

Water Quality Improvement Plan

Little Calfpasture River



A plan to reduce sediment in the water

Technical Document

June 1, 2018

Prepared by

VA Department of Environmental Quality

In Cooperation with

Local Stakeholders

Virginia Tech Biological Systems Engineering

ACKNOWLEDGEMENTS

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

Rockbridge County
Goshen Volunteer Fire Department
Rockbridge Baths Volunteer Fire Department
Natural Bridge Soil and Water Conservation District
Headwaters Soil and Water Conservation District
USDA Natural Resources Conservation Service
Rockbridge Area Conservation Council
National Capital Area Council – Boy Scouts of America
VA Cooperative Extension

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1. INTRODUCTION

1.1 Background

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

When streams fail to meet standards, Section 303(d) of the CWA and the U.S. Environmental Protection Agency's (EPA) Water Quality Management and Planning Regulation both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a waterbody. The TMDL sets limits on the amount of pollution that a stream can tolerate and still maintain water quality standards. In order to develop a TMDL, background concentrations, point source loadings, and nonpoint 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 waterbody. 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". A TMDL Implementation Plan (TMDL IP) describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in order 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 Use General Standard (9 VAC 25-260-20)

The water quality standard supported through biological monitoring is Virginia’s narrative General Standard (9 VAC 25-260-20, also known as the Aquatic Life Use standard) which states in part:

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 ... 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 biological monitoring program in Virginia used to evaluate compliance with the above standard is run by the Virginia Department of Environmental Quality (VADEQ). Evaluations of monitoring data from this program focus on the benthic (bottom-dwelling) macro (large enough to see) invertebrates (insects, mollusks, crustaceans, and annelid worms) and are used to determine whether or not a stream segment has a benthic

impairment. Changes in water quality generally result in alterations to the quantity and diversity of the benthic organisms that live in streams and other water bodies. In addition to being the major intermediate constituent of the aquatic food chain, benthic macroinvertebrates are "living recorders" of past and present water quality conditions. This is due to their relative immobility and their variable resistance to the diverse contaminants that are introduced into streams. The community structure of these organisms provides the basis for the biological evaluation of water quality.

Although this TMDL was developed for sediment, 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 this TMDL 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 approvable TMDL IP or are merely a recommended topic that should be covered in a thorough TMDL IP. This chapter has three sections that discuss a) the requirements outlined by the WQMIRA that must be met in order to produce an IP that is approvable by the Commonwealth, b) the EPA recommended elements of IPs, and c) the required components of an IP in accordance with Section 319 guidance.

2.1 State Requirements

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia), or WQMIRA. WQMIRA directs the SWCB to "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 of an approvable IP 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 time line for implementing these measures,
- legal or regulatory controls,
- the time required to attain water quality standards, and
- a monitoring plan and milestones for attaining water quality standards.

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

2.3 Requirements for Section 319 Fund Eligibility

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

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

3. REVIEW OF TMDL DEVELOPMENT

3.1 Background

The following summary of the Little Calfpasture TMDL was excerpted from the final report submitted to the Virginia Department of Environmental Quality (VADEQ) in January 2010 entitled “Total Maximum Daily Load Development to Address a Benthic Impairment in the Little Calfpasture River, Rockbridge County, Virginia” as prepared by Dr. Robert Brent with James Madison University.

The Little Calfpasture River was first assessed as impaired and listed on the 303(d) list in 1996. The impaired segment is a 0.83 mile reach from the Goshen Dam to the confluence with the Calfpasture River (shown in red on **Error! Reference source not found.**). This reach fails to meet the general standard for aquatic life based on biomonitoring of the benthic macroinvertebrate community. This section of the Little Calfpasture River (Assessment Unit ID: VAV-I32R_LCF01A00) has remained on the 303(d) list with an aquatic life impairment from 1996 through the most current 2008 305(b)/303(d) Integrated Report at the time of the TMDL (VADEQ, 2008).

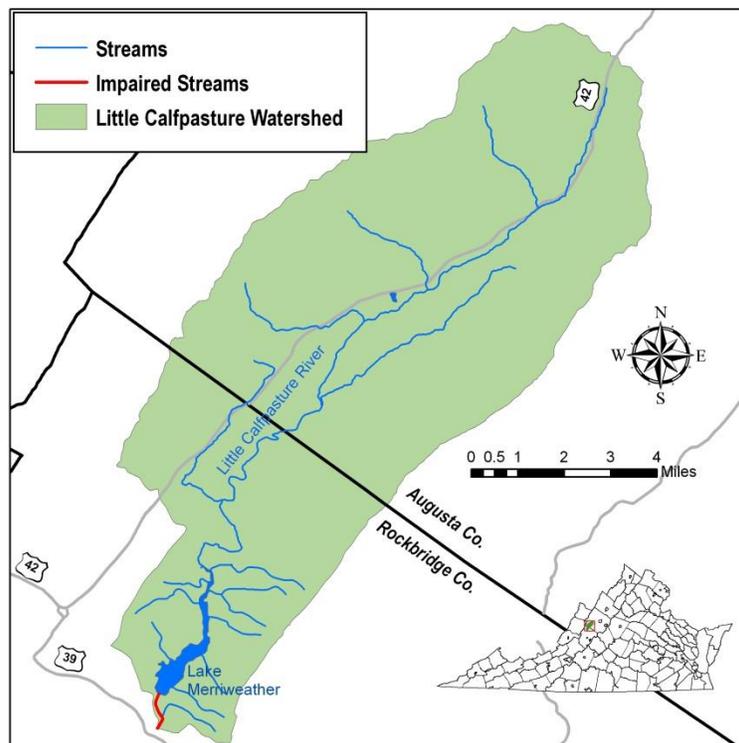


Figure 3-1. Location of Little Calfpasture River Impaired Segment and Watershed

The Little Calfpasture River (Watershed ID VAV-I32R; state hydrologic units JU69 and JU70) is located in Augusta and Rockbridge Counties, Virginia. The Little Calfpasture River drains a land area of 53,395 acres (83 mi²). The Little Calfpasture River flows south and joins with the Calfpasture River near Goshen, Virginia to form the Maury River. The Maury River flows into the James River, which empties into the Chesapeake Bay.

Approximately 0.8 miles upstream from the confluence of the Little Calfpasture River with the Maury River is the Goshen Dam, which impounds the Little Calfpasture River and forms Lake Merriweather. Lake Merriweather is a 444-acre lake with a full pool at 1369 ft in elevation. The lake and dam are part of a 4,000-acre camp (Goshen Scout Camps) owned and operated by the National Capital Area Council of the Boy Scouts of America (NCAC-BSA). Their membership comes from 23 districts from northern Virginia, Maryland, Washington D.C. and the U.S. Virgin Islands. The Goshen Dam was constructed in 1966 to form Lake Merriweather and provide a recreational benefit to the NCAC-BSA. While not constructed for flood control, the dam currently provides some flood control benefits. The operation of the dam has previously been identified as causing fish kills and biological impairment in the Little Calfpasture River and was the subject of a Virginia Department of Environmental Quality (VADEQ) enforcement action and special order.

