistance for most agricultural practices will be provided by VACS, DEQ NPS BMP Implementation Program, and federal NRCS cost-share programs.

Riparian Buffers

For modeling purposes, it was assumed that a typical vegetative buffer would be able to receive and treat runoff from an area two times its width. For example, a buffer that was 35 feet wide and 1,000 feet long would treat runoff from an area that was 70 feet wide and 1,000 feet long. Runoff from upland areas greater than two times the buffer width was assumed to be in the form of channelized flow rather than the sheet flow that a buffer can trap.

Grazing Land Management

Rotational grazing systems and commonly established in conjunction with livestock exclusion projects. The majority of fencing programs will provide cost share for the establishment of cross fencing and alternative watering sources to establish these systems. In cases where livestock exclusion is not necessary, grazing land management was prescribed. Grazing land management allows a farmer to better utilize grazing land and associated forage production. This practice includes:

- Implement a current nutrient management plan
- Maintain adequate soil nutrient and pH levels
- Manage livestock rotation to paddock subdivisions to maintain minimum grazing height recommendations and sufficient rest periods for plant recovery
- Maintain adequate and uniform plant cover (≥ 60%) and pasture stand density
- Locate feeding and watering facilities away from sensitive areas
- Manage distribution of nutrients and minimize soil disturbance at hay feeding sites by unrolling hay across the upland landscape in varied locations
- Designate a sacrifice lot/paddock to locate cattle for feeding when adequate forage is not available in the pasture system. Sacrifice lot/paddock should not drain directly into ponds, creeks or other sensitive areas and should not be more than 10% of the total pasture acreage.
- Mow pasture as needed to control woody vegetation

A one-time incentive payment of $75 per acre is available to producers who choose to implement this practice.

Cropland Management Practices

A series of cropland management practices are included to control cropland runoff contributing sediment to Hat Creek. The Black Creek TMDL did not identify any cropland within the watershed. Because cropland acreage in Hat Creek is minimal, BMP implementation goals were kept relatively low to ensure that goals could be achieved within a limited group of landowners. Cropland BMPs were prescribed for 10% of cropland in the Hat Creek watershed (Table 5-6). Continuous no-till is a practice that is becoming widely adopted in the region. By reducing tillage of the soil, farmers can conserve valuable soil and fertilizer and increase organic matter, which is an important factor in determining soil quality. It was estimated that this practice would be implemented on 5% of cropland in the Hat Creek watershed. Cover crops are planted on an annual basis to prevent soil erosion following harvest of crops like corn and soybeans when the soil would typically be left exposed. It was estimated that this practice would be implemented on 5% of cropland in the Hat Creek watershed.

Hayland Management Practices

While runoff from hayland is relatively low, BMPs may be targeted to further reduce runoff in less productive fields more susceptible to erosion. Producers wishing to take hayland out of production and plant trees may receive an incentive payment of $100/acre in addition to 75% cost share for planting costs. While the extent of hayland adjacent to streams is minimal in the area, riparian buffers can be planted in these areas to filter runoff and trap sediment. Producers may receive 95% cost share for planting costs in addition to an incentive payment ranging from $100-$250/acre depending on the length of the contract signed and the type of trees planted.

Vineyard/Orchard Management Practices

There are several vineyards located in the Hat Creek watershed, which can contribute sediment to the stream where soils are left exposed between rows of vines. The TMDL study included a 4% reduction in sediment coming from these areas in the Hat Creek watershed. This land use was not identified in the Black Creek watershed. Like on cropland, filter strips and cover crops can be planted in vineyards and orchards in areas where soils are seasonally or permanently exposed. Additionally, critical areas can be stabilized by using mechanical and vegetative measures.

Table 5-6. Land based agricultural BMPs needed in the Hat and Black Creek watersheds.

Land use	BMP Name	BMP Cost Share Code	Extent (acres)	
			Hat	Black
Pasture	Grazing land management	SL-10/EQIP 528	201.0	124.3
	Forested riparian buffer	FR-3	21.5	8.4
	Grass riparian buffer	WQ-11	9.5	4.2
	Permanent vegetation on critical areas	SL-11	0.3	1.1
	Aforestation of erodible pasture	FR-1	0.3	11.9
	Nutrient management planning	NM-3	-	107.9
Cropland	Continuous no till	SL-15A	1.0	-
	Cover crops	SL-8B	1.0	-
Hayland	Forest riparian buffer	FR-3	24.5	7.4
	Aforestation of hayland	FR-1	23.6	120.8
	Nutrient management planning	NM-3	-	241.5
Vineyards/ Orchards	Cover crops	NA	3.1	-
	Grass filter strips	WQ-1	5.1	-
	Permanent vegetative cover on critical areas	SL-11	1.6	-

5.2.1 Residential and Urban Control Measures

To treat sediment and phosphorus running off developed land, BMPs to reduce and filter residential and urban runoff are necessary. According to the TMDL, an 6% reduction in residential turfgrass and pervious urban sediment sources is needed in Black Creek and a 1% reduction is needed in Hat Creek. A 30% reduction in impervious urban sediment sources is needed in Black Creek while only a 1% reduction in sediment from this source is needed in Hat Creek. The phosphorus TMDL for Black Creek calls for a 30% reduction in phosphorus from impervious sources, a 5% reduction from developed pervious sources, and a 25% reduction from turfgrass.

Urban and Turfgrass BMPs

A series of residential and urban stormwater BMPs were identified to treat runoff from developed areas, turfgrass and gravel roads in the watersheds. Opportunities for tree plantings on developed pervious areas and turfgrass were also identified. Rain gardens are small landscape features designed to catch runoff from paved surfaces and rooftops and filter out pollutants as the runoff moves down through a special soil mix. These practices are suitable for implementation in residential areas. Bioretention filters are similar in function, but generally require more complex design work due to their capacity to handle a greater drainage area. These practices are typically used more often in commercial developments. Bioswales are similar in function to bioretention filters, capturing and treating runoff in vegetative, shallow, landscaped depressions. These features were identified as another effective practice to treat runoff from impervious surfaces. Grass channels are a less expensive stormwater management practice that provides a modest amount of runoff filtering and volume attenuation. These practices were identified as a suitable option for gravel lots and impervious areas. The addition of drainage outlets to capture runoff from dirt and gravel roads was identified as an effective BMP for gravel roads experiencing erosion in the watersheds. Additionally, grade breaks can help to slow runoff across gravel roads, thereby reducing sediment transport from these areas to waterways. Conservation landscaping is the practice of modifying the visible features of turf grass areas or bare soils, to an area of land that incorporates environmentally sensitive design, low impact development, non-invasive native plants, and/or integrated pest management. The purpose is to create a diverse landscape that helps to protect clean air and water and support wildlife. Due to their associated costs, a small extent of permeable pavement and impervious surface removal practices was prescribed for urban impervious areas in the Black Creek watershed. Based on the large extent of sediment and phosphorus reductions called for from these portions of the Black Creek watershed and the fact that implementation opportunities are limited, local stakeholders felt that it was important to include multiple options for BMP implementation in the watershed.

A summary of residential/urban stormwater and BMPs needed in the Hat and Black Creek watersheds is provided in Table 5-7.

Table 5-7. Urban BMPs needed in the Hat and Black Creek watersheds.

Land use	BMP Name	BMP Cost Share Code	Units	Extent	
				Black	Hat
Developed: Pervious	Tree planting	CL-2	Acres	0.6	0.2
	Bioretention filter	BR-2-5	Acres treated	0.2	-

Land use	BMP Name	BMP Cost Share Code	Units	Extent	
				Black	Hat
	Grass channels	UB-2	Acres treated	0.1	-
Developed: Impervious	Bioretention filter	BR-2-5	Acres treated	13.0	1.8
	Bioswales	BR-6		10.0	-
	Grass channels	UB-2		13.0	-
	Permeable pavement	PP/IP-7	Acres	0.001	-
	Impervious surface removal	ISR		0.001	-
	Wet ponds/wetlands	CW/DP-2	Acres treated	10.0	-
Turfgrass	Tree planting	CL-2	Acres	35.0	8.4
	Rain gardens	BR-10	Acres treated	1.7	-
	Conservation landscaping	CL-1-5	Acres	24.8	-
	Nutrient management plan	NA	Acres	24.8	-
Gravel*	Grade break installation	NA	Number	4	3
	Drainage outlets	NA		4	3

** Grade breaks and drainage outlets were assumed to treat an average road width of 24 feet and an average upland extent of 50 feet resulting in 0.028 acres treated per practice.*

5.2.2 Streambank Stabilization

The sediment TMDLs for Hat and Black Creeks call for 6% and 20% reductions in streambank erosion, respectively. The phosphorus TMDL for Black Creek calls for a 25% reduction in phosphorus loads from streambank erosion. There are 23.3 miles of streambank in the Hat Creek watershed and 5.5 miles in the Black Creek watershed. The TMDLs do not identify the extent of streambank that is actively eroding, making it difficult to estimate the amount of stabilization that is needed in the watersheds to meet the TMDL target. Estimates of eroding streambank were based on Rapid Bioassessment Protocol habitat measurements collected as part of routine biological monitoring by DEQ in Hat and Black Creeks. Bank stability is a visual observation of streambanks, assigning a score to the overall stability of the banks and visible areas of erosion. Scores for both Hat and Black Creek averaged a value of 12 on a scale of 1-20, falling on the high end of the range of "moderately unstable," with an estimated 30% of banks eroding. The extent of streambank restoration called for in the two watersheds is shown in Table 5-8.

Table 5-8. Streambank stabilization (WP-2A) needed in the Hat and Black Creek watersheds.

Watershed	Streambank extent (meters)	Estimated % streambank eroding	Streambank stabilization goal	Streambank stabilization goal (meters)
Hat Creek	37,517	30%	6%	2,251
Black Creek	8,830	30%	20%	1,775

5.3 Technical Assistance and Education

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 articulate exactly what the TMDL and implementation plan mean to them and what practices will help meet the goal of improved water quality. The working groups recommended several education/outreach techniques, which will be utilized during implementation.

The following general tasks associated with agricultural and urban/residential programs 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).
- Give presentations at local Farm Bureau events including annual membership meetings. Provide information for distribution with semiannual newsletters.
- Organize educational programs for farmers including farm tours in partnership with VA Cooperative Extension and Farm Bureau.
- Work with NRCS and Thomas Jefferson SWCD to conduct outreach regarding agricultural BMPs.
- Conduct a stream walk to identify streambanks experiencing considerable erosion
- Work with partners to post announcements for outreach events on the Nelson Knows Facebook page
- Work with county Boards of Supervisors representatives to contact vast agricultural landowners in the watersheds to discuss water quality issues and potential management strategies.
- Work with VA Department of Energy to target critical area stabilization and tree planting practices to areas mapped as debris flow paths in Hurricane Camille study

- Handle and track cost-share
- Assess and track progress toward BMP implementation goals.
- Coordinate use of existing agricultural programs and suggest modifications, i.e. Adaptive management.

Residential Programs

- Work closely with Thomas Jefferson SWCD to target outreach for the VA Conservation Assistance Program (VCAP) to the Hat and Black Creek watersheds
- Identify opportunities for highly visible demonstration projects including impervious surface removal and installation of pervious pavement in the Black Creek watershed
- Conduct conservation landscaping workshop to encourage homeowners to participate in the VCAP program
- Work with Nelson County staff to identify opportunities for installation of urban stormwater BMPs to treat parking lot and rooftop runoff
- Assess progress toward implementation goals.

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 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 urban/residential components of the plan was estimated based on 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. Based on the size of the watersheds, the extent of implementation needed, and the overall project timeline, an estimate of 1/2 FTE was used for technical assistance. This estimate was based on similar implementation projects in other watersheds where on staff member is administering both the residential/urban and agricultural programs. It is expected that locality staff would be directly involved in any urban stormwater BMPs, serving as the project lead on any of these efforts with support from the Thomas Jefferson SWCD.

6 COSTS AND BENEFITS

6.1 Agricultural BMPs

The costs of agricultural best management practices included in the implementation plan were estimated based on data for Nelson County from the DCR Agricultural BMP Database, and the Thomas Jefferson SWCD cost lists for BMP components.

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 SL-6W, SL-6N, and CREP (CRSL-6). The cost of streamside fence and riparian buffer maintenance were identified as deterrents to participation. Producers may be eligible to receive an annual 25% tax credit for fence maintenance through the VA State Cost Share Program, though associated costs frequently exceed the value of this credit. The James River Buffer Program was launched by the Chesapeake Bay Foundation in 2019 for landowners in the Middle James region. The program directly pays for all riparian buffer project costs, including design, site preparation, materials, installation, and three years of establishment support. There is no out-of-pocket cost to the landowner. An extension and targeting of this program in the Hat and Black Creek watersheds could be helpful for producers with concerns about riparian buffer maintenance. Participants in the program to date have reported far lower mortality rates in their buffers as a result of the maintenance assistance. In developing the cost estimates for fence maintenance shown in Table 6.1, a figure of $5.50/linear foot of fence was used. It was estimated that approximately 10% of fencing would need to be replaced over the 12-year timeline of this project.

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, both the potential cost to landowners and the cost to state and federal programs must be considered. Table 6.1 shows total agricultural BMP costs by watershed.

6.2 Urban Stormwater BMPs

The costs of recommended stormwater BMPs were estimated using input from Nelson County and average cost data from regional studies and data provided by Hirschman Water & Environment, LLC (Table 6.2).

6.3 Streambank Restoration BMPs

The cost of streambank restoration practices is shown in Table 6-3. These estimates are based on natural stream channel restoration practices, to be implemented across residential, urban, and agricultural land.

Total BMP implementation costs are shown in Table 6-4. In Table 6.5, implementation costs are shown for two stages of implementation. These stages and the associated timeline are explained in greater detail in Chapter 7, Section 7.1.

Table 6-1. Agricultural BMP costs for the Hat and Black Creek watersheds.

Land use	BMP Name (BMP Cost Share Code)	Units	Unit cost	Hat Creek		Black Creek		Total	
				Extent	Cost	Extent	Cost	Extent	Cost
Livestock Stream Exclusion	CREP Stream Exclusion with Grazing Land Management (CRSL-6)	Feet	$30	4,939	$148,170	1,391	$41,721	6,330	$189,891
	Stream Exclusion with Wide Width Buffer and Grazing Land Management (SL-6W)		$18	22,522	$405,393	11,126	$200,261	33,647	$605,654
	Stream Exclusion with Narrow Width Buffer and Grazing Land Management (SL-6N)		$18	2,470	$44,451	695	$12,516	3,165	$56,967
	Stream Protection (WP-2N, WP-2W, WP-2T)		$5	988	$4,939	278	$1,391	1,266	$6,330
	Fence maintenance (12 years)		$4.50	3,092	$13,913	1,349	$6,070	4,441	$19,984
Pasture	Precision Intensive Rotational/ Prescribed Grazing (NRCS 528, SL-10)	Acres	$300	201	$60,296	124	$37,294	325	$97,589
	Permanent Vegetative Cover on Critical Areas (SL-11)		$3,000	0.26	$791	1.1	$3,422	1	$4,213
	Afforestation of Erodible Pasture (FR-1)		$200	0.26	$53	11.9	$2,386	12	$2,439
	Nutrient Management (NM-3)		$3	0	$0	108	$324	108	$324
Hayland	Streamside buffer (forested) (FR-3)	Acres	$1,000	25	$24,537	7	$7,384	32	$31,921
	Aforestation of hayland (FR-1)		$1,000	24	$23,587	121	$120,762	144	$144,349
	Nutrient management planning (NM-3)		$3	0	$0	242	$725	242	$725
Cropland	Continuous No-Till (SL-15B)	Acres	$100	1.1	$114	0	$0	1	$114
	Cover Crop (SL-8B)		$65	1.1	$74	0	$0	1	$74
Vineyards/ Orchards	Cover Crop	Acres	$65	47	$3,063	0	$0	47	$3,063
	Grass filter strip (WQ-1)		$80	9	$730	0	$0	9	$730
	Permanent Vegetative Cover on Critical Areas (SL-11)		$3,000	3	$9,425	0	$0	3	$9,425
Total estimated cost				**$739,536**		**$433,530**		**$1,173,066**	

Table 6-2. Urban and residential stormwater BMP costs for the Hat and Black Creek watersheds.

Land use	BMP Name (BMP Cost Share Code)	Units	Unit cost	Hat Creek		Black Creek		Total	
				Extent	Cost	Extent	Cost	Extent	Cost
Urban	Tree planting (CL-2)	Acres	$1,500	0.15	$225	0.60	$943	0.78	$1,168
	Bioretention filters (BR-2-5)	Ac. treated	$30,000	2	$53,629	13	$395,824	15	$449,453
	Bioswales (BR-6)		$36,570	0	$0	10	$365,958	10	$365,958
	Grass channels (UB-2)		$24,380	0	$0	13	$320,546	13	$320,546
	Permeable pavement (IP-7)	Acres	$1,524,600	0	$0	0.001	$1,526	0.001	$1,526
	Impervious surface removal (PP/IP-7)		$283,140	0	$0	0.001	$283	0.001	$283
	Wet ponds and wetlands (CW/DP-2)	Ac. treated	$22,612	0	$0	10	$226,280	10	$226,280
Gravel	Gradebreak installation (50 feet of roadway above)	Number	$5,000	3	$12,569	4	$17,593	6	$30,163
	Drainage outlets (50 feet of roadway above)		$4,000	3	$10,055	4	$14,075	6	$24,130
Turfgrass	Tree planting (CL-2)	Acres	$1,500	8	$12,632	35	$52,464	43	$65,095
	Rain gardens (BR-10)	Ac. treated	$25,000	0	$0	2	$41,245	2	$41,245
	Conservation landscaping (CL-1-5)	Acres	$8,500	0	$0	25	$210,349	25	$210,349
	Nutrient management plan		$3	0	$0	25	$74	25	$74
Total estimated cost				**$89,110**		**$1,647,160**		**$1,736,270**	

Table 6-3. Streambank restoration BMP costs for the Hat and Black Creek watersheds.