The Little Calfpasture River watershed (designated VAV-I32R) is located in the Ridge and Valley Level III Ecoregion (Woods et al., 1999). The Ridge and Valley Level III Ecoregion is characterized by its generation from sedimentary rocks, including sandstone, shale, limestone, and dolomite. This ecoregion consists of alternating forested ridges and agricultural valleys that are elongated and folded and faulted. The land use in the watershed is primarily forest (86%), with 12% in pasture and hay (Figure 3-2). The majority of the pasture and hay lands are within the narrow stream valleys in close proximity to the stream.

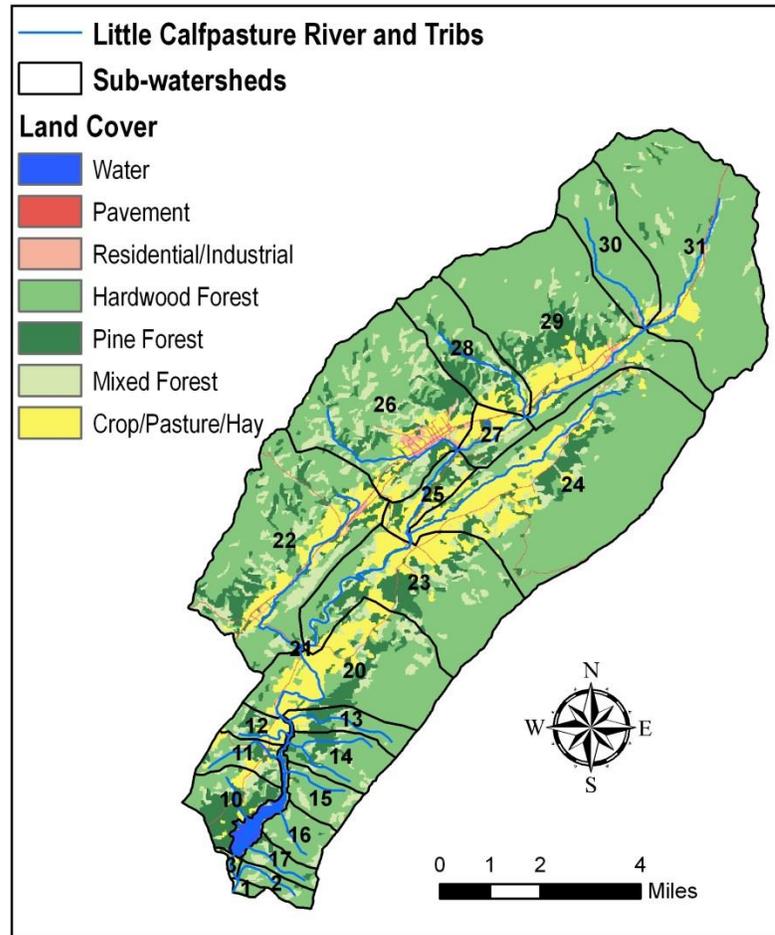


Figure 3-2. Land Use in the Little Calfpasture River Watershed

3.2 Benthic Stressor Analysis

TMDLs must be developed for a specific pollutant. Since a benthic impairment is based on a biological inventory, rather than on a physical or chemical water quality parameter, the pollutant is not identified in the assessment, as it is with physical and chemical parameters. The process outlined in EPA's Stressor Identification Guidance Document (USEPA, 2000) was used to identify the critical stressor for the Little Calfpasture River watershed. Watershed and water quality data from these river, permit data, local data, and field observations were used to help identify candidate causes. Based on the weight of evidence supporting each potential candidate, stressors were then separated into the following categories: non-stressors, possible stressors, and most probable stressors.

The stressor identification analysis used existing benthic, habitat, water chemistry, and historical data to document and support the existence of multiple stressors in the Little Calfpasture River. The most probable stressors in this system are a change in available

food supply, excess sediment, and low dissolved oxygen. The low dissolved oxygen issue has already been addressed by raising the level of the opening on the water intake riser by three feet in July 2009, so that the opening is now six feet below full pool.

3.2.1 Most Probable Stressors

Multiple lines of evidence suggest that sediment is the most probable stressor of the benthic community within the impaired reach. The first line of evidence is historical documentation that includes Notices of Violation, Consent Orders, and numerous investigations and complaints. All of this documentation points to the periodic release of large amounts of sediment from Lake Merriweather. VADEQ enforcement files include pictures and descriptions of intense sediment loads coming through the dam and continuing downstream into the Maury River. Enforcement files have documented the periodic release of sediment during lake drawdown, and more sustained sediment releases during time periods when the lake was below full pool and exposed shorelines were eroded by storm events. The Consent Orders were intended to address these problems by requiring the NCAC-BSA to develop protocols for dam operation that keep the lake at full pool (except under anticipated flood conditions) and eliminate the use of subsurface discharges for drawing down the lake. However, compliance with these Consent Orders was not consistent, and there is still the periodic need to lower lake levels during flood events and for maintenance. The Orders were terminated by VADEQ in October 2014.

In addition to historic documentation, habitat assessments indicate that sediment is a probable stressor downstream of the lake. Habitat scores for embeddedness were significantly lower just below the dam than at the upstream station. Further downstream, embeddedness scores were still lower, but the difference was not statistically significant.

Observations recorded by VADEQ biologists at the time of biological assessments also support sediment as a most probable stressor. Biologists recorded that “moderately turbid water” was being discharged from the lake (Bolgiano, 1996). In 1996, the regional biologist concluded that “the chronic discharge of sediment (punctuated by episodes of even heavier loadings of fines during resuspension by storms) is maintaining a reach of stream that is inhospitable to normal benthic assemblages” (Bolgiano, 1996). In 1999, the regional biologist again concurred that “sediment embeddedness is the most likely cause

of impairment in the Little Calfpasture and Maury Rivers” (VanWart, 1999). At this time, it was also observed that there was delineation in the Maury River between clean substrate above the confluence with the Little Calfpasture River and embedded substrate below the Little Calfpasture River.

Water quality sampling above and below the lake also confirms that sediment is a probable stressor. TSS and turbidity levels were consistently higher downstream of the lake in the impaired reach than in the upstream unimpaired reach. Excluding the conditions during Hurricane Jeanne, these increases in TSS and turbidity downstream of the dam were statistically significant. A VADGIF turbidity study of the Little Calfpasture River in 1998 also confirmed that turbidity levels below the lake were significantly higher than above the lake. This study also showed the direct correlation of increased turbidity with lake lowering.

More recent turbidity levels monitored above and below the lake were analyzed in relation to storm events and dam operations to investigate causes for the increased downstream turbidity. Figure 3-3 shows the difference in turbidity measurements taken on the same days above and below the dam. This difference represents the turbidity at station 2-LCF000.02 minus the turbidity at station 2-LCF007.00, so positive values indicate higher turbidity downstream of the dam. This figure plots the difference in turbidity against the number of days since the last storm event. Different symbols also distinguish between whether gates were near (within 2 feet of) full pool during the week preceding the turbidity measurement or whether gates were in a lower position (more than 2 feet below full pool) during that time period.

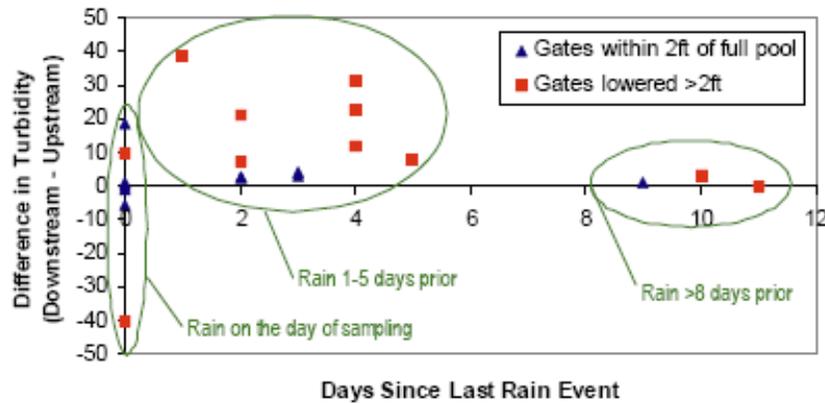


Figure 3-3. Analysis of Turbidity Levels Upstream and Downstream of Lake Merriweather in Relation to Storm Events and Dam Operations

This figure presents three distinct regions. The first is when storm events occurred on the day of turbidity sampling. Under these conditions, turbidity above and below the lake was highly variable. Turbidity below the lake was higher on three occasions and turbidity above the lake was higher on three occasions. This variability might be expected due to the timing of sampling in relation to the timing, location, and intensity of rainfall. Because turbidity naturally increases in streams during storm events, it is not surprising that the three highest measured turbidities above the lake were measured during storm events. It should also be noted that the only three times when turbidity was higher above the lake was on days when storm events occurred.

The second distinct region apparent in Figure 3-3 is when rainfall occurred from one to five days prior to the turbidity measurement. In all of these situations (11 sampling events), turbidity was higher below the lake. The degree of increased turbidity below the lake, however, was directly tied to the operation of the dam. When the dam gates were more than 2 ft below full pool, turbidity below the lake was much higher. Under these conditions, turbidity below the lake averaged 20 NTUs higher than turbidity above the lake. When the dam was at full pool, however, turbidity was only slightly greater below the lake, averaging only 3.1 NTUs higher. This indicates that in the days following a storm event (1-5 days) turbidity below the lake is consistently higher than above the lake. When the dam is operated at full pool, this increase is small, but when the dam gates are set in a lower position, the increase in turbidity below the lake is large.

The last distinct region in Figure 3-3 is during dry conditions when rainfall has not occurred in at least the preceding 9 days. Under these conditions, turbidity is only slightly

higher below the lake than above it. The difference in turbidity levels also did not appear to be greatly influenced by the position of the dam gates. Even when dam gates were lowered, turbidity levels below the lake were only slightly higher than above the lake. Taken in total, this analysis highlights several implications regarding the functioning of the Goshen Dam. First, when it is not raining, turbidity is consistently higher below the lake. This finding is probably typical for shallow lakes. Sediment is retained in the lake during storm events and released more slowly over the following days as the lake clears.

Phytoplankton production within the lake also adds to the increased turbidity downstream, regardless of storm events. Secondly, the lowering of dam gates greatly increases the downstream turbidity following storm events. When dam gates are lowered, barren shoreline and previously settled sediment are exposed. Storm events erode this material, washing it into the lake. The more shallow depths and increased velocities due to the lowered lake levels also increase turbulence and mixing within the lake. This keeps sediment suspended in the water column and increases sediment in the overflow. For 1 to 5 days (and possibly up to 8 days) following a storm event, turbidity below the lake is greatly increased when dam gates are lowered. Increases of as much as 38.8 NTUs over lake influent levels were measured in the days following storm events. At more than 8 days following storm events, conditions appeared to clear and turbidity in lake outflow was only slightly higher than inflow.

These observations in conjunction with modeling results produce the following picture of sediment impairment in the Little Calfpasture River below the Goshen Dam. Sediment washed off of the land surface or eroded from the stream banks is transported into the lake during storm events. These high flow events also increase velocities through the lake, which can resuspend additional sediment that was previously deposited in the lake.

Erosion of the lake shoreline can also contribute to sediment within the lake if lake levels are lowered prior to the storm event. All of these sources combine to increase suspended sediment concentrations in the lake following storm events. Some of the suspended sediment within the lake is re-deposited within the lake, but much (76% on average) is discharge from the lake through the spillway to the Little Calfpasture River below the dam. This discharge of sediment can persist for days to weeks following storm events.

Since this discharge occurs as flows are receding from the event and velocities are decreasing, some of this sediment is deposited on the streambed below the dam. This excess sediment smothers certain bugs that live in the bottom of the stream and limits the diversity of aquatic life.

3.3 Source Assessment of Sediment

Sediment sources in the Little Calfpasture River watershed include both direct point sources, such as discharges from permitted facilities, and nonpoint sources, such as runoff from the land surface. Information on point sources and permitted nonpoint source discharges was obtained from VADEQ and the Virginia Department of Conservation and Recreation (VADCR).

Within the Little Calfpasture River watershed, there are a total of eight permitted point source discharges. There are four dischargers that currently hold individual Virginia Pollutant Discharge Elimination System (VPDES) permits, three Single Family Home (SFH) Domestic Sewage general permits, and one Industrial Stormwater general permit. Table 3-2 lists the permitted point sources in the Little Calfpasture River watershed along with TSS wasteload allocations (WLA) for those permitted discharges.

Table 3-1. Permitted Point Sources in the Little Calfpasture River Watershed

Facility	Permit #	Permitted Flow (MGD)	Permitted TSS Conc. (mg/L) ^a	Annual Wasteload Allocation (WLA) (tonnes/yr)	Daily Wasteload Allocation (WLA) (tonnes/d)
Augusta Springs WTP	VA0090395	0.072	30/60	2.99	0.0164
Casta Line Trout Farm	VA0091227			2.13 ^b	0.00584
Craigsville STP	VA0091821	0.435	30/45	18.1	0.0741
Craigsville WTP	VA009247	0.012	30/60	0.497	0.00273
Blue ridge Lumber Co.	VAR050879		100	4.66 ^c	0.0861 ^c
3 Single Family Home General Permits	Various	0.003	30	0.125	0.000341
			Total	28.4	0.185

^a When two numbers are given, the first is the average monthly limit, and the second is the maximum or average weekly limit.

^b Wasteload allocation from the Wallace Mill Stream TMDL. This wasteload allocation was 2,814 lbs/yr organic solids. The allocation was converted to total suspended solids using a 60% organic solids content. Conversion to T/yr equals 2.13 T/yr. No additional reductions (beyond those required in the Wallace Mill Stream TMDL) are required from this facility to meet water quality standards in the Little Calfpasture River.

^c Wasteload allocation was determined from modeling 12.8 acres of impervious area.

Nonpoint sources of sediment in the watershed include runoff from residential areas, cropland, pasture, forest, and impervious areas. Erosion of the stream bank is another source of sediment in the watershed. Because stream bank erosion is difficult to estimate and model, an additional land use category was used by the Chesapeake Bay Program to

represent areas of active bank erosion. This land use category was termed “degraded riparian pasture”, and represents areas with no riparian vegetation and where cattle have access to the stream. These areas are locations of high bank erosion rates, because cattle hooves trample and dislodge bank sediments and because the bank soil is not stabilized by riparian vegetation. These areas were identified from aerial imagery, and designated as a 100 meter band along either side of a visually eroding stream bank with limited vegetation and cattle access.