BMP Name (BMP Cost Share Code)	Units	Unit cost	Hat Creek		Black Creek		Total	
			Extent	Cost	Extent	Cost	Extent	Cost
Streambank restoration (WP-2A)	linear ft	$250	2,251	$2,251,002	1,775	$1,774,750	4,026	$4,025,752

Table 6-4. Total BMP costs for the Hat and Black Creek watersheds.

BMP type	Hat Creek	Black Creek	Total
Agricultural	$739,536	$433,530	$1,173,066
Urban/Residential Stormwater	$89,110	$1,647,160	$1,736,270
Streambank restoration	$2,251,002	$1,774,750	$4,025,752
TOTAL	**$3,079,648**	**$3,855,440**	**$6,935,088**

Table 6-5. Staged BMP implementation costs for the Hat and Black Creek watersheds.

BMP Type	Stage 1 Cost			Stage 2 Cost			Total by BMP type
	Hat	Black	Stage 1 Total	Hat	Black	Stage 2 Total	
Agricultural	$554,311	$216,765	$771,076	$185,226	$216,765	$401,991	$1,173,066
Urban/Residential Stormwater	$66,832	$823,580	$890,412	$22,277	$823,580	$845,857	$1,736,270
Streambank restoration	$1,688,252	$887,375	$2,575,626	$562,751	$1,911,886	$2,474,636	$5,050,262
Total by watershed	$2,309,395	$1,927,720	$4,237,114	$770,254	$2,952,230	$3,722,484	$7,959,598

6.4 Technical Assistance

Technical assistance costs were estimated for one half time position for Stages 1 and 2 (years 1-12) of the project using a cost of $50,000/position per year. These figures are based on the existing staffing costs included in the Virginia Department of Environmental Quality's grant agreements for similar implementation projects in the region. Based on the 12-year timeline of this plan (described in detail in the Implementation Timeline section of this plan), this would make the total cost of technical assistance approximately $300,000. When factored into the cost estimate for BMP implementation shown in Table 6-4, this would make the total cost of implementation approximately $8.26M.

6.5 Benefit Analysis

The primary benefit of implementing this plan will be restoration of aquatic life in Hat and Black Creeks. Specifically, sediment and phosphorus (Black Creek) pollution will be reduced to a level at which the creeks can support a healthy and diverse pollution of aquatic life. The cost effectiveness of all best management practices included in the plan was reviewed to estimate the relative water quality benefit per dollar invested in each practice. The overall sediment and phosphorus reductions associated with implementation of each BMP was divided by the total estimated cost of that practice. BMPs were then ranked based on their overall cost effectiveness and overall benefit (Table 6-6). This information will prove helpful during the early stages of implementation when partners will be focusing on implementation of the most cost-effective practices first.

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, improved pasture management, and improved residential and urban stormwater management will each provide economic benefits to land owners. Additionally, money spent by landowners and state agencies in the process of implementing this plan will stimulate the local economy.

Table 6-6. BMP cost effectiveness rankings for Hat and Black Creeks

BMP Type	BMP Name	Units	Cost/ unit	Cost/lbs sediment removed	Cost/lb. phosphorus removed	Ranking (1-5)
Livestock stream access*	Livestock exclusion with 100 ft buffer	Feet	$35	$10	$28,916	2
	Livestock exclusion with 35-50 ft buffer		$35	$26	$83,394	3
	Livestock exclusion with 10-25 ft buffer		$29	$47	$164,315	3
	Livestock exclusion w/35 ft buffer (no water)		$10	$9	$12,998	2
Pasture	Precision rotational/ prescribed grazing	Acres	$300	$1	$3,320	1
	Permanent vegetation on critical areas		$3,000	$2	$1,902	1
	Aforestation of erodible pasture		$200	$0.09	$156	1
	Nutrient management plan		$3	NA	$117	1
Cropland (Hat Creek only)	Continuous no till	Acres	$100	$0.25	NA	1
	Cover crops		$65	$1	NA	1
	Permanent vegetation on cropland		$350	$0.82	NA	1
Hay	Forest buffer	Acres	$1,000	$7	$1,230	2
	Aforestation of hayland		$1,000	$17	$2,134	2
	Nutrient management plan		$4	NA	$104	1
Vineyard	Cover crops	Acres	$65	$2	NA	1
	Grass filter strips		$80	$0.83	NA	1
	Permanent vegetative cover on critical areas		$3,000	$40	NA	3
Gravel	Gradebreak installation (50 feet of roadway above)	Number	$5,000	$626	NA	4
	Drainage outlets (50 feet of roadway above)		$4,000	$545	NA	4
Turfgrass	Tree planting	Acres	$1,500	$38	$9,495	3
	Wet ponds and wetlands	Acres treated	$22,612	$440	$298,867	4
	Rain gardens		$45,713	$667	$362,518	4
	Bioswales		$36,570	$534	$290,012	4
	Vegetated open channels		$24,380	$407	$322,235	4

	Nutrient management plan	Acres	$3	NA	$397	1
Urban/ Developed	Tree planting	Acres	$1,500	$12	$8	1
	Bioretention filters (urban)	Acres treated	$50,000	$56	$108	1
	Bioswales		$36,570	$41	$79	1
	Vegetated open channels	Acres treated	$24,380	$33	$88	1
	Wet ponds and wetlands		$22,612	$34	$93	1
	Permeable pavement	Acres	$1,524,600	$1,323	$638,746	5
	Impervious surface removal		$283,140	$486	$213,978	4
Streambank erosion	Streambank stabilization	Feet	$250	$209	$1.06M	3/5

6.5.1 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.

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 6-7 shows an example of how this can translate into economic gains for producers. Fresh clean water is the primary nutrient for livestock with healthy cattle consuming, on a daily basis, close to 10% of their body weight during winter and 15% of their body weight in summer. Many livestock illnesses can be spread through contaminated water supplies. For instance, coccidia can be delivered through feed, water and haircoat contamination with manure (VCE, 2000). In addition, horses drinking from marshy areas or areas where wildlife or cattle carrying Leptospirosis have access tend to have an increased incidence of moonblindness associated with Leptospirosis infections (VCE, 1998b). A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills.

Table 6-7. 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	Increased revenue gain due to off-stream water due to off stream waterer	
		Per pound	Per calf
500 lbs/calf	5% or 25 lbs	$0.60 per lb	$15/calf

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

Taking the opportunity to implement a rotational grazing system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Grazing land management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40 % and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80 % of the cost of growing or maintaining an animal, and pastures providing feed at a cost of 0.01 to 0.02 cents/lb of total digestible nutrients (TDN) compared to 0.04 to 0.06 cents/lb TDN for hay, increasing the amount of time that cattle are fed on pasture is clearly a financial benefit to producers (VCE, 1996). Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits by allowing higher stocking rates and increasing the amount of gain per acre. Another benefit is that cattle are closely confined allowing for quicker examination and handling.

In general, many of the agricultural BMPs recommended in this document will provide both environmental benefits and economic benefits to the farmer.

6.5.2 Urban Stormwater

The primary benefits of stormwater management practices to private property owners include flood mitigation and improved water quality. A 2004 study assessing the economic benefits of stormwater management showed that these services can be valued at 0-5% of the market value of a home (Braden and Johnston, 2004). In addition, urban BMPs have a number of economic benefits to localities. Increased retention of stormwater on site can lower peak discharges, thereby reducing the drainage infrastructure needed to prevent flooding. This can result in cost savings to local governments through reduced engineering and land acquisition costs, and reduced materials and installation costs for stormwater culverts and streambank armoring to prevent scour. Lastly, implementation of urban BMPs greatly reduces soil erosion and sediment transport to our rivers, streams, and lakes. A 1993 study of the economic cost of erosion-related pollution showed that national off-site damages from urban sediment sources cost between $192 million and $2.2 billion per year in 1990-dollar values (Paterson et al, 1993). This cost range would be far greater today if adjusted for inflation.

6.5.3 Watershed Health and Associated Benefits

Focusing on reducing bacteria in the watersheds will have associated watershed health benefits as well. 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. 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 Chapter 9).

7 MEASUREABLE GOALS AND MILESTONES

Given the scope of work involved with implementing this plan, full implementation can be expected within 12 years, and de-listing from the Virginia Section 305(b)/303(d) list within 14 years provided that full funding for technical assistance and BMP cost share were available. Described in this section are a timeline for implementation, water quality and implementation goals and milestones, and strategies for targeting of best management practices.

7.1 Milestone Identification

The end goals of implementation are restored water quality of the impaired waters and subsequent de-listing of the waters from the Commonwealth of Virginia's Section 305(b)/303(d) list within 12 years. Progress toward end goals will be assessed during implementation through tracking of best management practices through the Virginia Agricultural Cost-Share Program and DEQ-hosted BMP Warehouse, and through continued water quality monitoring.

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the amount of control measures installed within certain timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. The milestones described here are intended to achieve full implementation of the TMDLs within 12 years.

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. Implementation has been divided up into two 6-year stages. Table 7-1 through Table 7-5 show implementation and water quality improvement goals for sediment and phosphorus (Black Creek) for the watersheds in each implementation stage.

Table 7-1. Staged BMP implementation goals for Hat Creek.

Land use	BMP Name (BMP Cost Share Code)	Units	Extent		Sediment reduction (lbs/yr)	
			Stage 1	Stage 2	Stage 1	Stage 2
Pasture	Livestock exclusion with tree planting (CRSL-6)	Feet	3,704	1,235	16,131	5,388
	Livestock exclusion with 35-50 ft buffer (SL-6W)		16,891	5,630	25,736	8,579
	Livestock exclusion with 10-25 ft buffer (SL-6N)		1,852	617	1,203	401
	Livestock exclusion with 35 ft buffer (WP-2)		741	247	1,115	372
	Exclusion fence maintenance (12 yrs)		2,319	773	NA	NA
	Grazing land management (SL-10)	Acres	151	50	52,241	17,414
	Permanent vegetation on critical areas (SL-11)		0.20	0.07	385	128
	Aforestation of erodible pasture (FR-1)		0.20	0.07	505	168
Cropland	Continuous no till (SL-15A)	Acres	0.85	0.28	339	113
	Cover crops (SL-8B)		0.85	0.28	48	16
Hayland	Forest buffer (FR-3)	Acres	18	6	1,998	669
	Aforestation of hayland (FR-1)		18	6	781	260
Vineyards	Cover crops	Acres	2	0.79	24	8
	Grass filter strips (WQ-1)		4	1	370	123
	Permanent vegetative cover on critical areas (SL-11)		1	0.39	89	30
Urban	Tree planting (CL-2/UB-3)	Acres	0.11	0.04	17	6
	Bioretention filters (BR-1-5)	Ac treated	1.34	0.45	679	226
Turfgrass	Tree planting (CL-2/UB-3)	Acres	6	2	218	73
Gravel roads	Gradebreak installation (50 feet of roadway above)	Number	2	0.63	15	5
	Drainage outlets (50 feet of roadway above)		2	0.63	14	5
Streambank erosion	Streambank restoration (WP-2A)*	Meters	1,688	563	12,395	4,132
Estimated annual NPS sediment load (lb/yr) upon completion					***2,031,729***	***1,993,614***
NPS sediment reduction (%)					***5.63%***	***1.91%***

Land use	BMP Name (BMP Cost Share Code)	Units	Extent		Sediment reduction (lbs/yr)	
			Stage 1	Stage 2	Stage 1	Stage 2
				Estimated annual NPS and PS sediment load (lb/yr) upon completion	***2,031,820***	***1,993,705***
				Total sediment reduction (PS and NPS) (%)	***5.63%***	***1.91%***
				Total cumulative sediment reduction (Phase 1 and Phase 2) (%)	***7.10%***	

Table 7-2. Percent of land use receiving BMP by stage in Hat Creek.

Land use	BMP Name (BMP Cost Share Code)	Units	% Land Use treated	
			Stage 1	Stage 2
Pasture	Livestock exclusion with tree planting (CRSL-6)	Feet	4%	1%
	Livestock exclusion with 35-50 ft buffer (SL-6W)		17%	6%
	Livestock exclusion with 10-25 ft buffer (SL-6N)		2%	1%
	Livestock exclusion with 35 ft buffer (WP-2)		1%	0%
	Exclusion fence maintenance (12 yrs)		5%	5%
	Grazing land management (SL-10)	Acres	14%	5%
	Permanent vegetation on critical areas (SL-11)		0.02%	0.01%
	Aforestation of erodible pasture (FR-1)		0.02%	0.01%
Cropland	Continuous no till (SL-15A)	Acres	4%	1%
	Cover crops (SL-8B)		4%	1%
Hayland	Forest buffer (FR-3)	Acres	2%	0.52%
	Aforestation of hayland (FR-1)		2%	0.50%
Vineyards	Cover crops	Acres	2%	0.50%
	Grass filter strips (WQ-1)		2%	0.81%
	Permanent vegetative cover on critical areas (SL-11)		0.75%	0.25%
Urban	Tree planting (CL-2/UB-3)	Acres	0.08%	0.03%
	Bioretention filters (BR-1-5)	Ac treated	1%	0.30%
Turfgrass	Tree planting (CL-2/UB-3)	Acres	2%	0.58%
Gravel roads	Gradebreak installation (50 feet of roadway above)	Number	0.56%	0.19%

Land use	BMP Name (BMP Cost Share Code)	Units	% Land Use treated	
			Stage 1	Stage 2
	Drainage outlets (50 feet of roadway above)		0.56%	0.19%
Streambank erosion	Streambank restoration (WP-2A)*	Meters	15%	5%

** % land use treated only includes the length of eroding streambank, total excludes stable banks*

Table 7-3. Staged implementation goals for Black Creek (sediment).

Land use	BMP Name (BMP Cost Share Code)	Units	Extent		Sediment reduction (lbs/yr)	
			Stage 1	Stage 2	Stage 1	Stage 2
Pasture	Livestock exclusion with tree planting (CRSL-6)	Feet	695	695	2,566	2,566
	Livestock exclusion with 35-50 ft buffer (SL-6W)		5,563	5563	11,444	11,444
	Livestock exclusion with 10-25 ft buffer (SL-6N)		348	348	478	478
	Livestock exclusion with 35 ft buffer (WP-2)		139	139	447	447
	Exclusion fence maintenance (12 yrs)		674	674	NA	NA
	Grazing land management (SL-10)	Acres	62	62	20,983	20,983
	Permanent vegetation on critical areas (SL-11)		0.57	0.57	1,336	1,336
	Aforestation of erodible pasture (FR-1)		6	6	6,771	6,771
	Nutrient management (NM-3)		54	54	0	0
Hayland	Forest buffer (FR-3)	Acres	4	4	644	644
	Aforestation of hayland (FR-1)		60	60	4,459	4,459
	Nutrient management (NM-3)		121	121	0	0
Urban	Tree planting (CL-2)	Acres	0.31	30	0.31	30
	Bioretention filters (BR-2-5)	Ac treated	7	3,543	7	3,543
	Bioswales (BR-6)		5	2,714	5	2,714
	Grass channels (UB-2)		7	3,097	7	3,097
	Permeable pavement (PP/IP-7)	Acres	0.001	0.58	0.001	0.58
	Impervious surface removal (ISR)		0.001	0.29	0.001	0.29

Land use	BMP Name (BMP Cost Share Code)	Units	Extent		Sediment reduction (lbs/yr)	
			Stage 1	Stage 2	Stage 1	Stage 2
	Wet ponds and wetlands (CW/DP-2)	Ac treated	5	2,036	5	2,036
Turfgrass	Tree planting (CL-2)	Acres	18	775	18	775
	Rain gardens (BR-10)	Ac treated	0.82	62	0.82	62
	Conservation landscaping (CL-1-5)	Acres	12	0	12	0
	Nutrient management plan		12	0	12	0
Gravel roads	Gradebreak installation (50 feet of roadway above)	Number	2	2	15	15
	Drainage outlets (50 feet of roadway above)		2	2	13	13
Streambank erosion	Streambank restoration (WP-2A)*	Meters	887	887	2,130	2,130
Estimated annual NPS sediment load (lb/yr) upon completion					***493,968***	***430,425***
NPS sediment reduction (%)					***12.86%***	***14.76%****
Estimated annual NPS and PS sediment load (lb/yr) upon completion					***495,581***	***450,543***
Total sediment reduction (PS and NPS) (%)					***11.36%***	***14.71%****
Total cumulative sediment reduction (Phase 1 and Phase 2) (%)					***22.73%***	

**% reductions for Stage 2 are cumulative and are based on an existing sediment load following achievement of Stage 1 goals*

Table 7-4. Staged implementation goals for Black Creek (phosphorus)

Land use	BMP Name (BMP Cost Share Code)	Units	Extent		Phosphorus reduction (lbs/yr)	
			Stage 1	Stage 2	Stage 1	Stage 2
Pasture	Livestock exclusion with tree planting (CRSL-6)	Feet	695	695	0.72	0.72
	Livestock exclusion with 35-50 ft buffer (SL-6W)		5,563	5563	2.0	2.0
	Livestock exclusion with 10-25 ft buffer (SL-6N)		348	348	0.05	0.05
	Livestock exclusion with 35 ft buffer (WP-2)		139	139	0.05	0.05
	Exclusion fence maintenance (10 yrs)		674	674	NA	NA
	Grazing land management (SL-10)	Acres	62	62	5.4	5.4
	Permanent vegetation on critical areas (SL-11)		0.57	0.57	0.73	0.73

Land use	BMP Name (BMP Cost Share Code)	Units	Extent		Phosphorus reduction (lbs/yr)	
			Stage 1	Stage 2	Stage 1	Stage 2
	Aforestation of erodible pasture (FR-1)		6	6	2.3	2.3
	Nutrient management (NM-3)		54	54	1.1	1.1
Hayland	Forest buffer (FR-3)	Acres	4	4	2.3	2.3
	Aforestation of hayland (FR-1)		60	60	23	23
	Nutrient management (NM-3)		121	121	3.8	3.8
Urban	Tree planting (CL-2/UB-3)	Acres	0.31	30	0.04	0.04
	Bioretention filters (BR-1-5)	Ac treated	7	3,543	7.3	7.3
	Bioswales (BR-6)		5	2,714	5.6	5.6
	Grass channels (WP-3)		7	3,097	4.4	4.4
	Permeable pavement (PP/IP-7)	Acres	0.001	0.58	0.001	0.001
	Impervious surface removal (ISR)		0.001	0.29	0.001	0.001
	Wet ponds and wetlands (CW/DP-2)	Ac treated	5	2,036	3.4	3.4
Turfgrass	Tree planting (CL-2/UB-3)	Acres	18	775	2.8	2.8
	Rain gardens (BR-10)	Ac treated	0.82	62	0.10	0.10
	Conservation landscaping (CL-1-5)	Acres	12	0	0.52	0.52
	Nutrient management plan		12	0	0.09	0.09
Gravel roads	Gradebreak installation (50 feet of roadway above)	Number	2	2	NA	NA
	Drainage outlets (50 feet of roadway above)		2	2	NA	NA
Streambank erosion	Streambank restoration (WP-2A)*	Meters	887	887	0.83	0.83
Estimated annual NPS phosphorus load (lb/yr) upon completion					***587***	***521***
NPS phosphorus reduction (%)					***11.28%***	***12.71%***
Estimated annual NPS and PS phosphorus load (lb/yr) upon completion					***1,272***	***1,206***
Total phosphorus reduction (PS and NPS) (%)					***18.83%***	***23.06%***
Total cumulative phosphorus reduction (Phase 1 and Phase 2) (%)					***23.09%***	

Table 7-5. Percent of land use receiving BMP by stage in Black Creek.