Sediment loads from the nonpoint sources were modeled using the LSPC watershed model. Based on the calibrated model, edge-of-stream sediment loads were calculated for the various sources in all sub-watersheds. Below Lake Merriweather, nearly all of the sediment (99%) comes from flow over the Goshen Dam. This is not surprising considering that the land area below the dam represents only 1% of the Little Calfpasture River watershed, while 99% of the watershed drains to Lake Merriweather.

Above Lake Merriweather, sediment contributions are primarily from degraded riparian pasture, pasture/hay, and forest land uses, as shown in Figure 3-4. Degraded riparian pasture accounts for the largest source of sediment above Lake Merriweather. While degraded riparian pasture accounts for only 2% of the watershed area, it accounts for approximately half of the sediment load. This is due to the very high unit area sediment load from this land use and its close proximity to the stream. The unit area sediment loads from degraded riparian pasture are nearly 4 times higher than any other land use in the watershed (Figure 3-5). In contrast, forest represents 86% of the watershed area, but only 12% of the sediment load, due to very low unit area sediment contributions (0.01 T/yr/acre). Pasture was the second highest contributor to sediment loads, representing 27% of the load. Impervious areas accounted for 4% of the sediment load, while cropland accounted for 3% and residential areas accounted for 2%. All point sources combined accounted for less than 0.01% of the sediment load.

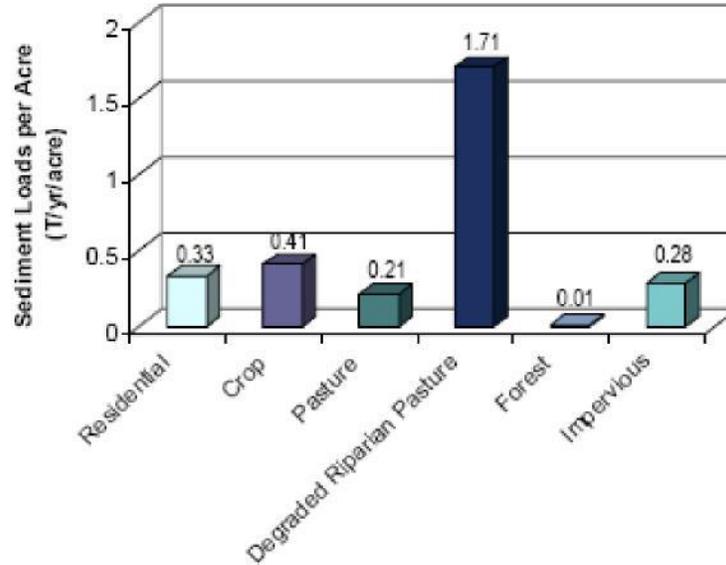


Figure 3-4. Sediment Loads per Acre from Sources Above Lake Merriweather

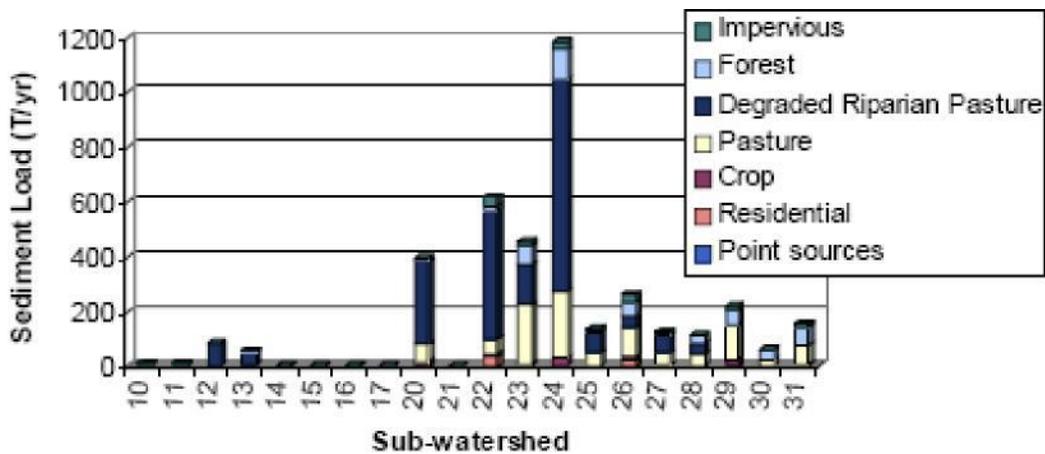


Figure 3-5. Sediment Loads in Little Calfpasture River Sub-watersheds Above Lake Merriweather

Sediment loadings were also calculated for each sub-watershed. The largest sediment loading was from sub-watershed 24, which covers the Estaline Valley and is drained by Smith Creek. Sediment loads from this watershed averaged 1184 T/yr, which is more than 10 times the load of most sub-watersheds and nearly twice as high as the next highest sub-watershed. This is not surprising since sub-watershed 24 contains the most acres of pasture and degraded riparian pasture of any sub-watershed. The second highest sediment load is from sub-watershed 22, which contains the most impervious area of any sub-watershed and the second most degraded riparian pasture and pasture acres. Sub-watersheds 20 and 23 were the next highest contributors of sediment loads. These top 4

sub-watersheds in sediment contribution are also some of the largest sub-watersheds, so loads are expected to be higher than in smaller sub-watersheds.

Figure 3-6 shows sub-watershed sediment contributions on a unit area basis (i.e., sediment load per acre). On this basis, an area on the north end of Lake Merriweather, an area just north of Craigsville, and Estaline Valley have the highest unit area sediment loads.

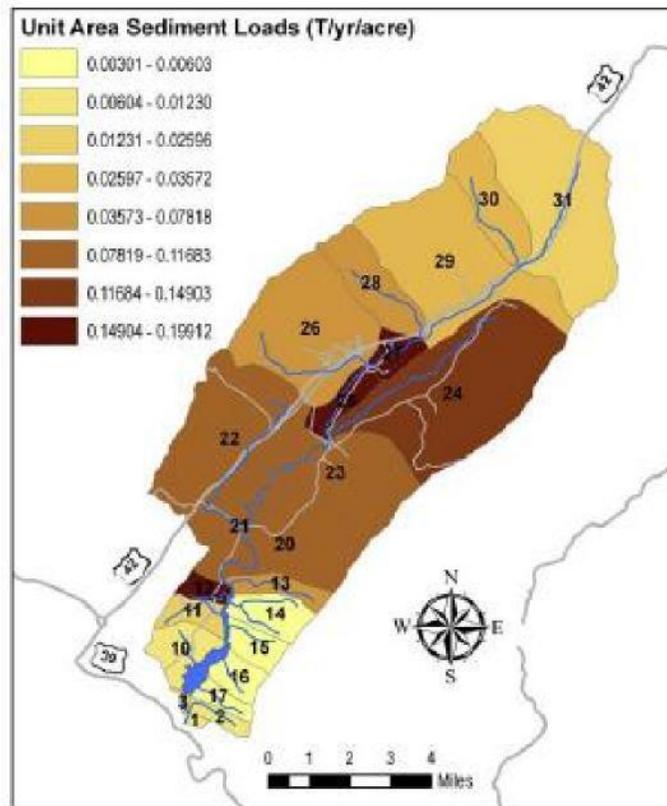


Figure 3-6. Unit Area Sediment Loads Among Little Calfpasture River Sub-watersheds

3.4 The Little Calfpasture River TMDL

The objective of a TMDL is to allocate allowable loads among different pollutant sources so that appropriate actions can be taken to achieve water quality standards (USEPA, 1991).

The Little Calfpasture River TMDL was developed to consider further growth and future conditions in the watershed. For the Little Calfpasture River TMDL, a projection of future conditions in the year 2020 was used. The future condition scenarios assume that the consent order that was open at the time of TMDL development with the NCAC-BSA

will be followed. This consent order called for the lake to remain at full pool except in the event of emergency flooding conditions. All future condition and TMDL scenarios were modeled assuming that the lake will be at this full pool elevation.

3.4.1 TMDL Endpoint

To determine the TMDL endpoint for the Little Calfpasture River, VADEQ evaluated benthic monitoring results in conjunction with sediment modeling. Near the mouth of the Little Calfpasture River, DEQ monitoring showed that the aquatic life standard was met on the impaired stream segment with a VA Stream Condition Index score of 61 (60 or greater is considered unimpaired) in the fall of 2001. This means that sediment loading conditions immediately preceding this time period were conducive to supporting a healthy benthic community. Based on these findings, the 2001 sediment yield (1198 tonnes/yr) minus a 5% margin of safety was used as the TMDL endpoint. Sediment reductions were set to produce simulated average annual loads of less than 1138 tonnes (the annual load in 2001 minus a 5% margin of safety).

In addition, sediment reductions were set to reduce the frequency of elevated TSS concentrations (>3 mg/L) to background levels simulated above Lake Merriweather, where benthic conditions are consistently unimpaired. To remedy the TSS exposure duration issue, an additional TMDL endpoint was implemented. Sediment reductions were set to produce simulated TSS concentrations that exceed 3 mg/L no more than 22% of the time.

3.4.2 Allocation Scenarios

Loading Simulation Program C++ (LSPC) and the Environmental Fluid Dynamics Computer Code (EFDC) model simulations for 2000 to 2006 were used to develop TMDL allocations. This period represents a range of environmental conditions, including dry and wet years. A variety of allocation scenarios were evaluated against the TMDL criteria. As described above, a successful TMDL allocation was one with an average annual sediment load of less than 1138 tonnes/yr and a frequency of elevated TSS concentrations (>3 mg/L) no more than 22%. Table 3-3 shows various allocation scenarios representing different combinations of sediment load reductions from the various sources. These scenarios represent a combination of sediment source reductions

and lake sediment management options. Sediment source reductions decrease the amount of sediment entering the Little Calfpasture River and/or Lake Merriweather through best management practices that limit erosion from the land surface. Lake sediment management options decrease the amount of sediment leaving Lake Merriweather without impacting sediment sources. The combination of sediment source reductions and improved lake management strategies can be used to restore aquatic life and meet water quality standards in the Little Calfpasture River.

Table 3-2. Sediment Allocation Scenarios for the Little Calfpasture River

Scenario ¹	Residential Sediment Runoff Reduction	Cropland Sediment Runoff Reduction	Pasture Sediment Runoff Reduction	Degraded Riparian Pasture Sediment Runoff Reduction	Forest Sediment Runoff Reduction	Urban Sediment Runoff Reduction	Point Sources	Lake Mgmt. Equivalent to Increased Depth (ft)	TMDL Criterion: Avg. Annual Sed. Load (tonnes/yr)	TMDL Criterion: Frequency of TSS Conc. >3mg/L (%of time)
Existing condition	0%	0%	0%	0%	0%	0%	0%	0	2595	36%
Future Condition	0%	0%	0%	0%	0%	0%	0%	0	2369	38%
3	50%	50%	50%	50%	0%	50%	0%	0	1371	21%
4	75%	75%	75%	75%	0%	75%	0%	0	866	16%
5	65%	65%	65%	65%	0%	65%	0%	0	1067	18%
6	61%	61%	61%	61%	0%	61%	0%	0	1123	19%
7	50%	50%	50%	72%	0%	50%	0%	0	1117	18%
8	0%	0%	0%	0%	0%	0%	0%	1	2229	30%
9	0%	0%	0%	0%	0%	0%	0%	2	2099	30%
10	0%	0%	0%	0%	0%	0%	0%	4	1864	30%
11	0%	0%	0%	0%	0%	0%	0%	6	1649	29%
12	47%	47%	47%	47%	0%	47%	0%	4	1106	22%
13	40%	40%	40%	66%	0%	40%	0%	2	1136	20%

¹Scenarios highlighted in yellow represent reasonable reduction levels that meet the TMDL criteria. Scenario 13 was selected as the TMDL scenario. Scenarios 6, 7, and 12 represent other reasonable alternatives that could be implemented to achieve the TMDL.

Scenario 13 was selected as the preferred TMDL allocation scenario and includes a 2 ft increase in overall lake depth, 66% reduction from degraded riparian pasture, and 40% reduction from residential, pasture, cropland, and urban land uses. Scenario 13 was selected as the TMDL allocation scenario, because it provides the most equity between lake sediment management options and source reductions. Scenarios 6, 7, and 12 provide other reasonable alternatives that meet the TMDL targets and could be selected during TMDL implementation planning if supported by the planning team.

In the TMDL allocation scenario (Scenario 13), lake sediment management was modeled by increasing the depth of the lake by 2 ft. The TMDL does not necessarily prescribe this lake sediment management practice. Other lake sediment management practices would be acceptable if they were able to achieve equivalent reductions in sediment output. To

quantify the reductions from the modeled 2-ft increased depth, sediment loads into and out of the lake were calculated under Scenario 13. Under this scenario, sediment loads through the lake were reduced by 34%. Therefore, any lake sediment management options that reduce sediment by 34% would be acceptable for meeting the TMDL scenario.

Overall, sediment loads in the Little Calfpasture River are reduced by 56% under the TMDL scenario (Table 3-4). The resulting average annual sediment load under the TMDL scenario is 1136 tonnes/yr, which meets the TMDL criteria of 1138 tonnes/yr (2001 sediment load with a 5% margin of safety).

Table 3-3. Annual Sediment Loads at the Mouth of the Little Calfpasture River Under Existing Conditions and TMDL Scenario

Year	Existing Conditions (tonnes/yr)	TMDL Scenario (tonnes/yr)	% Reduction
2000	2141	815	62%
2001	1198	466	61%
2002	658	247	62%
2003	4887	2640	46%
2004	4668	2336	50%
2005	2349	738	69%
2006	2268	708	69%
Total	18168	7951	56%
Average	2595	1136	56%

3.4.3 TMDL

The TMDL consisted of a permitted waste load allocation (WLA), a nonpoint source load allocation (LA), and a margin of safety (MOS), using the following equation:

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

where,

- WLA = wasteload allocation (point source contributions);
- LA = load allocation (nonpoint source contributions); and
- MOS = margin of safety.