Land use	BMP Name (BMP Cost Share Code)	Units	% Land Use treated	
			Stage 1	Stage 2
Pasture	Livestock exclusion with tree planting (CRSL-6)	Feet	5%	5%
	Livestock exclusion with 35-50 ft buffer (SL-6W)		40%	40%
	Livestock exclusion with 10-25 ft buffer (SL-6N)		3%	3%
	Livestock exclusion with 35 ft buffer (WP-2)		1%	1%
	Exclusion fence maintenance (12 yrs)		5%	5%
	Grazing land management (SL-10)	Acres	27%	27%
	Permanent vegetation on critical areas (SL-11)		0.25%	0.25%
	Aforestation of erodible pasture (FR-1)		3%	3%
	Nutrient management (NM-3)		23%	23%
Hayland	Forest buffer (FR-3)	Acres	0.76%	0.76%
	Aforestation of hayland (FR-1)		13%	13%
	Nutrient management (NM-3)		25%	25%
Urban	Tree planting (CL-2/UB-3)	Acres	0.29%	0.29%
	Bioretention filters (BR-1-5)	Ac treated	6%	6%
	Bioswales (BR-6)		5%	5%
	Grass channels (WP-3)		6%	6%
	Permeable pavement (PP/IP-7)	Acres	<0.01%	<0.01%
	Impervious surface removal (ISR)		<0.01%	<0.01%
	Wet ponds and wetlands (CW/DP-2)	Ac treated	5%	5%
Turfgrass	Tree planting (CL-2/UB-3)	Acres	11%	11%
	Rain gardens (BR-10)	Ac treated	0.50%	0.50%
	Conservation landscaping (CL-1-5)	Acres	8%	8%
	Nutrient management plan		8%	8%
Gravel roads	Gradebreak installation (50 feet of roadway above)	Number	2%	2%
	Drainage outlets (50 feet of roadway above)		2%	2%

Land use	BMP Name (BMP Cost Share Code)	Units	% Land Use treated	
			Stage 1	Stage 2
Streambank erosion	Streambank restoration (WP-2A)*	Meters	34%	34%

** % land use treated only includes the length of eroding streambank, total excludes stable banks*

Table 7-6 and show a more detailed breakdown of expected BMP implementation levels and associated sediment and phosphorus reductions for each quarter of the overall 12-year project timeline. It is expected that the implementation rates will be slower in the first quarter as outreach is conducted and local stakeholders familiarized themselves with local water quality issues and cost share programs available to assist with BMP implementation. During this quarter, it is projected that 25% of Stage 1 BMPs will be installed. It is expected that the second and third quarters will comprise the greatest extent of implementation as landowners see successful examples of BMP implementation in their community and trust is built between landowners and conservation partners. It is estimated that 75% of Stage 1 and Stage 2 goals will be achieved in the second and third quarters, respectively. The final quarter of implementation is likely to experience a slower rate of implementation after the "low hanging fruit" has been picked and the more challenging projects remain. It is estimated that 25% of Stage 2 BMP implementation goals will be accomplished during the final quarter of implementation. It should be noted that these timelines are based on previous experiences implementing watershed plans in Virginia; however, each watershed community is different and implementation progress is variable.

Table 7-6. Quarterly BMP implementation (12-year timeline) in the Hat Creek watershed.

Land use	BMP Name (BMP Cost Share Code)	Units	Stage 1		Stage 2	
			Years 1-3	Years 4-6	Years 7-9	Years 10-12
Pasture	Livestock exclusion with tree planting (CRSL-6)	Feet	926	2,778	926	309
	Livestock exclusion with 35-50 ft buffer (SL-6W)		4,223	12,669	4,223	1,408
	Livestock exclusion with 10-25 ft buffer (SL-6N)		463	1,389	463	154
	Livestock exclusion with 35 ft buffer (WP-2)		185	556	185	62
	Exclusion fence maintenance (12 yrs)		580	1,739	580	193
	Grazing land management (SL-10)	Acres	38	113	38	13
	Permanent vegetation on critical areas (SL-11)		0.05	0.15	0.05	0.02
	Aforestation of erodible pasture (FR-1)		0.05	0.15	0.05	0.02
Cropland	Continuous no till (SL-15A)	Acres	0.21	0.64	0.21	0.07
	Cover crops (SL-8B)		0.21	0.64	0.21	0.07
Hayland	Forest buffer (FR-3)	Acres	4.6	14	4.6	1.5
	Aforestation of hayland (FR-1)		4.4	13	4.4	1.5
Vineyards	Cover crops	Acres	0.59	1.8	0.59	0.20
	Grass filter strips (WQ-1)		0.96	2.9	0.96	0.32
	Permanent vegetative cover on critical areas (SL-11)		0.29	0.88	0.29	0.10
Urban	Tree planting (CL-2/UB-3)	Acres	0.03	0.08	0.03	0.01
	Bioretention filters (BR-1-5)	Ac treated	0.34	1.0	0.34	0.11
Turfgrass	Tree planting (CL-2/UB-3)	Acres	1.6	4.7	1.6	0.53
Gravel roads	Gradebreak installation (50 feet of roadway above)	Number	0.47	1.4	0.47	0.16
	Drainage outlets (50 feet of roadway above)		0.47	1.4	0.47	0.16
Streambank erosion	Streambank restoration (WP-2A)*	Meters	422	1,266	422	141
Estimated annual sediment load (lb./yr) upon completion			***2,117,546***	***2,031,820***	***2,002,886***	***1,993,241***
Total sediment reduction (%)			***1.3%***	***4.0%***	***1.4%***	***0.45%***

Table 7-7. Quarterly BMP implementation (12-year timeline) in the Black Creek watershed

Land use	BMP Name (BMP Cost Share Code)	Units	Stage 1		Stage 2	
			Years 1-3	Years 4-6	Years 7-9	Years 10-12
Pasture	Livestock exclusion with tree planting (CRSL-6)	Feet	174	522	522	174
	Livestock exclusion with 35-50 ft buffer (SL-6W)		1,391	4,172	4,172	1,391
	Livestock exclusion with 10-25 ft buffer (SL-6N)		87	261	261	87
	Livestock exclusion with 35 ft buffer (WP-2)		35	104	104	35
	Exclusion fence maintenance (10 yrs)		169	506	506	169
	Grazing land management (SL-10)	Acres	16	47	47	16
	Permanent vegetation on critical areas (SL-11)		0.14	0.43	0.43	0.14
	Aforestation of erodible pasture (FR-1)		1.5	4.5	4.5	1.5
	Nutrient management (NM-3)		14	40.5	41	14
Hayland	Forest buffer (FR-3)	Acres	0.92	2.8	2.8	0.92
	Aforestation of hayland (FR-1)		15	45	45	15
	Nutrient management (NM-3)		30	91	91	30
Urban	Tree planting (CL-2/UB-3)	Acres	0.08	0.24	0.24	0.08
	Bioretention filters (BR-1-5)	Ac treated	1.7	5.0	5.0	1.7
	Bioswales (BR-6)		1.3	3.8	3.8	1.3
	Grass channels (WP-3)		1.6	4.9	4.9	1.6
	Permeable pavement (PP/IP-7)	Acres	0	0.0004	0.0004	0
	Impervious surface removal (ISR)		0	0.0004	0.0004	0
	Wet ponds and wetlands (CW/DP-2)	Ac treated	1.3	3.8	3.8	1.3
Turfgrass	Tree planting (CL-2/UB-3)	Acres	4.4	13	13	4.4
	Rain gardens (BR-10)	Ac treated	0.21	0.62	0.62	0.21
	Conservation landscaping (CL-1-5)	Acres	3.1	9.3	9.3	3.1
	Nutrient management plan		3.1	9.3	9.3	3.1
Gravel roads	Gradebreak installation (50 feet of roadway above)	Number	0.44	1.3	1.3	0.44
	Drainage outlets (50 feet of roadway above)		0.44	1.3	1.3	0.44

Land use	BMP Name (BMP Cost Share Code)	Units	Stage 1		Stage 2	
			Years 1-3	Years 4-6	Years 7-9	Years 10-12
Streambank erosion	Streambank restoration (WP-2A)*	Meters	223	666	666	223
Estimated annual sediment load (lb./yr) upon completion			***543,238***	***495,581***	***447,923***	***432,038***
Total sediment reduction (%)			***2.8%***	***8.5%***	***8.5%***	***2.8%***
Estimated annual phosphorus load (lb./yr) upon completion			***1,551***	***1,501***	***1,452***	***1,435***
Total phosphorus reduction (%)			***1.1%***	***3.2%***	***3.2%***	***1.1%***

Effective education and outreach will be a critical component in advancing implementation goals and milestones. Parcels greater than 75 acres were identified and prioritized for agricultural BMP outreach. There are 20 of these parcels in Hat Creek and 7 in Black Creek. Direct outreach to each of these 27 property owners will be a target milestone for the first year of implementation. A total of 71 riparian parcels greater than 15 acres have been identified in Hat Creek, and 25 riparian parcels in Black Creek. In an effort to accomplish implementation goals, outreach to these 97 landowners should serve as a project milestone to be accomplished by the end of the first quarter (year 3).

7.2 Water Quality Monitoring

7.2.1 DEQ Monitoring

Improvements in water quality will be evaluated through biological monitoring conducted at DEQ monitoring stations located in the watersheds as shown below in Figure 7-1. Descriptions of these stations are provided in Table 7-8. The map shows stations that are part of DEQ's Biological Monitoring Program and are co-located with ambient monitoring stations as well. Biological monitoring is conducted in the spring and fall and takes place on a rotating basis within a six-year assessment cycle. Monitoring will begin no sooner than the second odd numbered calendar year following the initiation of implementation. Beginning monitoring after 2 to 3 years of BMP implementation will help ensure that time has passed for remedial measures to have stabilized and BMPs to have become functional. At a minimum, the frequency of sample collections will be every spring and fall for two years. After two years of bi-annual monitoring an assessment will be made to determine if the segments are no longer impaired. If full restoration, as defined in the current or most recent version of the DEQ Final Water Quality Assessment Guidance Manual, has been achieved, monitoring will be suspended. If the two listing stations shown on the map do not show signs of improvement within this two-year period, monitoring will be discontinued for two years. Bi-annual monitoring will be resumed for another two years on the odd numbered calendar year in the third two-year period of the six-year assessment window. After this, the most recent two years of data will be evaluated, and the same criteria as was used for the first two-year monitoring cycle will apply.

7.2.2 Citizen Monitoring

Citizen monitoring is another valuable tool for assessing water quality. Citizen monitoring can supplement DEQ monitoring, identify priority areas for implementation, and detect improvements in water quality following implementation. DEQ offers information on Citizen Water Quality Monitoring on its website.

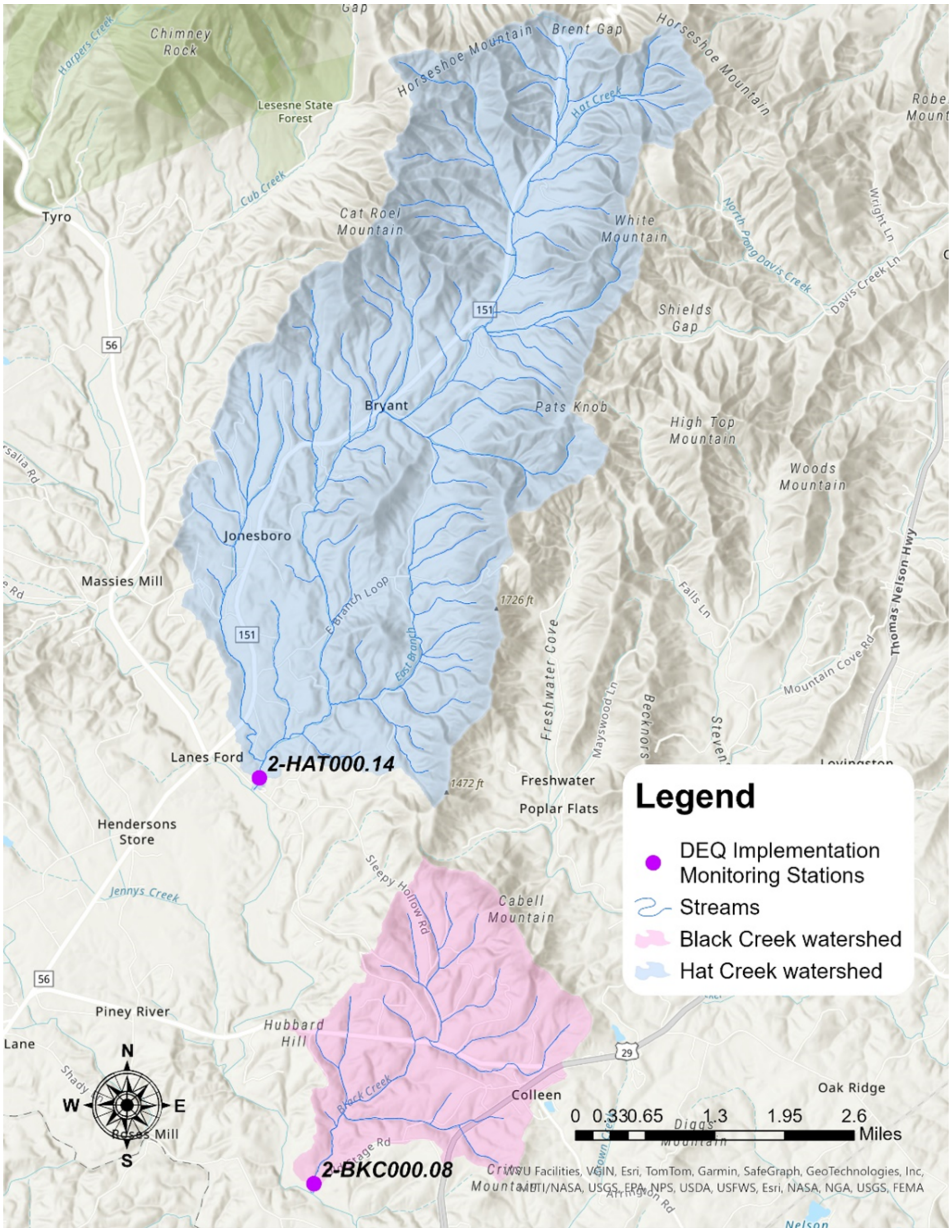

Figure 7-1. DEQ implementation monitoring stations.

Table 7-8. DEQ station location descriptions

Watershed	Station ID	Description
Hat Creek	2-HAT000.14	100 yards upstream of Route 655 Bridge
Black Creek	2-BKC000.08	Old Stage Rd Culvert on Piney River Farm

7.3 Prioritizing Implementation Actions

Staged implementation implies the process of prioritizing BMPs to achieve the greatest sediment reduction benefits early in the process. Table 6-6 shows the cost effectiveness of each practice included in the plan. Focusing on cropland and pasture management practices during the first several years of implementation will result in the greatest reduction in sediment at the lowest cost. Additionally, local stakeholders expressed considerable interest in streambank stabilization practices, recommending that implementation begin in the headwaters of Hat and Black Creeks. It is expected that streambank stabilization projects would move forward quickly given the interest expressed previously. Prioritizing different BMPs across the stages optimizes the use of limited resources by focusing on the most cost-effective practices and those that present the least obstacles (acceptance by landowners, available cost-share, etc.).

7.3.1 Landslide Susceptibility Mapping

In August 1969, Hurricane Camille made landfall along the Gulf Coast and made its way north, entering Virginia as a tropical depression. In Nelson County, extreme rainfall rates of up to 27-inches in 8-hours caused extensive flood damage wiping out roadways, bridges, and railways, and killing over 100 people. In addition to the flooding, the high-intensity rainfall initiated over 7,200 landslides, 900 (12.5%) of which occurred in the headwaters of the Hat Creek watershed. This widespread movement of sediment from hillslopes and streambanks intensified flood damage, depositing debris piles of trees, boulders and sand 10-20 feet deep in some areas (USGS, 1970). Much of this unconsolidated material was deposited in floodplains and remains there today.

In 2024, the Virginia Department of Energy's Geology and Mineral Resources Program completed a landslide hazard mapping study for Nelson and Albemarle Counties. The study, funded by a Federal Emergency Management Agency (FEMA) grant entitled "Enhancement of Landslide Hazard Risk in State and Local Hazard Mitigation Plans" identified areas and infrastructure susceptible to landslides. This mapping is intended to assist local officials in adopting strategies to reduce landslide risks in their communities (Witt et al, 2024). It may also be used to identify priority areas for implementation of BMPs intended to stabilize areas susceptible to erosion in addition to afforestation of pasture and hayland practices. While most of the 1969 landslides that occurred in the Hat Creek watershed initiated in steep forested areas of the watershed (Figure 7-2), unconsolidated debris flowed down these steep slopes where it was largely deposited in the floodplain. Streambank stabilization practices should also target areas of landslide inundation and deposition adjacent to the existing stream channel.

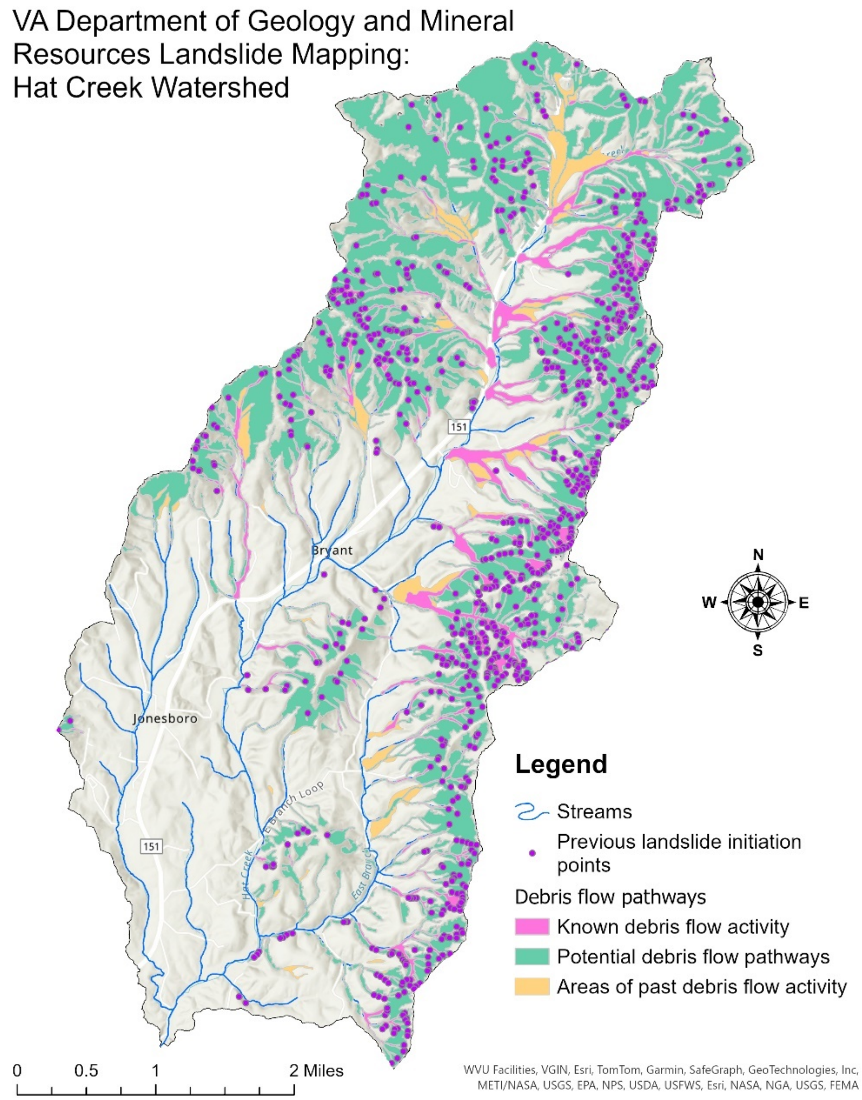

Figure 7-2 Landslide mapping conducted by the Virginia Department Energy's Geology and Mineral Resources Program for the Hat Creek watershed.

7.3.2 Prioritizing Agricultural Implementation Actions

Agricultural implementation actions were prioritized spatially in Hat Creek based on parcel sizes to ensure optimum utilization of limited technical and financial resources. Subwatersheds with the greatest number riparian agricultural parcels greater than 75 acres were assigned a higher priority for outreach and engagement. These parcels were also identified in Black Creek, but due to its size, it was not necessary to split the watershed into smaller priority subwatersheds. Efforts to sign up owners of these large riparian parcels for conservation programs will have a greater return on the investment of time, resulting in larger projects and greater reductions in sediment (Figure 7-3).

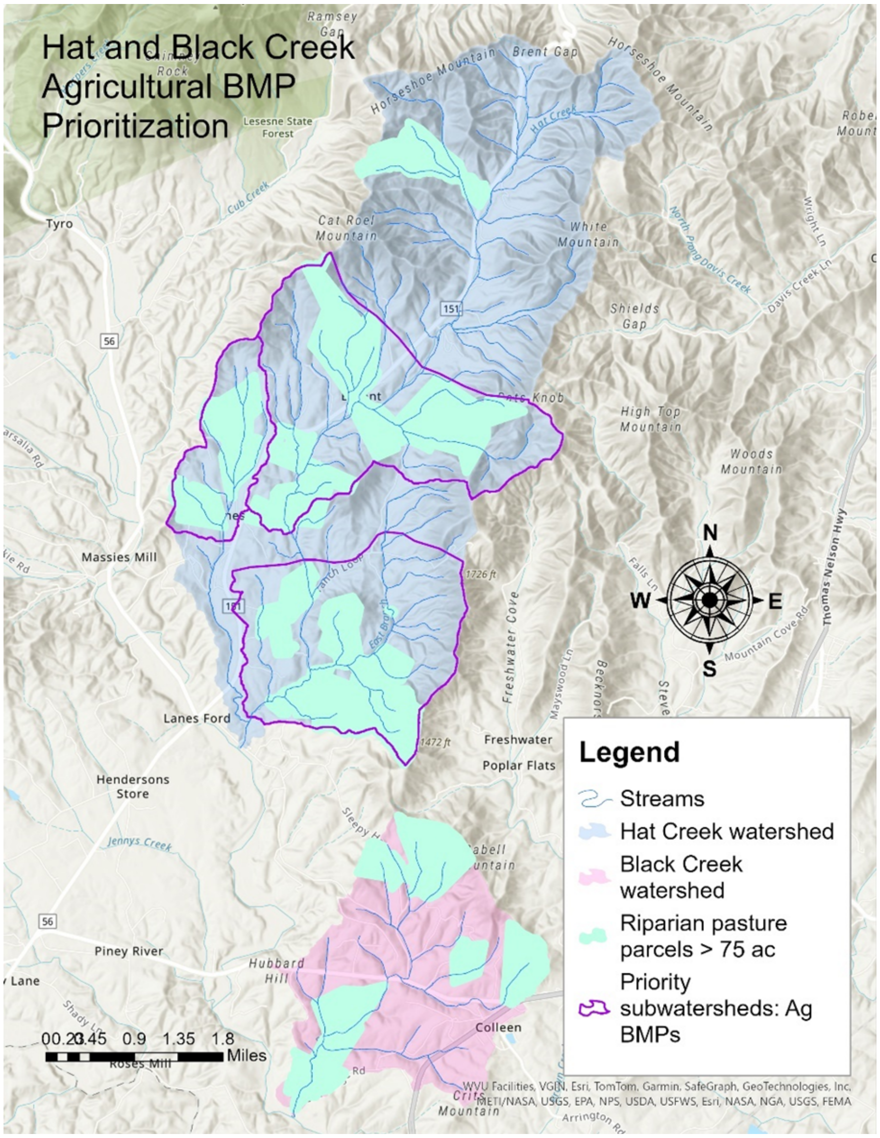

Figure 7-3. Agricultural BMP implementation prioritization for Hat and Black Creek.
Note: Parcel polygon boundaries have been buffered to ensure landowner privacy.

7.3.3 Prioritizing Urban/Residential Implementation Actions

Areas for residential and urban BMP implementation are relatively limited in both the Hat and Black Creek watersheds, but particularly in Hat Creek. Consequently, a small extent of urban/residential BMPs were included in the Hat Creek watershed. In Black Creek, urban stormwater BMPs will be targeted in and around the Colleen area, which is the portion of the watershed most likely to experience growth in the future. The Thomas Jefferson SWCD has considerable experience working with homeowners/businesses on stormwater BMPs through the VA Conservation Assistance Program (VCAP). Therefore, urban and residential BMPs included in the plan were selected based on options and specifications of this program. Nelson County and the Thomas Jefferson SWCD will work to identify opportunities to work with businesses and residential property owners on BMP implementation in the watersheds.

7.4 Adaptive Management Strategy

An adaptive management strategy will be utilized in the implementation of this plan to achieve water quality goals. Throughout the course of implementation, the management measures and water quality goals will be assessed, and adjustments of actions will be made as appropriate. The assessment of these measures and goals will be accomplished through monitoring of water quality, as discussed in Section 7.2 of this report, and evaluation of BMP implementation. Both mechanisms are documented in DEQ's triennial Progress Reports. The IP Progress Report is developed at the watershed/IP level and includes a summary of the watershed, implementation highlights, and water quality monitoring results. Information in the IP Progress Report can be used to determine if adaptive management is necessary. If assessments of Stage 1 water quality and implementation milestones show that progress toward achieving the sediment reduction goals is not as expected, the implementation strategy can be adjusted. Stakeholders, such the Thomas Jefferson SWCD, NRCS, and DEQ will be responsible for making this determination. Stakeholders' roles are described in Chapter 8.

As new technologies and BMPs become available, these practices will be evaluated for implementation in the watersheds. In addition, as new funding opportunities become available, they will be reviewed and pursued if applicable in the Hat and Black Creek watersheds.

8 STAKEHOLDERS AND THEIR ROLE IN IMPLEMENTATION

Achieving the goals of this plan is dependent on stakeholder participation and strong leadership on the part of both community members and conservation organizations. The Thomas Jefferson Soil and Water Conservation District covers all the project area with respect to administration of the VA Agricultural BMP Cost Share Program. Additional partners will be necessary to address urban/residential implementation needs including Nelson County. The following sections in this chapter describe the responsibilities and expectations for the various components of implementation.

8.1 Partner Roles and Responsibilities

8.1.1 Watershed Landowners

The majority of practices recommended in this plan are related to agriculture since it is a predominant land use in the watersheds. Participation from local farmers is thus a key factor to the success of this plan. Consequently, it is important to consider characteristics of farms and farmers in the watersheds that will affect the decisions farmers make when it comes to implementing conservation practices on their farms. For example, the average size of farms is an important factor to consider, since it affects how much land a farmer can give up for a riparian buffer. The age of a farmer may also influence their decision to implement best management practices, particularly if they are close to retirement and will be relying on the sale of their land for income during retirement. In such cases, it may be less likely that a farmer would be willing to invest a portion of their income in best management practices. In 2022, the average age of a farmer in Virginia was 59. Table 8.1 provides a summary of relevant characteristics of farmers and producers in Nelson County in the 2022 Agricultural Census. These characteristics were considered when developing implementation scenarios and should be utilized to develop suitable education and outreach strategies.

Table 8.1. Characteristics of farms and farmers in Nelson County.

Characteristic	**2022**	**% change since 2017**
Number of farms	399	-2%
Land in farms (acres)	68,566	-1%
Average size of farm (acres)	172	-4%
Per farm average		
Farm related income	$32,425	+29%
Total production expenses	$94,105	+45%
Net cash farm income	$4,336	-61%
Characteristic	**2022**	
% of farms implementing no till	3%	
% of farmers identifying farming as their primary occupation	44%	
% of farmers working 200 days/yr or more off farm	39%	
Average number of years present on farm	21	
% of land under conservation easement	6%	
% of rented land in farms	24%	

In addition to local farmers, participation from homeowners, local government staff and elected officials is critical to the success of this plan. Elected officials 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.

8.1.2 Thomas Jefferson Soil and Water Conservation District (SWCD) and Natural Resource Conservation Service (NRCS)

Both the SWCD and NRCS are continually reaching out to farmers in the watersheds and providing them technical assistance with conservation practices. The SWCD also has staff who administer the VA Conservation Assistance Program (VCAP), working homeowners and businesses to implement residential and urban BMPs. Most practices included in this program are eligible for 80% cost share and some practices provide a flat rate incentive payment up to the installation cost. Landowners interested in participating in the program can reach out to the Thomas Jefferson SWCD to discuss their eligibility for assistance. SWCD staff will conduct a site visit to the property and assist with development of a design plan. The SWCD Board and the

VCAP Steering Committee review applications for assistance and make decisions on approval. All practices are required to be maintained for 10 years. Through this program, the SWCD could play an important role in working with Nelson County to implement priority stormwater BMPs in the watersheds.

Currently, dedicated staff is not available to work solely in the watersheds that are covered in this plan, meaning that agricultural and urban/residential BMP implementation goals cannot be met without additional resources. SWCD and NRCS staff responsibilities include promoting available funding for BMPs and providing assistance in the design and layout of agricultural and residential/urban BMPs.

SWCD and NRCS staff can assist with conducting outreach activities in the watersheds to encourage participation in conservation programs; however, staff time for targeted outreach is limited due to existing workloads. Should funding for additional staff become available for outreach in these watersheds, the Thomas Jefferson SWCD would be well suited to administer an agricultural and urban/residential BMP program.

8.1.3 Nelson County

Decisions made by local government staff and elected officials regarding land use and zoning will play an important role in the implementation of this plan. This makes Nelson County a key partner in long term implementation efforts. Nelson County administers a Purchase of Development Rights Program, which enables the county to buy the right to develop parcels of land and then places those parcels in a conservation easement that restricts it from further development. This program is intended to preserve farm, forestland, and open space, while conserving and protecting water resources and environmentally sensitive lands. Additionally, the county has designated five agricultural forestal districts. This designation protects agricultural and forest land from development. Local government support of land conservation will become increasingly important as greater numbers of conservation measures are implemented across the watersheds. Nelson County will also serve as a key partner in urban/residential stormwater BMP outreach and implementation.

8.1.4 Virginia Department of Environmental Quality

DEQ has a lead role in the development of implementation plans to address non-point source (NPS) pollutants such as sediment and phosphorus from agricultural operations and urban/residential stormwater that contribute to water quality impairments. DEQ provides available grant funding and technical support for the implementation of NPS components of implementation plans. DEQ will work closely with project partners including the Thomas Jefferson Soil and Water Conservation District to track implementation progress for best management practices. In addition, DEQ will work with interested partners on grant proposals to generate funds for projects included in the implementation plan. When needed, DEQ will facilitate additional meetings of the steering committee to discuss implementation progress and make necessary adjustments to the implementation plan.

DEQ is charged with administering the Virginia Pollutant Discharge Elimination System (VPDES) program. Through this program, DEQ issues discharge permits to all point source discharges to surface waters in addition to dischargers of stormwater from Municipal Separate Storm Sewer Systems (MS4s) and construction activities (Virginia Stormwater Management Program), and dischargers of stormwater from industrial activities. DEQ will work with VPDES permit holders in the watersheds to ensure compliance with permit discharge and concentration limits to protect downstream water quality.

DEQ is also responsible for monitoring state waters to determine compliance with water quality standards. DEQ will continue monitoring water quality in Hat and Black Creeks to assess water quality and determine when restoration has been achieved and the streams can be removed from Virginia’s impaired waters list.

8.1.5 Virginia Department of Conservation and Recreation

DCR 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. DCR works with the SWCDs to track BMP implementation as well. In addition, DCR administers the state’s Nutrient Management Program, which provides guidelines and technical assistance to producers in appropriate manure and poultry litter storage and application, as well as application of commercial fertilizer.

8.1.6 Other Potential Local Partners

There are numerous opportunities for future partnerships 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:

- VA Cooperative Extension
- Chesapeake Bay Foundation
- James River Association
- VA Master Naturalists
- VA Master Gardeners
- Local Ruritan and Rotary Clubs
- Central Shenandoah Planning District Commission
- Nelson County Farm Bureau
- Native Plant Society
- Blue Ridge PRSIM
- Rockfish Valley Foundation
- VA Rural Water Association

8.2 Integration with Other Watershed Plans

Each watershed in the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographic boundaries and goals. These include but are not limited to TMDLs, Roundtables, Water Quality Management Plans, erosion and sediment control regulations, stormwater management, Source Water Protection Programs, and local comprehensive plans. Coordination of the implementation project with these existing programs could result in additional resources and increased participation.

8.2.1 Nelson County Comprehensive Plan

Nelson County has adopted a Comprehensive Plan intended to guide development and natural resource management within its jurisdiction (Nelson County, 2024). The plan stresses the importance of the preservation of rural areas and encourage development in development core areas. The Comprehensive Plan lists a series of natural environment goals with supporting objectives and strategies. Objectives and supporting strategies specifically related to the goals of this water quality improvement plan include:

1. Support of the use of low impact development and stormwater BMPs to reduce pollution of waterways
2. Support of landowners working with the Thomas Jefferson SWCD to install BMPs through existing cost share programs
3. Continued partnerships with state and local partners to implement TMDLs
4. Protect steep slopes, define and guide development on steep slopes to prevent erosion and sediment transport.