The wasteload allocation (or WLA) portion of the TMDL includes sediment (in the form of TSS) contributions from 8 VPDES permits in the Little Calfpasture River watershed. Wasteload allocations were calculated based on permitted design flows and TSS concentrations. No reductions in sediment loadings from permitted point sources are called for in the TMDL. A margin of safety (or MOS) of 5% was used in the Little Calfpasture River TMDL.

The load allocation (LA) portion of the Little Calfpasture River TMDL represents the contributions from all nonpoint sources. The LA was calculated as the TMDL minus the sum of MOS and WLA. The TMDL load, components, and aggregated WLAs are shown for the Little Calfpasture River sediment TMDL in Table 3-5.

Table 3-4. Little Calfpasture River Sediment TMDL (tonnes/yr)

WLA (tonnes/yr)	LA (tonnes/yr)	MOS (tonnes/yr)	TMDL (tonnes/yr)
30.4	1,107.6	60	1,198

In order to comply with current USEPA guidance (USEPA, 2007), the Little Calfpasture River sediment TMDL was also expressed as a daily load by evaluating the variability and distribution of simulated loads (Table 3-6).

Table 3-5. Little Calfpasture River Sediment TMDL as a Daily Load (tonnes/day)

WLA (tonnes/d)	LA (tonnes/d)	MOS (tonnes/d)	TMDL (tonnes/d)
0.191	11	0.59	11.8

Although this TMDL was developed for sediment, attainment of a healthy benthic community will ultimately be based on biological monitoring of the benthic macro-invertebrate community, in accordance with established DEQ protocols. If a future review should find that the reductions called for in this TMDL 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.

4. IMPLEMENTATION PLAN DEVELOPMENT

The Consent Orders in place during the time of TMDL development were terminated by VADEQ in 2014. Thus, it is unlikely that Lake Merriweather will be maintained at full pool while under management by the National Capital Area Council for the foreseeable future. Consequently, implementation scenarios were developed based upon a limited drawdown schedule for the lake and additional stabilization of the exposed mudflats. In addition, watershed reconnaissance during implementation planning indicated that the degraded riparian pasture land use acres were largely overestimated during TMDL development. It is likely that a large portion of this sediment load may actually be attributed to the exposed mudflats during lake drawdown events. Consequently, it is expected that the sediment load reductions resulting from the reduced lake drawdown schedule and additional lake management BMPs included in the plan will meet TMDL goals developed with the assumption that the lake would be maintained at full pool.

The implementation plan was based on simulated results for future conditions. Sediment load reductions to be achieved with the plan were based on an overall reduction of 56%. The 34% reduction assigned to lake management was achieved through modification to the lake drawdown schedule and stabilization or removal of parts of the exposed mudflats, in lieu of increasing the overall depth of the lake by 2 feet. In addition, stakeholder input resulted in the inclusion of reductions from forest harvesting practices in the plan. Larger percent reductions were taken from the degraded riparian pasture areas, because of their relatively lower cost, and because the smaller amounts of land in row crop, residential and urban land uses were limited in the practices which might be applicable in this watershed.

These assumptions will be validated by continuous monitoring during BMP implementation, and an adaptive management strategy will be employed should additional measures be necessary to meet TMDL goals.

5. COMMUNITY PARTICIPATION

Collecting input from the public on conservation and outreach strategies to include in the TMDL 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.

5.1 Public Meetings

A public meeting was held on the evening of August 2, 2016 at the Goshen Volunteer Fire Department to kick off the development of the implementation plan. This meeting served as an opportunity for local residents to learn more about the problems facing the Little Calfpasture River and work together to come up with new ideas to protect and restore water quality in their community. This meeting was publicized through notices to local media outlets, email announcements, invitations mailed to riparian landowners, and flyers posted throughout the watersheds. The meeting included a presentation by VADEQ staff on current water quality issues in the watersheds and development of the implementation plan. Approximately 60 people attended the meeting.

A final public meeting will be held on May 18, 2017 at the Goshen Volunteer Fire Department to present the completed draft plan to the public and collect local input.

Two working groups (agricultural and lake management) were formed in order to discuss implementation and outreach strategies suitable for agricultural land in the watershed along with management strategies for Lake Merriweather and the Goshen Dam. Each working group was made up of stakeholders who were familiar with land use management issues specific to their particular working group focus area. The agricultural working group met twice during the development of this plan, while the lake management working group had three meetings.

5.2 Agricultural Working Group

The role of the Agricultural Working Group was to review conservation practices and outreach strategies from an agricultural perspective. During the first agricultural working group meeting, which was held at the Goshen Volunteer Fire Department on September 27, 2016, the group discussed the status of farming in the region and characteristics of

typical farms in the watershed. It was noted that the farming population in the watershed is aging and that few young farmers are returning to family farms. The older population is less interested in trying new things on their farms including livestock exclusion fencing. The group also discussed illegal dumping of trash above Lake Merriweather and how it was part of the reason that the NCAC-BSA have to draw the lake down each fall (to clean out large debris).

A large amount of livestock exclusion fencing is needed at the Augusta Correctional Center property. The group discussed the fact that the Correctional Center has over 200 livestock, all of which have unrestricted access to Smith Creek, a tributary of the Little Calfpasture River. DEQ staff suggested that they could work with Virginia Cooperative Extension (VCE) to approach the prison about installing livestock exclusion fencing. It was noted that VCE recently held a fencing field day where they looked at the use of poly flex fencing to keep cattle out of the stream. This fencing costs around \$0.18/ft and has a life span of 10-20 years. Something like this could be paired with the portable solar powered watering system the VCE staff has been working with up in Augusta County as a less expensive, less management intensive option to keep cows out of the stream. Obstacles to livestock exclusion were also discussed. The group discussed the best ways to reach out to farmers. One on one communication and mailings were identified as the two more effective means of getting the word out about water quality issues and BMP implementation. Participants were then asked to complete a survey regarding different BMPs to include in the plan along with obstacles to livestock stream exclusion.

A second meeting was held at the Rockbridge Baths Fire Hall on November 1, 2016, during which the working group reviewed the survey results and BMP implementation scenarios. Livestock exclusion from streams, streamside buffers and streambank stabilization were ranked as the three most important practices in the surveys. It was noted that there are only three properties with cropland in the watershed, and that there is some tillage and some fields that could use cover crops on these properties. One is an organic farm, making no till a challenge. Another is the prison property, which one participant estimated has about 60 acres of cropland that they are tilling. This could be a good opportunity to work with them on cover crops and no till practices.

The group discussed a timeline for implementation efforts. A ten year timeline was suggested and participants were in agreement.

5.3 Lake Management Working Group

The primary role of the Lake Management Working Group was to discuss management strategies to reduce sediment coming out of Lake Merriweather through the Goshen Dam. The group discussed the lengthy history of regulatory actions pertaining to the dam dating back to the early 90's. It was explained that while DEQ previously had a consent order and associated amendment in place that included specific requirements regarding daily operation of the dam, these orders were terminated in September of 2014.