The preservation of agricultural land in the watersheds will help to extend the life span of agricultural BMPs installed by landowners, while protection of forest land will provide numerous water quality benefits including the filtration of pollutants from adjacent developed lands. The comprehensive plan establishes both conservation areas and rural areas. Conservation areas are defined as " those areas with significant environmental sensitivity and/or areas that are currently protected from development through permanent conservation or recreation use". These areas are established to protect surface and groundwater and the other ecosystem services provided by these areas. Rural areas comprise the majority of Nelson County, and are defined as prime agricultural areas, forested mountains, rural homesteads and some low-density single-family subdivisions. Preservation of these areas is identified as a key strategy to protecting the rural character of the county. It will also help to ensure the longevity of BMPs installed in support of this plan and prevent significant development of the watersheds that would lead to increased stormwater runoff. Additionally, the comprehensive plan identifies the following tools to protect rural and forested landscapes in the region:

- Conservation easements
- Agricultural and forestal districts
- Use-value taxation assessment
- Purchase of development rights program

8.2.2 Virginia's Phase III 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 to meet nitrogen, phosphorous, and sediment loading reductions called for in the Chesapeake Bay TMDL, completed in December 2010. In July 2018, the Environmental Protection Agency issued State-Basin Targets for nitrogen and phosphorus in Virginia's five Chesapeake Bay River basins including the James River. Nutrient reduction goals established for 2025 are ambitious and will require a significant level of BMP implementation. Sustained funding and increased technical capacity are identified as critical needs to accomplish these goals across all source sectors. Multiple state initiatives designed to engage local communities, identify resource gaps, and encourage continued innovation with respect to BMP implementation will be employed to meet 2025 targets. These efforts will support both Chesapeake Bay and local TMDL implementation. Several of the BMPs included in this implementation plan are also found in Virginia's Phase III WIP. Consequently, Nelson County will be able to track and receive credit for progress in meeting Phase III WIP goals while also working towards implementation goals established in this plan to improve local water quality.

8.2.3 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 Chesapeake Bay Foundation, the James River Association and the Virginia Department of Forestry are currently collaborating on the James River Buffer Program, which is a grant funded initiative to restore or create forest buffers in the James River watershed. The program covers the full cost of buffer plantings, allows landowners to select native trees and plants based on their preferences, and maintains the buffers for a period of three years after planting. The program was launched in 2019 after the Chesapeake Bay Foundation was awarded a $1.1 million grant from the Virginia Environmental Endowment's James River Water Quality Improvement Program. The program was very successful due to the flexibility that it offers landowners with respect to tree species options and maintenance support. The coverage area was expanded into the Middle James River watershed in 2020 through another grant from the Virginia Environmental Endowment providing landowner support for buffer plantings through 2024. Virginia Cooperative Extension is working to encourage implementation of rotational grazing through its Graze 300 initiative. The program's mission is to "enable Virginia farmers to achieve 300 days of livestock grazing by facilitating better pasture management and environmental stewardship." This educational initiative is designed to improve both farm profitability and water quality by encouraging farmers to shift from feeding hay in the winter months to extended rotational grazing. 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 the Hat and Black Creek watersheds.

8.3 Legal Authority

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

DEQ has responsibility for monitoring waters to determine compliance with state standards, and for requiring permitted point dischargers to maintain loads within permit limits. It has the regulatory authority to levy fines and take legal action against those in violation of permits. Beginning in 1994, animal waste from confined animal facilities that hold in excess of 300 animal units (cattle and hogs) has been managed through a Virginia general pollution abatement permit. These operations are required to implement a number of practices to prevent surface and groundwater contamination. In response to increasing demand from the public to develop new regulations dealing with animal waste, the Virginia General Assembly passed legislation in 1999 requiring DEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999). On January 1, 2008, DEQ assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids as a directed by the Virginia General Assembly in 2007. DEQ's Office of Land Application Programs within the Water Quality Division to manages the biosolids program. The biosolids program includes having and following nutrient management plans for all fields receiving biosolids, unannounced inspections of the land application sites, certification of persons land applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied. DEQ holds the responsibility for addressing nonpoint sources (NPS) of pollution as of July 1, 2013.

DCR is responsible for administering the Virginia Agricultural Cost Share and Nutrient Management Programs. Historically, most DCR programs have dealt with agricultural NPS pollution through education and voluntary incentives. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the level of participation required by TMDLs (near 100%). To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentive programs are continually reevaluated to account for this level of participation.

Through Virginia's Agricultural Stewardship Act (ASA), the Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty of up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. VDACS has three staff members dedicated to enforcing the Agricultural Stewardship Act, and a small amount of funding is available to support water quality sampling. The Agricultural Stewardship Act is entirely complaint driven.

VDH is responsible for maintaining safe drinking water measured by standards set by the EPA. Their duties also include septic system regulation and, historically, regulation of biosolids land application on permitted farmland sites. Like VDACS, VDH’s actions are complaint driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance.

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

8.4 Legal Action

The Clean Water Act Section 303(d) calls for the identification of impaired waters. It also requires that the streams be ranked by the severity of the impairment and that TMDLs be calculated for streams to meet water quality standards. Implementation plans are not required in the Federal Code; however, Virginia State Code does include the development of implementation plans for impaired streams. EPA largely ignored the nonpoint source section of the Clean Water Act until citizens began to realize that regulating only point sources was not protective of water quality. Lawsuits from citizens and environmental groups citing EPA for not carrying out the statutes of the CWA began as far back as the 1970s and have continued until the present. In Virginia in 1998, the American Canoe Association and the American Littoral Society filed a complaint against EPA for failure to comply with provisions of §303d. The suit was settled by Consent Decree, which contained a TMDL development schedule through 2010. It is becoming more common for concerned citizens and environmental groups to turn to the courts for the enforcement of water quality issues.

Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role, of course, falls on the landowner. However, local, state, and federal agencies also have a stake in ensuring that Virginia's waters are clean and provide a healthy environment for its citizens. An important first step in correcting the existing water quality problem is recognizing that there is a problem, and that the health of citizens is at stake. Virginia's approach to correcting NPS pollution problems has been, and continues to be, encouragement of participation through education and financial incentives.

9 FUNDING

A list of potential funding sources available for implementation has been developed. As part of adaptive management, the state recognizes that other funding opportunities may become available. These opportunities will be utilized if appropriate. A brief description of the programs and their requirements is provided in this chapter. Detailed descriptions can be obtained from the SWCD, DEQ, DCR, NRCS, and VCE.

9.1 Virginia Nonpoint Source Implementation Program

Virginia’s nonpoint source (NPS) implementation program is administered by DEQ through local SWCDs, local governments, nonprofits, planning district commissions (PDC), and local health departments to improve water quality in the Commonwealth’s streams and rivers and in the Chesapeake Bay. DEQ, through its partners, provides cost-share assistance to landowners, homeowners, and agricultural operators as an incentive to voluntarily install nonpoint source NPS BMPs in designated watersheds. The program uses funds from a variety of sources, including EPA 319(h) and the state-funded Water Quality Improvement Fund (WQIF) to install BMPs with the goal of ultimately meeting Virginia's NPS pollution water quality objectives. Although resource-based problems affecting water quality can occur on all land uses, this program addresses cost-share assistance on agricultural, residential, and urban lands. The geographic extent of eligible lands is identified in grant agreements and in watershed-based plans (WBPs), including IPs approved by DEQ and EPA.

9.2 Virginia Agricultural Best Management Practices Cost-Share Program (VACS)

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 state maximum.

9.3 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. Any practice approved by the local SWCD Board must be completed within the taxable year in which the credit is claimed. The credit is only allowed for expenditures made by the taxpayer from funds of his/her own sources. 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. If the amount of the credit exceeds the taxpayer's state tax obligation, the excess will be refunded to the taxpayer by the Virginia Department of Taxation. 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.

Tax credits are also available for the purchase of precision agricultural equipment and conservation tillage equipment. This includes manure applicators, sprayers, variable rate application equipment, and equipment used to reduce soil compaction. Individuals may claim a state tax credit of 25% of all expenditures made for purchasing and installing the equipment, up to a set maximum amount. A Nutrient Management Plan approved by the local SWCD is required to claim these credits.

9.4 Virginia Conservation Assistance Program (VCAP)

This is a relatively new program that provides financial incentives and technical and educational assistance to residential/urban landowners who install stormwater BMPs in Virginia's Chesapeake Bay watershed. Cost-share is typically 75% and some practices provide a flat incentive payment. SWCDs administer the program to encourage residential and urban property owners to install BMPs on their land to reduce erosion, poor drainage, and poor vegetation that contribute to water quality problems.

9.5 Virginia Water Quality Improvement Fund (WQIF)

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 both point and nonpoint source pollution remediation are administered through DEQ.

9.6 Conservation Reserve Program (CRP)

Through this program, cost-share assistance is available to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. Applications for the program are ranked, accepted and processed during signup periods that are announced by the Farm Service Agency (FSA). If accepted, contracts are developed for a minimum of 10 and not more than 15 years. To be eligible for consideration, land and applicants must meet certain criteria set by FSA. Payments may include cost share for practice establishment, incentive payments, and rental payments on enrolled acres.

9.7 Conservation Reserve Enhancement Program (CREP)

This program is an "enhancement" of the existing USDA Conservation Reserve Program. It has been enhanced by combining federal funds with state funds in a partnership to address high priority conservation concerns. In exchange for removing environmentally sensitive land from production and establishing permanent resource conserving plant species, farmers are paid an annual rental rate along with state and federal incentives. Contracts are typically established for 10 or 15 years in support of CREP goals, which include reducing sediment, nutrients, nitrogen and other pollutants entering waterbodies, reducing soil erosion, wetland restoration, and enhancement of wildlife habitat. The landowner can obtain and complete CREP application forms at the FSA center. The forms are forwarded to local NRCS and SWCD offices while FSA determines land eligibility. If the land is deemed eligible, NRCS and the local SWCD determine and design appropriate conservation practices. A conservation plan is written, and fieldwork is begun, which completes the conservation practice design phase. FSA then measures CREP acreage, conservation practice contracts are written, and practices are installed. The landowner submits bills for cost-share reimbursement to FSA. Once the landowner completes BMP installation and the practice is approved, FSA and the SWCD make the cost-share payments. The SWCD also pays out the state's one-time, lump sum rental payment. FSA conducts random spot checks throughout the life of the contract, and the agency continues to pay annual rent throughout the contract period.

9.8 Environmental Quality Incentives Program (EQIP)

This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource needs and objectives. EQIP is administered by NRCS and offers landowners and farmers cost-share assistance to implement a wide range of conservation practices on agricultural and forest land. Applications are ranked and priority is given to conservation practices that will result in greater environmental benefits.

9.9 EPA Water Infrastructure Finance and Innovation Act (WIFIA) Funds

The WIFIA program was established by the Water Infrastructure Finance and Innovation Act of 2014. WIFIA provides long-term, low-cost supplemental loans for regionally and nationally significant projects. The funds can be used for development and implementation activities for eligible projects including, but not limited to, wastewater conveyance and treatment, drinking water treatment and distribution, enhanced energy efficiency projects at drinking water and wastewater facilities, acquisition of property if it is integral to the project or will mitigate the environmental impact of a project, and combinations of eligible projects. Loans can be combined with other funding sources including state Revolving Fund loans.

9.11 National Fish and Wildlife Foundation (NFWF)

Grant proposals for this funding are accepted throughout the year and processed during fixed signup 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 are awarded for the purpose of conserving fish, wildlife, plants, and their habitats. Special grant programs are listed and described on the NFWF website National Fish and Wildlife Foundation (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.

9.12 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, land conservation and riparian buffers.

9.13 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 that provides compensation for aquatic resources in financially and environmentally preferable ways. Not every site or property is suitable for mitigation banking. Mitigation banks are required to be protected in perpetuity, to provide financial assurances and long term stewardship. The mitigation banking process is overseen by an Inter-Agency Review Team made up of state and federal agencies and chaired by DEQ and the Army Corps of Engineers.

9.15 Other Potential Funding Sources

Additional potential funding sources that have been identified by the working groups or in previous IPs include: Virginia Outdoors Foundation, U. S. Fish and Wildlife Service (FWS) Conservation Grant Program, USDA Agricultural Conservation Easement Program, Virginia Environmental Endowment, Trout Unlimited, Ducks Unlimited. As part of adaptive management, the state recognizes that other funding opportunities may become available. These opportunities will be utilized if appropriate.

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Appendix A.

Community Engagement Meeting Summaries

Hat and Black Creek Community Engagement Meeting #1

March 1, 2023

Nelson Memorial Library, Lovingston, VA

Participants

George Miller (Nelson Co. Service Authority)
Bryon Mowyer (Nelson Co. Service Authority)
Robert McSwain (Nelson Co. Service Authority)
Christian Giles
Luke Longanecker (Thomas Jefferson SWCD)
Tamara Tomlin
Justin and Heidi Crandall
Katie Shoemaker (Wetland Studies and Solutions Inc)
Dick Whitehead
Michelle Clark
Yvette Stafford
Isabella O'Brien (Thomas Jefferson PCC)
Trygve and Hal Loken
Emily Hjulstrom (Nelson Co)
Heather Coiner
Coty Painter
Robert Saunders
Rob Campbell (James River Assoc)
Mark Campbell (VA Farm Bureau)
Anne Witt (VA Dept of Energy)
Nesha McRae (VA Dept of Environmental Quality)
Tara Wyrick (VA Department of Environmental Quality)

Meeting Summary

Nesha McRae (DEQ) began the meeting by welcoming participants and providing a re-cap of the impairments in Hat and Black Creeks, the TMDL process, and the benthic stressor analysis, which identified sediment as the primary stressor in both streams and phosphorus as an additional stressor in Black Creek.

Source Assessment Discussion

The group moved on to discuss land cover acreage estimates for the two watersheds. Nesha asked whether there had been any recent changes in land use in the area, or if future changes are expected. This includes shifts in agricultural land (converting cropland to pasture, pasture to hay etc) as well as urban and residential development. Participants agreed that there has been little to no development in the area in the past 30 years. Constraints such as availability of water and sewer along with topography have considerably limited opportunities for development. One participant asked why the maps on the handout weren't broken out by pasture/hay but tabular data is. Katie Shoemaker (WSSI) explained that she used land use data from the VA Department of Conservation and Recreation (DCR) to further breakdown agricultural land cover estimates into pasture and hay, but that the scale of the DCR data does not allow her to map this breakdown. One participant noted that there has not been a lot of change in agricultural land in the area. There has been some decrease in farming, with some of this land shifting to open fields. Some of the smaller pastures have been converted to hay while some of these areas are being reforested. A participant asked why hay and pasture land are the predominant source of sediment and phosphorus in the watersheds but forest is the majority of land use. Katie and Nesha explained that each land use category is assigned a loading rate for sediment and phosphorus. These loading rates are determined based on specific characteristics of the watershed (e.g soil type, slope) along with characteristics of the land cover type. These loading rates are applied to estimated acreage to come up with a total load, and based on the loading rate and the prevalence of a given land cover type, the majority of the load may not come from the most abundant land cover type if that land cover (e.g. forest) has a very low loading rate compared to other land cover types. A participant asked if there are standard loading rates used in these estimates that could be shared for other land cover types (e.g. barren land). Katie explained that these estimates are going to be unique for each watershed due to differences in slope, soil properties, and rainfall patterns. The group reviewed the loading rates assigned to each land cover type in the watersheds along with acreages and total estimated loads of sediment and phosphorus.

Several participants noted that a significant load of sediment is coming from a large number of gravel roads in the area. They suggested trying to account for this runoff in the study. It was suggested that Katie and Nesha reach out to VDOT since the county doesn't maintain any of the roads. These gravel roads are typically on steep slopes and a considerable amount of material washes away. VDOT might be able to provide some figures on the amount of material that is placed on these roads annually, which might provide us with an idea of how much runoff is occurring. A participant noted that there are a lot of gravel roads around Tyro, Montebello, and Massies Mill, and that they are often located close to streams and springs.

A participant asked how orchards are classified in the land use data. Katie explained that depending on the size of the orchard, they would either be captured under the forest or tree category. Participants noted that there have been more grapes planted in the area in the last 10-20 years, but that the number of orchards has decreased in the last 20 years. Participants weren't aware of any orchards in the Black Creek watershed. It was noted that Bryant Orchard, located in Hat Creek, has increased recently, but that's about it. Participants noted that a large area of cropland shown on the map in Hat Creek is probably an orchard. Participants agreed that the extent of cropland in Hat Creek shown on the handout is likely overestimated. It was also noted that cropland in this area is typically not conventionally tilled. A participant explained that all of the cropland shown on the map on the handout from Jonesboro north along Route 151 is inaccurate, it is all hayland or open fields.

The group discussed how to account for future permitted land disturbance in the watersheds. Nesha explained that typically, an annual average acreage of land under a VPDES Construction General Permit is used to create a set aside wasteload allocation for permitted construction. However, in this project area, there have been not permits for construction in the past 10 years. Nesha asked the group if they thought this would change in the future and whether the county comprehensive plan reflects any plans for growth in the area. Participants explained that the availability of water and other utilities is limiting capacity for development in some areas since the infrastructure is not there to support development. There is no public water or sewer in project area accept maybe in the Colleen area. We also need to consider extent of land in the floodplain when looking at opportunities for future development, as that is another limiting factor. Lovingston and Colleen are earmarked as targeted development areas for the county in the Comprehensive Plan, though these areas currently lack the infrastructure to support it. Participants thought that eventually there would probably be some development in the Colleen area, so we may need to consider this in the study. This area typically experiences much smaller scale development (e.g. 10 houses constructed on 50 acres). A participant suggested considering the potential for solar farms, though there are none planned and there is currently little interest. Tara Wyrick (DEQ) explained that DEQ has been working to develop regulations that use a Permit by Rule (PBR) for permitting small renewable energy projects. We could take a look at these regulations to get an idea of how solar farms might be accounted for in the project area.