Gene Yagow (Virginia Tech) described how sediment concentrations typically change in the river when the lake is drawn down versus when it is maintained at full pool (turbidity in the river is typically higher when the lake is lowered). Gene noted recent changes in land use in the watershed including some land disturbance and possibly logging below the dam. In addition, the NCAC-BSA received a grant to complete a dredging project from the Army Corps of Engineers in 2015. It was later clarified that the funding for this project was provided through a 1996 special project allotment of Water Resources Development Act Funding. Mike Jolly (Superintendent for NCAC-BSA at the Goshen Scout Reservation) noted that there was quite a bit of debris in the material removed during dredging. The group moved on to discuss current management of the lake and the schedule for drawing it down in the fall. Typically the lake is lowered from a depth of 26 feet to 17 feet beginning in September. The purpose of the draw down is to clean debris out of the lake. They must leave the lake lowered long enough for the mud flats to dry out so that equipment can be brought out to help clear material. They typically wait until January when the ground is frozen to complete the cleanup. The lake is then brought up to 24 feet in April and returned to full pool by Memorial Day. It was also noted that much of the sediment in the lake is deposited on the left side of the bend at the top (on the western side of the upper end of the lake), which can be seen from aerial imagery. The group moved on to discuss potential management strategies to be included in the plan. Gene shared a series of options including additional mudflat excavation, altering the drawdown schedule for the lake, establishing vegetation on the mudflats, and addressing the debris that is washing in to the lake from upstream.

One participant suggested looking in to ways to catch some of the debris that is washing in to the lake at the top, which would allow for a shorter draw down time and lower draw down level for future cleanouts. Mike explained that the lake receives a lot of debris during flash floods including large round hay bales. Mike noted that the Scouts had talked with the ACOE about diverting and filtering water immediately downstream of their footbridge at the top of the lake some time ago. Ultimately, plans for such a project did not move forward though. The group thought that it would be helpful to prioritize a series of mudflat excavation projects for the lake, targeting areas contributing the greatest amount of sediment to the lake when it is lowered. A participant asked whether there was room for negotiation on the draw down process for the lake (keeping the water level higher and leaving the lake below full pool for a shorter period of time). Phil Barbash (NCAC-BSA) responded that they were willing to consider adjusting this process to help reduce sediment coming out of the lake. The group discussed the issues with disposal of large items such as sofas, refrigerators and tires in Rockbridge and Augusta Counties, both of which are struggling with illegal dumping.

A second Lake Management Working Group Meeting was held on October 25, 2016. Updates were provided since that meeting regarding a potential cleanup effort. DEQ staff contacted Rockbridge and Augusta County staff regarding illegal dumping in the watershed. DEQ staff has also contacted VMI to see about a potential project for the cadets with respect to assistance with cleanup efforts.

Gene Yagow (Virginia Tech) shared a map highlighting four potential areas around the lake for mudflat excavation and discussed prioritization of those sites. Options for revegetating projects were also discussed. Gene shared mudflat excavation cost estimates (per cy of sediment removed) based on the costs of the ACOE funded dredging project that took place at the lake in fall of 2015. Gene also presented a series of alternative drawdown scenarios for the lake. Gene shared a map of the watershed just below the dam with aerial imagery showing a disturbed area where soil erosion appeared to be occurring. Gene explained that this area was the site of the emergency spillway project recently completed for the dam, and that it could benefit from some vegetative controls to prevent further erosion. Gene noted that the upstream diversion project that the Boy Scout had considered previously would be another option to include in the plan. Another participant

added that options for filtering out debris before it gets into the lake should also be explored. The costs and associated engineering to design something to keep large material out of the lake should be considered since this would allow the Boy Scouts to adjust their drawdown schedule when they go in each winter to remove debris. Mike Jolly noted that the four areas Gene identified for mudflat excavation would be very easy to get to with basic equipment. The primary challenge/expense would be appropriate disposal of the material. Gene suggested exploring marketing options for the material since it would be very good soil. One participant suggested looking at the Rockbridge County 100 year flood database to identify any locations on the Boy Scout property where the material could be disposed of..

A third lake management working group meeting was held on March 29, 2017 at the Goshen Scout Camp. The group reviewed lake management implementation scenarios and associated costs, and agreed upon a time line for implementation. Gene Yagow (VA Tech) presented the implementation scenarios. A table showing a series of different drawdown scenarios for the lake was shared with the group, varying the length and depth of the drawdown. Gene noted that the emergency spillway below the dam is a new source of sediment in the watershed, which is evident on aerial imagery showing the formation of rills. This site needs to be stabilized to avoid further erosion. Gene shared a table with the group showing the costs of implementing various practices.

The group discussed the drawdown scenarios presented, and the Council suggested picking a wet weather scenario (drawdown time of 3 months, reduction in drawdown depth of 6.68 feet) and a dry weather scenario (drawdown time of 4 months, reduction in drawdown depth of 4.96 feet). The group was in support of this approach. In order to complete much of the mudflat excavation, the lake will need to be lowered about seven feet. It was agreed that Stage 1 of the TMDL IP could focus on harvesting sediment from Area I on the map Gene shared, which is at the uppermost portion of the lake. One participant asked about the types of plants that could be used for vegetative stabilization. NRCS staff suggested trying to establish a cover crop of rye each year, broadcasting seeds by boat. If the lake is lowered 6 inches a day, the seed could be spread at the point in time when it would be submerged for a day or so. This could be tested prior to attempting it at the lake scale. It was noted that there is significant value to the material

excavated from the mudflats, which should be considered when estimating the cost. It was noted that there is a local excavator with a farm near the lake who might be interested in doing the excavating and could also use some of the material on his farm.

The group discussed a time line for the two stages. One participant suggested adopting a 10 year time line with three stages (2 years, 4 years and 10 years). The first two years would be spent exploring the feasibility of the various strategies and how effective they will be. This could include a series of pilot projects to test such as excavation of the uppermost mudflat and establishment of a cover crop on a portion of this area. The group agreed on this timeline and approach. It was also suggested that it would be worthwhile to complete additional sediment monitoring beyond the confluence of the Little Calfpasture River with the Maury River. This might inform us as to the impact of the sediment further downstream and the overall health of the river. A local university like Washington and Lee could serve as a partner in such an effort.

5.4 Steering Committee

The Steering Committee met on April 11, 2017 at the Rockbridge Baths Fire Hall to discuss plans for the final public meeting and to review the draft public implementation plan report prior to the final public meeting on May 18, 2017. The committee was made up of representatives from the three working groups that had met throughout the TMDL IP development process. This ensured that the suggestions and concerns of the working groups were adequately addressed in the draft TMDL IP document. The group provided comments on the draft plan and helped to develop a final agenda for the meeting.