Target Loading Rate Development Discussion

Nesha moved on to discuss how target sediment and phosphorus loads will be developed for the watersheds. The group reviewed the AllForX method that has been used to establish pollutant endpoints in Virginia since 2014. A participant asked how these endpoints were previously established before the AllForX model was introduced. Nesha explained that previously, we would compare the impaired watershed with a non impaired reference watershed (sometimes a couple of reference watershed). The AllForX model allows us to consider a larger number of watersheds across a greater range of stream health. Nesha reviewed the example shown on the handout for sediment in Black Creek. She explained that a similar process was used to establish an endpoint for Hat Creek; however, it showed that no reductions in sediment were needed in the Hat Creek watershed. It is possible that some of the unique characteristics of the watershed, most notably the impacts of Hurricane Camille, might not be accounted for through the AllForX process. Nesha explained that an ongoing study by the VA Department of Energy includes mapping of historic landslides in Nelson and Albemarle Counties. Anne Witt (DOE) noted that preliminary draft data shows comparatively few landslides in Black Creek compared to Hat Creek. Mapping of the western portion of the counties has been completed and includes a portion of the Hat Creek watershed. The study has shown that Hat Creek experienced a large number of landslides during Hurricane Camille. As a result of these landslides, a large amount of unconsolidated material, including sediment, was deposited in Hat Creek's floodplain. As the stream meanders through its floodplain, this material is susceptible to erosion, adding sediment to the stream. While we must consider the current potential for erosion resulting from these historic sediment deposits, we must also consider the possibility of future landslides in the area and additional movement of material into the floodplain. Consequently, Nesha suggested that a more conservative approach to setting sediment reduction goals in Hat Creek should be used and provided an example in which the 33rd percentile of stream condition index scores was used. This resulted in a -2.5% reduction being needed, however, once a margin of safety is added in, this would likely result in a small reduction being called for (somewhere in the range of 8%). A participant asked Katie whether she could consider weighted variables in the AllForX regression approach, for example, if a watershed has a high degree of pasture or very steep slopes, or if you could incorporate characteristics of particular areas within the watershed. Katie and Nesha explained that the model that is used to simulate pollutant transport in the watershed is a lumped model, meaning that it does not differentiate between different parcels of land within the watersheds. It groups acres by land use types and treats them the same. Nesha explained that part of this is by design in that the TMDL process is not intended to call out landowners, which is supported by the modeling process that is used. Katie added that specific sites and project ideas can be identified during the implementation phase if landowners are interested.

Additional Discussion

Further discussion on the ongoing impacts of Hurricane Camille brought up many additional insights. The extensive straightening of the stream channels in the immediate recovery efforts were noted as likely contributing to additional streambank erosion as the channels continue to re-establish natural meander patterns. Further, the estimated feet of deposited material from the landslides that was spread in the floodplains shifted the particle size distribution from typical stratification to a more uniform, smaller sized particle. Note was made that many of the boulders transported in the landslides were repurposed into stabilizing riprap while the channels were being straightened and bridges being repaired, much of which got washed out in later storms (notably Hurricane Agnes(?)). It was suggested that stabilization of historic landslide areas be incorporated into either the TMDL recommendations or the later Implementation Plan process.

A participant noted the they are still observing debris on their property that had washed out during Hurricane Camille. Participants agreed that streambank erosion is an issue in Hat Creek. The group discussed the need for bank restoration work. Nesha explained that a more targeted approach may be necessary in the watershed, particularly given the cost. A participant asked whether some of the existing bridges in the watershed could be constructed differently to address streambank erosion. Nesha explained that this may be cost prohibitive and is not typically something that DEQ's water quality improvement funding can be used to support. Rob Campbell (JRA) noted that the James River Buffer program is available for livestock stream exclusion and riparian buffer planting work and that there is no property size cutoff for this program. It was noted that there is a maintenance aspect to this program, and that JRA provides some support for maintenance, however property owners should also expect to spend some time on maintenance as well. A participant requested that this information on this program be distributed with the meeting summary. Another participant asked what types of practices can be used in a stream to deflect flow away from banks, particularly check dams. Nesha and Katie explained that check dams are not typically placed in streams and discussed some of the ways that banks can be stabilized including vegetative plantings and laying back stream banks so that the stream can assess its flood plain during high flow conditions. A participant asked that information be shared on suitable plantings for streambanks. Another participant asked whether you model the reduction associated with vegetating the streambanks as opposed to doing something more extensive that includes engineering and construction. Katie explained that this would be challenging to do.

Planning Next Steps

A participant asked if Katie could provide a breakdown of the pasture and cropland land use types and associated acreages in the watershed. Katie said that would not be a problem. The group moved on to discuss next steps. Nesha explained that she and Katie would work to develop a series of different pollutant reduction scenarios to share with the group. At the next meeting, the group will review these scenarios and decide on the option that seems to most fair, practical and equitable to the local community. Nesha noted that she will be sending out a poll regarding timing for the next meeting (day or evening) to be sure that we can accommodate the greatest number of participants. Nesha thanked participants for attending and the meeting was adjourned.

Hat and Black Creek Community Engagement Meeting #2

May 17, 2023

Nelson Memorial Library

Participants

David Collins (TJSWCD)
Wendy Kelly (VADOE)
Ernie Reed (Nelson Co BOS)
Jimmy Massie (landowner)
Robert McSeain (Nelson Co SA)
Hal Loken (Landowner)
Trygve Loken (Landowner)
Tara Wyrick (VA DEQ)
Kim Romero (VA DEQ)
Reid Copeland (landowner)
Yvette Stafford (landowner)
Coty Painter (landowner)
Dick Whitehead (landowner)
Connie Roussos (landowner)
Stephen Dombrowski (WSSI)
Robert Saunders (Landowner)
Emma Martin (Nelson Co Times)
Stephen Dombroski (WSSI)
Nesha McRae (DEQ)

Meeting Summary

The meeting began with an update on changes that were made to land cover distributions in Black and Hat Creek watersheds based on input from stakeholders at the previous meeting. Portions of the Hat Creek watershed that were identified as cropland were flagged by stakeholders in the previous meeting as areas not under row crop production. Upon closer inspection of aerial imagery, the majority of these areas were identified as orchards or vineyards, which is traditionally lumped with plowed-field row crops in the land cover database. However, knowing the differences in hydrology and sediment movement in orchards and vineyards compared to traditional row crops, these areas were separated into a new category of 'vineyard' with appropriate model parameters adjusted.

Stakeholders also reviewed estimates of gravel roads in the watersheds, which were collected from a dataset that VDOT maintains. These areas were identified as having high potential for runoff during storm events at the last meeting. Additional updates to land cover data included removal of a property on the edge of the Black Creek watershed that actually drains to a different watershed via a series of stormwater management structures and reclassification of a barren area that was actually a rip rapped stormwater pond. The group was in agreement with these updates. One participant noted that there is a significant amount of land that falls underneath power transmission lines, asking how this was classified. Nesha McRae (DEQ) responded that it was likely grouped with surrounding land uses, and Stephen Dombroski (WSSI) offered to follow up on the question.

The group moved on to revisit the previous discussion about establishing a set aside for construction stormwater permits in the watershed. Nesha explained that a set aside had not been developed based on input from the group at the last meeting. Some concerns were raised about the area in and around Colleen in the Black Creek watershed, which is a designated growth area. There is also an industrial park in the Black Creek watershed that could be developed at some point down the road. Nesha explained that if the group decided to establish a set aside for future construction in Black Creek, this would require additional reductions in sediment from other sources in the watershed. After further discussion, it was decided that there was sufficient future growth included in the proposed TMDL to account for any construction activities in the watersheds in the coming years.

The group discussed the 2% future growth allocation and the 10% margin of safety included in the TMDL to account for error in the model. A participant asked if the model has a known error rate. Stephen explained that it is hard to define a precise error rate, but that the margin of safety is designed to ensure that the TMDL is protective of stream health. Nesha noted that having an explicit 10% margin of safety will be helpful in the Hat Creek watershed, where it has been difficult to account for legacy sediment in the floodplain following Hurricane Camille and Hurricane Agnes. One participant noted that Hurricane Agnes did nearly as much damage as Hurricane Camille, but that landowners did not address damage to the streambanks following Agnes. It is likely that we are still seeing the results of this damage through streambank erosion. Participants agreed that a considerable amount of vegetation was lost in the floodplain during these storms, and that the established network of tree roots and vegetative cover has not been replaced to date. This may also be contributing to erosion today. Many of the floodplains around Hat Creek were filled back in with silt and rock following Camille, and there is still quite a bit of debris that remains in the watershed today. There are a number of absentee landowners in the Hat Creek watershed, who are less likely to engage in restoration work on their riparian property.

The group reviewed tables showing sediment and phosphorus sources in the Hat and Black Creek watersheds. Nesha noted that in Black Creek, the STP comprises 69% of the total phosphorus load in the watershed. This has presented some challenges in TMDL development and the identification of phosphorus reductions needed to restore stream health. As a result, the group will only be reviewing sediment allocation scenarios for Hat and Black Creek during the meeting, with phosphorus allocation scenarios for Black Creek presented at a later date. A participant asked how DEQ's TMDL and Water Permitting programs work together, noting that permitting staff need to be involved in this effort if there will be impacts to the STP's permit. Nesha responded that she and others in the TMDL program have been working very closely with Water Permitting staff, who joined her in a recent visit to the STP and reservoir. A participant noted that the reservoir at the STP is slowly filling in with sediment and needs to be dredged to restore its storage capacity. Nesha noted that during implementation plan development, areas upstream of the reservoir could be identified for targeted BMP implementation to prevent further sedimentation of the reservoir. A participant asked whether DEQ could assist in funding the dredging activity and Nesha responded that this was not typically something DEQ would fund. The group discussed potential upstream sources of sediment in the Black Creek watershed. Draft results of VA Department of Energy's landslide mapping in the area show that Black Creek was not subject to the extent of landslides observed in Hat Creek, so legacy sediment deposits are an unlikely upstream source. One participant commented that there is a lot of white dirt in the upper portion of the Black Creek watershed that has a higher potential for erosion. This could be contributing to the issues observed in the reservoir.

The group discussed best management practices (BMPs) that were accounted for in the study, resulting in reductions in the sediment and phosphorus loads coming from these areas in the watersheds. One participant noted that farm ponds can be very helpful in capturing sediment in runoff, and asked whether these could be explored as a BMP for the watersheds. Nesha responded that this practice has been included in other implementation plans, but that there were some downsides to them including cost, and the potential to discharge water with low oxygen concentrations downstream. Another participant noted that ponds placed on steep slopes will frequently get blown out during rain events. Perhaps this practice could be included as a means to address particularly bad situations in the watersheds in addition to practices like rotational grazing and streamside buffers.

The group discussed how the revisions to land cover data impacted estimates of existing sediment and phosphorus loads in the watersheds in addition to target loads. These updates resulted in a decrease in the overall existing sediment and phosphorus loads in the Hat and Black Creek watersheds. These changes also shifted the AllForX target multipliers developed from the regressions, and with the decrease in watershed area slightly lowered the all-forested loads of Black Creek. Together, these shifts resulted in a decrease in the target loads for the watersheds. The group discussed the fact that before future growth and a margin of safety are established for Hat Creek, the model shows that a negative reduction in sediment is needed, i.e. no reduction needed to meet the target. Though this does not mean that the stream is considered healthy, as VSCI scores and the results of the BSA support the impairment of the watershed, this does provide further evidence that the stream is close to being considered unimpaired. A participant asked how accomplishment of water quality improvement goals will be determined. Nesha explained that success will be determined based on monitoring of aquatic life in the watersheds. The sediment and phosphorus reduction targets will be continually evaluated and could be revised if they are accomplished but the streams remained impaired.

The group reviewed four different allocation scenarios for sediment in the watersheds:

- Scenario 1 – Even reductions across all load sources
- Scenario 2 – Reductions on agricultural load sources only
- Scenario 3 – Reductions on urban load sources only
- Scenario 4 – Balanced reductions with higher reductions on agricultural load sources

The pros and cons of each approach were discussed. The high costs associated with urban and residential stormwater BMPs were noted, along with the work required to reach out to a larger number of smaller property owners compared to working with farmers. Several participants expressed support for partnering with the agricultural community to accomplish pollution reduction goals. Participants thought that local farmers would be more supportive and willing to work with partners to implement BMPs compared to residential property owners. While participants did not want to place all of the burden on the agricultural community, their commitment to natural resources was noted, making them a strong partner in this effort. Another participant noted that if government resources are to be used to assist with BMP implementation costs, it makes sense to focus these resources on the most cost effective practices first. Nesha asked for a show of hands regarding selection of scenario 4. Consensus was reached that this was the best reduction scenario for sediment in the two watersheds.

Nesha asked participants if they would like to have another meeting to review phosphorus reduction scenarios for Black Creek, or if they would prefer to handle it through email. Participants noted that it is helpful to get together to go over material due to its complexity. While most participants to date live in the Hat Creek watershed, there will still be some interest in reviewing allocation scenarios for phosphorus, particularly from the Nelson County Service Authority who operates the STP.

Nesha discussed next steps with participants. Another meeting will be held to review phosphorus allocations. Following this meeting, the draft report will be circulated to the group, allowing two weeks for review and return of comments. This phase in the project will be completed with a final community meeting. Nesha asked participants for suggestions on meeting dates, times and locations. It was noted that holding the meeting at the end of summer would result in better participation (Nelson County schools start back on August 14). Tuesday evenings were identified as the best time of the week, and the Nelson Center was suggested as a good meeting location. Nesha suggested having VA DOE tag team a brief presentation with Dick Whitehead regarding their landslide mapping efforts in the watersheds. Mapping efforts are expected to conclude in September 2023, but a summary of draft results could be shared. Participants agreed that stakeholders would be interested in something like this. Nesha asked about meeting outreach. Participants suggested posting something on Facebook and in the local paper. Nelson Knows was also suggested as a good way to get the word out about the meeting.

Nesha thanked participants for attending and the meeting was adjourned.

Hat and Black Creek Community Engagement Meeting #3

Nelson Memorial Library, Lovingston VA
January 10, 2024

Participants

Sara Senn (TJSWCD)
Yvette Stafford
Markley Ligon
Heidi Crandall
William Perry (VADOF)
David Collins (TJSWCD)
Reid Copeland
Anne Witt (VADOE)
Dick Whitehead
Courtney Harlow Humphreys (TJSWCD)
Hal Loken
Jim Saunders
Mike Yager (TJSWCD)
Emily Hjulstrom (Nelson County)
Robert McSwain
Conny Roussos
Nesha McRae (DEQ)

Tara Wyrick (DEQ)
Caleb M.

Meeting Summary

Follow Up Monitoring

The meeting began with a welcome from Nesha McRae (DEQ) followed by introductions. Nesha gave a recap of where things were left off with the project at the last meeting and explained that challenges had been encountered in identifying an appropriate phosphorus reduction target (endpoint) for Black Creek. DEQ collected three additional phosphorus samples in the summer of 2023 to confirm that phosphorus remained an issue in Black Creek. Nesha explained that she had concerns that previous monitoring results were skewed following the overflow at the STP in spring 2021. Nesha shared the monitoring results, which were still elevated in 2023. A participant asked if monitoring was conducted above the STP discharge. Nesha explained that DEQ samples right above the watershed outlet to get a holistic picture of water quality in Black Creek.

Setting Reduction Goals for Phosphorus in Black Creek

The group discussed the two processes that were used to develop a phosphorus reduction target for Black Creek. The AllForX model was initially used to set an endpoint, which would have required a 72% reduction in phosphorus in the watershed. Nesha explained that given current best management practices (BMPs) available to reduce phosphorus, this level of reduction would not be a reasonable goal for Black Creek. In addition, it would require modification of the STP permit and an upgrade to the facility to incorporate phosphorus removal technologies into their treatment system. This would necessitate a considerable investment by the Nelson County Service Authority. A concentration-based endpoint was also calculated for phosphorus in Black Creek. A similar approach was used in the Little Otter phosphorus TMDL, where the 90^{th} percentile of phosphorus concentrations from a non impaired reference stream was used to set the endpoint. Hat Creek was selected as a reference for Black Creek since it has similar characteristics and no apparent phosphorus issues. A concentration of 0.092 mg/L was used as the endpoint to calculate necessary reductions in phosphorus loads in the watershed. The result was far more reasonable, though it would still require considerable reductions from point and non-point sources in the watershed.

Discussion of Phosphorus Sources

Participants asked what the major sources of phosphorus are in the watershed and how these estimates were calculated. Nesha responded that hay land is the largest source, which is a result of the extent of hay land in the watershed. Pasture and urban impervious areas are also considerable sources as is groundwater. A participant asked whether we differentiate between hay land receiving biosolids application and those fertilized with manure or commercial fertilizer. Nesha responded that the model does not differentiate between those sources. Load estimates are developed using a watershed model that takes watershed characteristics into account such as soil types, slopes, rainfall, and land use. Reported values have not been measured from different land uses, they are derived using the watershed model. A participant asked why Hat Creek does not have similar phosphorus concentrations given that land use and watershed characteristics are similar. Nesha responded that there is not an STP on Hat Creek, and that it is a much larger stream. There are additional unique characteristics in Black Creek that are likely contributing to the elevated concentrations we are seeing in the stream.

Participants discussed current programs to support nutrient management planning, which are offered through the Thomas Jefferson Soil and Water Conservation District and the VA Department of Conservation and Recreation.

Addressing Nelson County STP Phosphorus Load

Participants asked where the phosphorus discharged from the STP is coming from. Nesha shared results of monitoring conducted by the Nelson County Service Authority at their pumping stations directing effluent to the STP on Black Creek. Phosphorus concentrations varied considerably, ranging from 1.2 mg/L at the STP outfall to 8.3 mg/L at the Henderson Store pumping station in Piney River. One participant suggested that elevated phosphorus concentrations might be coming from the use of detergents containing high levels of phosphorus. It was suggested that an outreach campaign be targeted at residents encouraging the use of detergents containing low levels of phosphorus. The group discussed how difficult it is to get people to change their behavior. Nesha explained that Virginia had been working to upgrade sewage treatment plants across the state to improve their nutrient removal efficiency. Nesha explained that the STP on Black Creek was not designed to remove phosphorus, and that they do not have a concentration limit in their permit. They are currently discharging well below their permitted design flow of 0.22 MGD. In addition, the average phosphorus concentration at their outfall is below the target concentration for small facilities in VA of 2.5 mg/L (average = 2.4 mg/L). A participant asked if the county could provide financial assistance with needed upgrades. This would need to come as a directive from the County Board of Supervisors. A participant suggested that residents should approach the board about this to encourage their support. The Nelson County Service Authority is currently facing several significant expenses as they work to address needed upgrades at facilities and expansions to ensure that they can address future demands. Some of these upgrades and expansions may help take some pressure off the facility on Black Creek. Additionally, their reservoir on Black Creek is filling in with sediment and needs to be dredged. This will be very expensive. The Service Authority wants to be a partner in the effort to restore Black Creek, but they have borrowed so much for recent upgrades at facilities that they are now up against a ceiling. Nesha noted that DEQ has grant programs available to provide support for upgrades to STP's, and that conversations regarding funding to incorporate phosphorus removal technology at the Black Creek facility are already underway.

Watershed Plan Alternative

The group moved on to discuss the option of developing a watershed plan for Hat and Black Creeks rather than continuing with development of a TMDL. This approach would not require modification of the STP's permit and would move the current planning process directly into the planning phase for BMP implementation. Nesha explained that this approach is well suited for watersheds where the community is very engaged and invested in water quality improvement. Additionally, the Nelson County Service Authority has indicated their support for the project and is willing to work with partners to make the needed upgrades at their facility on Black Creek. The watershed plan approach would give the Service Authority time to work with partners to locate funding for these upgrades and complete them within a reasonable time frame. However, Nesha noted that if the watershed plan is not effective in restoring aquatic life in the streams, then a TMDL will still be required.

Phosphorus Reduction Scenarios

The group reviewed four phosphorus reduction scenarios for Black Creek (Table 4 in the handout). Each scenario included a 54% reduction for the STP. Nesha explained that reaching anything over a 50% reduction in phosphorus from non-point sources would be extremely difficult to accomplish without significantly altering the watershed landscape (e.g., converting a large amount of hay land to forest). This is not the goal of this process. Participants discussed practices that can be used to reduce phosphorus from agricultural and urban sources. A participant asked where property owners can get information on residential fertilizer application and conservation practices that residential property owners can implement. Nesha responded that the Department of Conservation and Recreation has an urban nutrient management program. The Thomas Jefferson Soil and Water Conservation District (TJSWCD) also has a program to support homeowners interested in implementing conservation practices.

In addition to the final reduction scenarios, the group discussed a draft interim reduction scenario (Table 5 in the handout). Nesha explained that this scenario assumes that the uniform reduction scenario (Scenario 1 from Table 4) is selected by the group. The scenario can be modified depending on what the group selects for the final scenario. The interim reduction scenario assumes that the STP will continue to discharge at a rate of 0.12 MGD (well below their permitted design flow) and at an average phosphorus concentration of 2.4 mg/L. The interim scenario is based on accomplishing approximately half of the phosphorus reduction called for from non-point sources, assuming that efforts would also be underway to reduce sediment runoff from these sources. Nesha explained that having interim targets and goals allows us to evaluate how water quality is changing as implementation occurs. A participant asked when DEQ typically conducts monitoring once implementation is underway. Nesha responded that DEQ usually waits a couple of years to allow practices to become fully functional before conducting follow up monitoring.

Implementation Timeline

A participant noted that any interim goals should allow sufficient time for outreach, which can take a while. It can also take a long time to get approved for cost share programs that provide incentives for BMP implementation. The project timeline should take these delays into account. One participant noted that the Conservation Reserve Enhancement Program (CREP) is an excellent program that pays for installation of riparian buffers and livestock exclusion. Cost share for this program can exceed 100% of project costs. The James River Association has a very successful buffer program that pays for buffer planting in addition to maintenance. A participant noted that when it comes to livestock exclusion, most of the low hanging fruit has already been picked. It will be difficult to get remaining property owners to install fencing and buffers. The group discussed outreach ideas that would be most effective for the community. Open houses to share information from different organizations are great but participants didn't think that we would get many new participants this way. The group discussed the value of going to where property owners are gathering already. One participant suggested reaching out to producers at pesticide application recertification meetings. This is a requirement that many property owners have to meet. The Farm Bureau and Cooperative Extension should be included as partners in any outreach. Participants agreed that nobody likes to be told what to do, so outreach to increase awareness of water quality issues will be important. There aren't a lot of great websites that can be used to get the word out to county residents. Mailers are probably the best option.

Funding Discussion

Nesha explained how the watershed plan can be used as a tool to obtain funding for implementation efforts. DEQ has a grant program to fund implementation of watershed plans. It is important to make sure that all implementation ideas get captured in the plan, because DEQ funds can only be used to support practices that are identified in the plan. While funds can be obtained to support existing BMP cost share programs, specific projects can also be identified in the plan and funded. Nesha mentioned a few examples including stormwater basin retrofits and streambank restoration projects. The group could also consider including extension of existing grant funded programs like the James River Association's buffer program in the plan. If this was done, additional funding to support the program could be requested in a grant proposal. It was noted that existing BMP cost share programs do not provide sufficient support for streambank restoration efforts. A participant asked how detailed the plan will need to be with respect to the location of different potential projects. Nesha explained that the plan should not call out specific property owners, but that the greater level of detail that can be included regarding project extent and costs, the easier it will be to prepare a grant proposal for funding. In additional to DEQ's grant program to support implementation efforts, there are other grant programs that could support these efforts (e.g., National Fish and Wildlife Foundation).

Selection of a Reduction Scenario and Next Steps

The group returned to review of Table 4 in the handout. Nesha asked for participants to vote on the different scenarios. Scenario 1, which assumes a uniform reduction from all the different sources, was the most favorable scenario for participants.

Nesha asked the group whether they supported moving forward with watershed plan development rather than continuing with the TMDL development process. The group agreed that this was the best option. Nesha explained that there will be a few more meetings (probably three) to discuss BMPs to include in the plan, associated costs, a project timeline and education and outreach strategies. The next meeting will likely be held in March. Nesha thanked participants for attending and the meeting was adjourned.

Hat and Black Creek Community Engagement Meeting #4

Nelson Memorial Library, Lovingston VA
February 27, 2024

Participants

Dick Whitehead
Sara Senn (TJSWCD)
Robert Saunders
Yvette Stafford
Robert McSwain
Conny Roussos
Ernie Reed (Nelson Co BOS)
Nesha McRae (DEQ)
Sara Jordan (DEQ)

Meeting Summary

Nesha McRae (DEQ) welcomed participants to the meeting and everyone introduced themselves. She shared a handout showing possible best management practices that could be included in the watershed plan for Hat and Black Creek. These practices (BMPs) were identified based on their ability to remove both sediment and phosphorus from non point source runoff. The group was then asked to assist in prioritizing the practices on a scale of one to four: 1= High likelihood of implementation; 2 = Moderate likelihood of implementation; 3 = Low likelihood of implementation; 4 = Remove from consideration.

Agricultural Best Management Practices (BMPs): Prioritization

State and federal agricultural BMP cost share programs are administered by the Thomas Jefferson Soil and Water Conservation District (SWCD) and the Natural Resource Conservation Service (NRCS). Agricultural landowners can receive reimbursement for anywhere from 75% to over 100% of BMP implementation costs. The group reviewed a table showing practices available through these programs that help to reduce sediment and phosphorus in streams. Participants reviewed different fencing practice options and their associated cost effectiveness with respect to their ability to remove sediment and phosphorus from runoff. Nesha explained that the fencing practice that does not include off stream water is the most cost effective because installation of a well and waterers is very expensive; however, producers don't select this practice very often because they need to provide water for their livestock if they fence them out of the stream. A participant asked if limited stream access points or crossings are allowed with this practice. These are allowed and may bring up the cost. A representative from the SWCD noted that most of the buffers they see are either 35 or 65 feet in width. Participants noted that it would be hard to install many 100-foot buffers in these watersheds due to the narrow pastures and surrounding topography. Several participants shared that they used to have livestock on their property, but that it became difficult to manage and that the return on their investment just wasn't there anymore. Making hay requires a lot less time and effort. It is likely that other landowners in the area have converted to hay, or have chosen to lease their land to other producers who are using it to graze livestock. Fencing out properties with many small tributaries would be very difficult and would require many gates, making rotating livestock around the property very labor intensive. A participant noted that it would also be beneficial to fence out wet areas.

Participants looked at maps showing opportunities for livestock exclusion fencing and buffers in addition to buffers on hayland. Two participants made notes on the maps noting the location of their property and the fact that they no longer have livestock. Nesha asked the group for feedback on whether property owners would be willing to plant trees in their buffers, or if they would be more likely to leave the buffer in grass. One participant shared that he had opted to plant trees, but that only 30-40% of his plantings remained several years later. Nesha shared information about the James River Buffer Program, which provides landowners with assistance maintaining their buffers for several years after they are planted. Participants thought that offering this sort of assistance to landowners in the watersheds might increase the likelihood that trees would be planted in the buffers. Nesha explained that we could include this program in the plan and look for an opportunity to partner with the James River Association to target the watersheds for assistance.

The group moved on to discuss pasture management practices including rotational grazing and nutrient management planning. Nesha explained that nutrient management plans can be developed for farer by certified planners to help with manure and litter management and overall fertilizer application rates and timing. A participant noted that a lot of poultry litter is being trucked into the area from the Valley, and that those receiving the litter probably already have nutrient management plans. It would be a good idea to include the practice in the plan to reduce phosphorus in Black Creek and to ensure that existing plans are updated over time. Nesha noted that the afforestation of erodible pasture might be a good practice to include for steeper areas where farmers are no longer finding it profitable to graze livestock. Permanent vegetation on critical areas could be used to remediate historic damage to pastures dating back to Hurricane Camille. The group reviewed cropland BMPs for Hat Creek (there is no cropland in Black Creek), noting that there is barely any cropland in Hat Creek. It will be difficult to have much success in meeting implementation goals for cropland if they are set too high, since there is probably only one or two landowners to work with in the watershed.

Streambank Restoration Prioritization
The group moved on to discuss opportunities for streambank restoration in the watersheds. Everyone agreed that this would need to be a major component of the watershed plan. Nesha explained that this is an expensive practice that the SWCD does not have sufficient funding to support. It will be helpful if a few priority projects could be identified in the plan where a high level of erosion is occurring. If these projects could be identified and scoped in terms of the extent of bank work needed, it will be helpful in identifying grant funds to support projects going forward. The group identified a couple of priority areas, and discussed opportunities to collaborate with the Department of Energy on targeting practices based on their landslide mapping in the watersheds. Areas where unconsolidated materials have been deposited in flood plans as a result of landslides during/following Camille may be contributing a large amount of sediment and phosphorus to the streams as the channel carves its way through these unconsolidated materials. Mapping of debris flow paths could also be used to identify erodible pastures that could be stabilized and/or planted with trees. A participant asked what streambank restoration includes and why it is so expensive. Nesha explained that people must often work with an engineer to design these projects, which brings up the costs. Eroded banks are graded back to allow the stream to access its floodplain, then stabilized with vegetation. Sometimes work in the stream is conducted to help direct flows and create habitat. A participant shared a great experience that he had working with the Department of Wildlife Resources on a streambank restoration project on his property. He had recently cut down a tree on his property, and they were able to use the log to help redirect flow and prevent further bank erosion. A participant noted that a lot of streams were channelized after Camille, which did not help with bank erosion. These areas may also need to be prioritized for restoration.

The group ran out of time to review urban BMPs included in the handout. Nesha explained that the group will meet one more time to go over a BMP scenario that meets the sediment and phosphorus reduction goals and discuss education and outreach strategies, costs and a project timeline. Following that meeting, a larger final community meeting will be held to present the plan to the public. A larger push to get the word out about this meeting will occur. Nesha thanked participants for attending and the meeting was adjourned.

Hat and Black Creek Community Engagement Meeting #5

Nelson Memorial Library, Lovingston VA
September 9, 2024

Participants
Mike Yager (TJSWCD)
Reid Copeland (landowner)
Emily Hjulstom (Nelson Co.)
Courtney Harlow Humphries (TJSWCD)
Jim Saunders (landowner)
John Pfaffe (TJSWCD)

Tara Wyrick (DEQ)
Yvette Stafford (landowner)
Dick Whitehead (landowner)
Robert McSwain (Nelson County Service Authority)
Nesha McRae (DEQ)

Meeting Summary

Nesha McRae (DEQ) welcomed participants and began the meeting with a round of introductions. Nesha noted that it had been some time since the group last met and provided a brief recap of the last community engagement meeting in February. During the meeting, the group reviewed and prioritized agricultural best management practices (BMPs) that could be used to achieve sediment and phosphorus reduction goals for Hat and Black Creek. At our next meeting, we were planning to prioritize urban BMPs, review draft agricultural and urban BMP implementation scenarios along with projected costs and a timeline for implementation.

Nesha explained the basis for the original decision to shift from developing a Total Maximum Daily Load (TMDL) to an Advance Restoration Plan (ARP) at the beginning of the process. TMDLs and an ARPs have a number of things in common, including identification of target pollutants, an assessment of pollutant loads coming from different sources in the watershed, and estimation of the reductions needed from each source to restore the stream. However, there are some differences. TMDLs include development of wasteload allocations for permitted pollutant sources. These allocations are then integrated into VPDES permits after the TMDL is completed. ARPs do not include this additional regulatory aspect. Unlike a TMDL, an ARP also includes descriptions of actions to be taken to accomplish reduction goals along with a schedule and milestones. In the TMDL process, TMDL Implementation Plans are developed following completion of a TMDL study. These plans include implementation actions, milestones and other components also found in an ARP. ARPs are near-term plans that are based on a timeline of implementation that is more immediately beneficial or practicable to restoring impaired streams. If implementation of an ARP does not occur, or if it occurs at a rate that is significantly slower than planned, a stream may be re-prioritized for TMDL development.

We began with the traditional route of TMDL development for the Hat and Black Creek watersheds, then shifted to an ARP after determining the level of phosphorus reductions needed from the Nelson County Regional STP (Facility). Representatives from the Nelson County Service Authority expressed a willingness to explore different treatment options making an ARP a viable and expedient option. This collaborative approach would not require modification of the Facility's VPDES permit and could result in a significant near term reduction in phosphorus concentrations in Black Creek. Since sediment reductions needed in both Hat and Black Creek were relatively low, this approach appeared acceptable to address both of the pollutants in the near term. Nesha noted that DEQ staff visited the Facility this spring to provide feedback on treatment operations and discuss treatment options to accomplish phosphorus reductions. Nelson County Service Authority staff expressed concerns about costs associated with phosphorus removal upgrades at the Facility, particularly in light of significant upgrades that have recently occurred or are occurring at their other water and wastewater treatment facilities. DEQ staff explored a few options to help fund upgrades at the Facility including the DEQ Revolving Loan Fund.

In addition to the financial concerns expressed by the Service Authority, EPA staff expressed concerns about the likelihood of implementation of the ARP in the absence of any regulatory controls over discharge from the Facility during a call with DEQ staff. EPA reiterated that an ARP is intended to serve as a near term plan, and that if it was not successfully implemented following completion, a TMDL would still be required which would include a phosphorus wasteload allocation for the Facility. While near term is not explicitly defined, Nesha explained that the expectation would be for implementation to begin shortly after the plan was completed.

After consideration of feedback from EPA regarding their expectations of the timeline for implementation of an ARP, and after multiple discussions with the Nelson County Service Authority regarding their ability to make upgrades to the facility on Black Creek in the near term, it was determined that an ARP was not a reasonable option for the watersheds. Consequently, DEQ has decided to pivot back to TMDL development for both watersheds (Hat and Black Creek) and for both pollutants (sediment and phosphorus).

One participant asked what the timeline would be for the Facility to meet the reductions in the TMDL and when they would be incorporated into their permit. Nesha explained that this typically occurs with the next reissuance of the permit. TMDLs do not include a timeline for accomplishing reductions. DEQ Water Permitting staff will work with permittees to determine the best path forward for accomplishing the reductions along with the timeline for implementation. One participant asked if an acceptable mitigation strategy would be to divert the discharge from the Facility to Tye River. Nesha responded that it would no longer be considered a source of phosphorus and sediment if this occurred but was not sure how cost effective this would be in comparison to additional treatment of phosphorus. The group discussed the fact that the geology of the surrounding area may be contributing to the phosphorus load coming from the Facility. There are a number of homes on private wells in the service area, where Nelsonite is prevalent. This rock is high in phosphorus and may be elevating concentrations in well water. The group discussed options to specifically address this portion of the service area but generally felt it was most efficient to treat everything at the Facility. It was noted that any treatment option will likely be expensive. Nesha responded that staff from DEQ's Clean Water Financing Program had been in touch with the Nelson County Service Authority regarding grant opportunities that could be used to support this effort.

Nesha reviewed the path forward to complete the project for the watersheds. She explained that the TMDL study was close to complete and that this would be done soon. There will be one more meeting during which participants will review BMP implementation scenarios along with associated costs and a timeline for implementation. After this meeting, Nesha will draft a separate implementation plan. Nesha explained that all of the work that has been done for this project is still relevant and applicable, but that pivoting back to a TMDL will take a little more time. Once both reports are done, a final public meeting will be held to present the material to the public.

The group moved on to review updated sediment and phosphorus reduction scenarios. Nesha explained that an error had been made in calculating sediment loads from pasture land in both watersheds, which resulted in the need for a great level of reduction in both watersheds. As a result, the pasture reduction in Black Creek was increased to 34%, while reductions needed from all sources in

Hat Creek were slightly increased. After calculating cost effectiveness of BMPs to address phosphorus in Black Creek, Nesha determined that it was far more cost effective to focus on the greatest sources of phosphorus in the watersheds rather than applying an equal reduction to all sources. By increasing the reduction needed for the greatest sources of phosphorus in the watershed by 3%, Nesha was able to reduce the reductions needed from smaller sources from 50% down to 8%. This equates to savings of hundreds of thousands of dollars. One participant noted that they thought the sediment load coming from streambank erosion in Hat Creek was far greater, noting that this load should be greater than the load coming from pasture and hayland. Significant straightening of the stream channel occurred throughout the watershed as the Army Corp of Engineers attempted to correct damage from Hurricane Camille. As a result, the stream is trying to meander back through the floodplain, cutting into unconsolidated materials as it goes and causing erosion. Participants asked how many miles of stream there are in the Hat Creek watershed. Nesha offered to circle back with participants on the final total number. One participant asked about beaver ponds given how well they seem to trap sediment. This is not something that government agencies have programs to assist with. The group discussed the value of identifying areas experiencing the greatest degree of erosion. Nesha suggested including plans for a stream walk in the implementation plan to identify high priority projects. These are usually more successful if they are conducted by a local group rather than a government agency due to private property rights issues. The group discussed how costly streambank restoration work is. This is not something that Soil and Water Conservation Districts had adequate funding the pay for. While they have plenty of funding for traditional agricultural BMPs, streambank restoration would be a good practice to pursue supplemental grant funding to support. Nesha noted that this is usually something property owners are excited to have completed on their property and that they key will be finding good project sites.

A participant asked about the best ways to encourage BMP implementation. Nesha responded that it can be helpful to highlight projects that have been completed successfully by local landowners who are known and trusted. If people can see these projects working well, it helps with their interest and willingness to consider them. The group reviewed the phosphorus reduction table for Black Creek and asked about the urban land cover categories, specifically developed impervious. Nesha explained that this is paved or hardened surfaces like roadways, parking lots, driveways and rooftops. Participants questions the extent of this land use sown for Hat Creek. Nesha calculated that it comprises around 1% of the total watershed area, which seems about right. Participants asked how phosphorus and sediment would be treated from this load, how would multiple roof tops be treated? Nesha explained that with rooftops, one rain garden or other stormwater BMP would be installed to treat water from the downspout for each home. One participant questioned how effective this would be, noting that the distance of some of these homes from the stream probably allows for filtration of a lot of runoff before it reaches the stream. The participant asked whether load calculations consider how close a piece of property is to the stream. Nesha explained that the model breaks the project area up into smaller subwatersheds, but that it is not that spatially explicit in terms of identifying proximity of each acre of land to the stream. The participant commented that the pasture loads were probably too high as a result and that stream bank erosion likely made up a greater proportion of the total sediment load in the watersheds.

A participant asked how sediment and phosphorus loads are determined (are they measured). Nesha explained that the loads are estimated based on watershed characteristics and land cover types. However, DEQ also measures phosphorus concentrations in the stream to ensure that estimates are accurate. Quite a bit of information goes into development of load estimates including slope, elevation, soil type, land cover, weather data and more.

A participant returned to the discussion about the role that streambank erosion is playing in impairment of the two streams. Nesha asked if participants would like to increase the reduction for streambank restoration and decrease for pasture or developed pervious areas. Participants liked this idea. Nesha noted that she could reduce developed pervious, gravel and turfgrass sediment reductions by 1% and increase the streambank erosion reduction by 6% in the TMDL. Participants liked this change. The group discussed the updated phosphorus reductions for Black Creek. Nesha recommended not increasing reductions for agricultural land beyond 53% since it will begin to get very challenging to accomplish these goals as a result. Nesha noted that groundwater is one of the greatest sources of phosphorus in the watershed, but not a source for which reductions can be prescribed. This makes it challenging to address the other sources.

Nesha explained next steps for the project, noting that the TMDL will be finished first, and then the implementation plan. Nesha explained that the implementation plan will be a voluntary plan that landowners will not be forced to implement. We rely on incentives to encourage landowners to participate in BMP implementation programs. Nesha explained that once the implementation plan is complete, conservation organizations like Soil and Water Conservation Districts can apply for funds to implement different portions of the plan. They could focus on streambank restoration in a proposal and then do additional outreach and education to encourage adoption of other practices such as rotational grazing. A participant suggested that if we want good attendance, the final public meeting should be held in the evening. It's always nice when food can be offered as well. Nesha noted that she hopes to be ready for the next meeting in late October/early November and that the final public meeting will be in early December or late January to avoid the holidays. Nesha thanks participants for attending and the meeting was adjourned.

Hat and Black Creek Community Engagement Meeting #6

Nelson Memorial Library, Lovingston

December 3, 2024

Participants

Robert McSwain (NCSA)
Bill Perry (DOF)
Robert Saunders
Conny Roussos
Dick Whitehead
Ernie Reed (NCSA/NCBOS)
John Pfaltz (TJSWCD)

Mike Yager (TJSWCD)
Reid Copeland
Courtney Harlow Humphries (TJSWCD)
Nesha McRae (DEQ)
Tara Wyrick (DEQ)

Summary

Nesha McRae (DEQ) reviewed the meeting agenda and noted that the goal for the meeting is to select an implementation scenario for best management practices to meet sediment and phosphorus reduction goals identified in the TMDL study. The group will also develop an overall project timeline and discuss education and outreach strategies.

A participant asked whether they would still be able to comment on the TMDL study. Nesha explained that the study would be presented at the final public meeting along with the implementation plan, and that this meeting would be followed by a 30-day public comment period.

A participant asked how success will be measured . Nesha explained that monitoring of benthic macroinvertebrates would be the ultimate measure of success since this is what resulted in the impairment listing of the streams. The group discussed the threshold for impairment listing and Nesha noted that Hat Creek is considered a borderline impairment, bouncing around the impairment threshold.

Agricultural BMPs

The group reviewed a table showing potential agricultural BMPs that could be implemented to accomplish sediment and phosphorus goals for agricultural sources. Nesha explained that the table shows both the extent of each BMP needed and the % of the associated land use that would be treated. Nesha encouraged participants to share thoughts on BMPs that should be increased or decreased considering likelihood of implementation, costs and balances between different land uses. Some practices were included just to be sure that funding could be used in the future in case of grant awards (WP2W). A participant asked whether DEQ follows state cost-share guidelines (difference between SL-6 and WP2W). Nesha responded that DEQ utilizes the same guidelines and specifications as the VACS program. A participant asked about the units shown for livestock exclusion fencing. Nesha explained that the feet shown reflect feet of fence needed (a 100-foot section of stream needing fencing on both sides would be shown as 200 ft). Nesha added that the % of land use treated for fencing reflects unfenced streams in pastures rather than total feet of stream within each watershed. Nesha reviewed the different fencing practices and different buffer widths. She also noted that there is a fencing practice that only provides funding for fence and does not include support for developing off stream water sources. This practice is typically not very popular and was included in the plan as a placeholder in case there is any interest. Nesha explained that in watersheds where streams frequently flood, buffers need to be wider to avoid washing out of the fence. In watersheds with narrow pastures and smaller farmers, producers may want more narrow buffers because they can't afford to lose the land. A participant noted that the SWCD has had a lot of success pairing state ag cost share funds with federal cost share funds to get 100% cost share for farmers. He asked whether the same could be done with DEQ grant funds and VACS funds. Nesha was not sure and offered to follow up on that. One landowner said that when he installed fencing on his property, he was able to extend buffers back 100 feet on some portions of the stream, but not everywhere on his property due to steep slopes and taking too much land out of pasture. Nesha described the improved pasture management practice (rotational grazing, including waterers) noting that it will be tough to get a goal of 68% of Black Creek pasture. This practice was included at such a large extent to avoid including too much conversion of pasture to other land uses including forest. While planting something in trees results in the greatest sediment and phosphorus reductions, the goal of the plan is not to limit agricultural production in the watersheds or change the overall character.

The group reviewed BMPs for cropland in Hat Creek (none in Black Creek). While the extent included is very small, these practices were included in case landowners were interested in implementing these practices.

There are not many options for BMPs on hayland. Most of the agricultural land next to the streams is used as pasture, so there aren't many opportunities for buffers. A participant asked how much sediment hayland really contributes to the stream. The groups discussed manure and fertilizer applications to hayland along with how runoff can occur when hay is harvested.

DEQ has not delt with BMPs for vineyards much in the past. Grass filter strips can be used between rows of vines to treat runoff. The permanent vegetative cover practice can be used for targeting critical areas of erosion to cover and keep in place. The group discussed the use of cover crops between trellises. There was not a lot of knowledge base in the room on this, but participants seemed unsure about practical application of this practice. A participant asked if the 71 acres of vineyards in the Hat Creek watershed include orchards. Yes – grouped vineyard and orchards together. Nesha will look at other options since the group seemed worried about whether cover crops would make sense for these areas. A participant asked what the sediment reduction efficiency of cover crops on vineyards was. Nesha was unsure and offered to follow up on that (its 10%, not very much). The group agreed it could be left in the plan but in a reduced amount.

Urban/developed BMPs

Nesha explained that while there is not a lot of urban/residential land in the watersheds, there are a lot of nutrients are coming from urban land uses. Nesha review the urban BMPs with the group. Most of the BMPs included in the table are practices designed to capture and increase filtration of stormwater/sheet flow of stormwater. They are expensive! Wetlands/wet ponds can treat a larger drainage area. The group discussed potential locations for wet ponds and asked for examples implemented in other areas. Nesha mentioned a wetland project completed in the City of Waynesboro that had been well received by the local community. There are not many good locations in Black Creek to install something like this since there aren't many subdivisions with any sort of regional stormwater drainage system. There may be one or two opportunities though, so it would be best to leave this practice in the plan. All of the turfgrass practices are in Soil and Water Conservation District's VCAP program, which can be used as a resource by homeowners to help pay for these practices. TJSWCD representatives suggested that if we want to align this with VCAP, we should increase the extent of conservation landscaping, and also add rain gardens. The VCAP program also provides financial assistance for stormwater conveyances (swales) and wetlands, but they are expensive and therefore rarely implemented. Impervious surface removal and permeable pavement could be added to the list as well, these are in the VCAP program. Nesha noted that she had left these practices out due to the cost and maintenance needs, but that she could put a small amount in so that they are an option of property owners are interested. Rainwater harvesting and impervious surface removal would also be good to include as options.

A participant noted an error in the urban BMPs table in the % land use treated columns for Hat and Black Creek. Nesha responded that she would correct the error and send out an updated copy of the handout to the group.

The group discussed BMPs for gravel roads, which is also something that DEQ has little experience with in the TMDL program. Nesha noted that she did some research and found that Penn State has a dirt and gravel roads institute that conducts research on gravel road BMPs and sediment reductions. Nesha described gradebreak installation and drainage outlet BMPs, which were included in a Penn State study. Nesha also reached out to the Department of Forestry and received some great information on BMPs for forest roads. A participant asked about the units for these practices. Nesha explained that the units reflect the number of each practice. The sediment reduction was based on an average road width of 24 feet. Nesha could not recall the length of road used to determine treatment area in the Penn State study (follow up: a length of 50 ft was used).

A participant asked whether funding would only be available for the extent of each BMP included in the plan, or if more funding would be available for practices if goals were surpassed. Nesha explained that the plan is intended to serve as a guide, but that if we found there was more interest than originally anticipated for a practice, funds can usually be shifted around to support further implementation.

A participant asked whether the gravel road BMPs are intended for VDOT roads or for private driveways. Nesha explained that the land cover data used to develop the TMDL did not likely catch all the private gravel driveways and that most of the gravel roads included in the study are probably larger roads maintained by VDOT. However, that does not mean that we could not work with private landowners on these projects and try to reach out to VDOT regarding potential projects. A participant asked how best to address compacted dirt roads. Gravel could be added to these roads to reduce erosion and runoff, but this is very expensive.

A participant asked how DEQ differentiated between hayland and pasture in the study. Nesha explained that the Non-Point Source Assessment breaks down hay and pasture land for different hydrologic units across the state, and that this ratio can be applied to the project area falling within each watershed. The participant commented that the goals for pasture seem very high and that we are putting a lot of weight on reductions for this land use. It could be that we have more hay or turfgrass in the watersheds than we realize. Nesha responded that the goals for pasture are higher because there's not that much that can be done for hay besides planting trees. A participant commented that they don't really work with BMPs for hayland often in the state agricultural cost share program. If we find that we have less pasture and more hay and turfgrass in the watershed once we begin implementing the plan, resources can be shifted. The plan is intended to be a starting point but is not set in stone.

Streambank stabilization

The extent of streambank stabilization needed in both watersheds is relatively high. We agreed on 6% for Hat Creek previously, and phosphorus reductions needed in Black Creek are driving up the extent of streambank stabilization we need in the watershed. Nesha noted that the % of streambank to be stabilized it based on the amount of eroding streambank, not the total amount of streambank in the watersheds. Nesha estimated the percent of eroding bank (30% for both watersheds) based on the streambanks scores collected at DEQ biological monitoring stations in the watersheds. DEQ has 3 stations on Black Creek and just one on Hat Creek. While a stream walk would give us a much better idea of what all the streambanks look like in the watersheds, this is the best data that we have to make this estimate. The costs are high to do even this amount. A participant asked whether there are cost-share programs available for this practice. Nesha responded that there is a streambank stabilization practice in the VACS program, but it is insufficient. A participant noted that it is very hard to meet the criteria for this practice, including the requirement that erosion must be caused by runoff from surrounding fields (not the stream itself). A participant asked whether rocks are used to stabilize eroding banks. Nesha explained some of the natural channel design methods used including laying back the streambanks and stabilizing them with vegetation. In stream structures may also be used but they can get expensive. A landowner offered that VDOT has done this and paid for it to compensate for small stream impacts in another part of the county/area. There are two projects on the Rockfish River that are interesting to look at. The Division of Wildlife Resources has a staff member trained in natural channel design. We have found that working with them on projects can really help bring down the cost. A participant commented that WSSI did a stream restoration project in Lynchburg with rocks armoring the bank and planting lots of shrub trees on the opposite bank. We could do a tour of existing sites as part of an education and outreach effort. A participant commented that this is a very large goal for this practice given the cost.

BMP Costs
The group reviewed estimated BMP costs. A participant asked why there was such a large difference in the cost of one 35 ft buffer fencing practice compared to another. Nesha explained that the second practice does not include development of off stream water sources. It was noted that the urban BMP costs are almost 2x as much as agricultural BMP costs but are treating far less land. Hat Creek has more wriggle room in terms of the extent of BMP implementation that is needed to address the impairment. Nesha noted that compared to other implementation plans she has been involved with in the area, these costs are reasonable. In addition, the TMDL and the plan are conservative and include a margin of safety and an allocation for future growth. It is likely that conditions could improve faster than expected.

Project timeline
The group discussed an appropriate timeline for implementation. Participants agreed that the goals are ambitious. Nesha explained that after the group agrees to an overall timeline, she will develop two implementation phases with milestones to evaluate progress. She noted that most plans have a 10–15-year timeline, but that it's up to the group to determine what they think is appropriate. DEQ doesn't set rules or requirements for when this must be done. A participant asked about commercial and other developed areas in the Black Creek watershed. Participants reviewed acres of impervious and pervious developed areas in Black Creek and studied a map of the project area. It as noted that a small area marked as hay/pasture on the map is actually cropland. Another area classified as hayland may be turfgrass. Nesha offered to look back at the TMDL to see if these things could be adjusted, but that it is late in the process to make these changes. The group returned to discussing the project timeline. One participant suggested that the timeline not be too long and put 10 years out for consideration. Another participant noted that DEQ grants are usually 3 years long and suggested a longer timeline. A participant asked how monitoring would work following completion of the plan. Nesha explained that DEQ would return to monitoring sites in the watersheds two years after implementation had begun to allow for

BMPs to take effect. At this point we would resume spring and fall biological monitoring for 1-2 years depending on results. The group discussed how long it can take for BMPs to reach full efficiency, particularly those that involve trees. A participant asked if improvements accelerate after the first few years of implementation. Nesha said that she was unsure and that results were probably pretty site specific.

Participants agreed on a timeline of 12 years.

Education and Outreach
The group discussed traditional outreach strategies including Cooperative Extension field days and farm tours. Nesha noted that she had a lot of success working with the Nelson County Farm Bureau to promote meetings. A participant noted that the Nelson Knows Facebook page was a good way to share information. TJSWCD could help DEQ with posting meeting announcements and other information. A participant commented that more people read the Facebook page than the local newspaper, but it is a rotating event posting so information isn't available for long. A participant commented that DEQ needs to update their contact information for the Nelson County Times newspaper (new contact – Emma left). Nesha commented that for the first public meeting, we had great luck with a postcard mailing to large riparian landowners. A participant suggested reaching out to smaller landowners as well, since many smaller parcels are often managed by a group of owners as a whole. Nesha responded that she would try, but did need to be aware of postage costs. Nesha asked for input on where to hold the final public meeting. The Nelson Center has a large auditorium, and Cooperative Extension has an office in there. They typically charge for use of the facility, but you can always ask for a waiver. The Rockfish Valley Community Center and the Massies Mill Ruritan Hall were also identified as good meeting locations.

A participant noted that the outreach strategies listed on the meeting handout are nothing new and that there's not a lot of new farmers. Local farmers have already heard all this information before. He noted that the lofty goals for residential and urban areas will be hard to meet, and that it will be very difficult to reach out to all the smaller landowners in the watersheds. Another participant commented that maybe additional funding would be helpful in overcoming these challenges. Being able to offer 100% cost share could be a HUGE selling point along with being able to provide the funds upfront so that the landowner does not have to handle the costs until the project is complete (DEQ has ag loans, TJSWCD has contractor-direct pay).

Nesha thanked participants for attending and the meeting was adjourned.