6. IMPLEMENTATION ACTIONS

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

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

6.1 Management Actions Selected through Stakeholder Review

Various BMP scenarios were developed and presented to the working groups, who reviewed both economic costs and the water quality benefits. The majority of agricultural best management practices (BMPs) in this plan are included in state and federal agricultural cost share programs that promote conservation. In addition, DEQ worked with VCE staff to develop a management plan for the Augusta Correctional Center due to the fact that a large amount of stream fencing is needed at the site and the nature of the property poses unique restrictions with respect to BMP implementation. DEQ also worked closely with the NCAC-BSA to identify a suite of management strategies to be implemented at the Goshen Scout Camp. Since the NCAC-BSA is the sole property owner and operator of Lake Merriweather and the Goshen Dam, it was critical that the management strategies included in this plan were reviewed and supported by the Council. The final set of practices identified and the efficiencies used in this study are listed in Table 6-1. It should be noted that an adaptive management strategy will be utilized in the implementation of this plan. BMPs that are easiest to implement, provide the greatest water quality benefits, and offer the greatest economic return to landowners will be implemented first. The effectiveness of these practices will be continually evaluated, and adjustments to actions will be made as appropriate. Watershed modeling provides us with estimates of sediment loads coming from different sources in the watershed and

associated sediment reductions from BMPs. However, it is recognized that the presence of the Goshen Dam and its impact on the Little Calfpasture River present us with an extraordinarily complex ecological system to evaluate. The timing of releases from the dam, the nature of the materials released, and hydrologic processes occurring within the lake itself all present challenges and uncertainty when it comes to estimating the sediment load coming out of the dam and the impact that different management strategies will have on it. Therefore, downstream monitoring of both the benthic community and sediment must be continually evaluated to ensure that the appropriate management practices are being implemented.

Table 6-1. Best management practices and associated sediment reductions

Source	BMP Description	Sediment Reduction Efficiency	Reference
Degraded riparian pasture	Livestock exclusion from waterway	100%	1
Degraded riparian pasture	Streambank stabilization	44.88 lbs/lin.ft.	2
Pasture	Reforestation	Land use (LU) change	3
Pasture	Streamside buffer (35-100 feet)	LU Change + 52.69%	2, 3
Pasture	Rotational grazing	30%	2
Pasture	Reforestation of highly erodible pasture/cropland	LU change	3
Cropland	Small grain cover crops	20%	2
Cropland	Continuous no-till	64%	2
Forest	Forest Harvesting BMPs	60%	2
Lake Management	Vegetative planting of exposed mudflats	LU change	3
Lake Management	Reduced depth of drawdown	LU change	3
Lake Management	Reduced period of drawdown	LU change	3
Lake Management	Mudflat excavation	LU change	3
Emergency spillway	Stabilize emergency spillway and disposal area	LU change	3

References

1. Removal efficiency is defined by the practice
2. Chesapeake Assessment Scenario Tool (EPA CBP) - BMP effectiveness values by land use, HGMR, and pollutant.
3. Based on differential loading rates to different land uses.

6.2 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 working groups. 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 sub-watersheds. Data from the VADCR Agricultural BMP Database and the Natural Bridge and Headwaters SWCDs showing where best management practices were already in place in the watersheds were considered when developing these estimates. Estimates of the amount of streamside fencing and number of full livestock exclusion systems were made through these analyses. The quantities of additional control measures were determined through spreadsheet modeling of alternative scenarios and applying the related pollutant reduction efficiencies to their associated sediment loads.

Implicit in the TMDL is the need to avoid increased delivery of pollutants from sources that have not been identified as needing a reduction, and from sources that may develop over time. One source that was identified since completion of the TMDL was the construction of a new emergency spillway and a related soil disposal area that are both showing signs of severe rilling and erosion. One potential for additional sources of the pollutants identified is future residential development. Care should be taken to monitor development and its impacts on water quality.

6.2.1 Interim Installed BMPs

The VADCR Agricultural BMP Database was queried to identify sediment-related BMPs already in place in the watershed. Load reductions were quantified for these BMPs and area changes were accounted for where BMPs included a land use change. Table 6-2 summarizes the BMPs identified from the database.

Table 6-2. Interim BMPs installed since completion of the TMDL, as tracked through the VADCR Agricultural BMP database: January 2008 – January 2017. NOTE: Table does not include data from systems that were not installed through government cost share programs. CRP and EQIP data was also not available.

Practice	Extent installed	Extent Units	No. of practices
Stream exclusion with grazing land management (SL-6)	29,014	lin. ft.	4
Livestock exclusion with reduced setback (LE-2)	2,000	lin. ft.	1
Reforestation of erodible crop and pastureland (FR-1)	20	acres	1
CREP Grazing land protection (CRSL-6)	21,300	lin. ft.	2
CREP riparian forest buffer planting (CRFR-3)	75.6	acres	4
CREP riparian 100' wide and wider buffer (CP-22B)	12	acres	1

6.2.2 Agricultural Control Measures

Livestock Exclusion BMPs

The TMDL reduction scenario shown previously in Table 3-3 includes recommendations of a 66% reduction in sediment from degraded riparian pasture and a 40% reduction in sediment from pasture in the Little Calfpasture River watershed. Consequently, this plan includes recommendations for livestock exclusion practices implemented in conjunction with improved pasture management. To estimate fencing needs, the perennial stream network was overlaid with land use using GIS mapping software (ArcView v.10.1). 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 2011 VBMP Orthophotography and the 2011 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, any interim fencing installed was subtracted from the length of potential fencing in the watershed. It was estimated that livestock exclusion practices need to be applied to 80% of the potential streamside fencing to meet the TMDL goal. An assessment of the stream fencing needs in Stage 1 is shown in Table 6-3.

Table 6-3. Stream fencing needs summary

Sub-watershed	Total potential fencing (ft)	Fencing needed to meet goal (ft) 80%	Interim Fencing Installed (ft)	Fencing still needed to meet goal (miles)
12	7675	6,140	0	6,140
13	13,728	10,982	13,300	0
14	847	678	0	678
20	21,410	17,128	0	17,128
22	27,667	22,134	0	22,134
23	10,221	8,177	0	8,177
24	49,751	39,801	14,430	25,371
25	8,327	6,662	3,623	3,039
26	2,186	1,749	0	1,749
27	22,053	17,642	11,698	5,944
28	979	783	364	419
29	8,228	6,582	0	6,582
30	1,836	1,469	0	1,469
31	14,016	11,213	13,600	0
TOTALS	188,924	151,139	57,015	98,829

It is expected that the majority of livestock exclusion fencing will be accomplished through the VA Agricultural BMP Cost Share Program and federal NRCS cost-share programs. Some applicable cost-shared BMPs for livestock exclusion in the programs are the SL-6 (Stream Exclusion with Grazing Land Management Practice), the LE-1T (Livestock Exclusion with Riparian Buffers for TMDL Implementation), the LE-2T (Livestock Exclusion with Reduced Setback for TMDL Implementation), the WP-2T (Stream Protection for TMDL Implementation) and CREP (the Conservation Reserve Enhancement Program). In order 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 VADCR 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 Agricultural Working Group, NRCS and the Natural Bridge and Headwaters SWCDs 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 6-4).

Table 6-4. Estimate of full streamside exclusion fencing systems needed by sub-watershed

Sub-watershed	SL-6/LE-1T fencing (Lin. feet)	SL-6/LE-1T fencing (Systems)	WP-2T fencing (Lin. feet)	WP-2T fencing (Systems)	CREP fencing (Lin. feet)	CREP fencing (Systems)	LE-2T fencing (Lin. feet)	LE-2T fencing (Systems)
12	2,149	0.35	614	0.10	1,228	0.20	2,149	0.35
13	0	0	0	0	0	0	0	0
14	237.16	0.35	67.76	0.1	135.52	0.2	237.16	0.35
20	5,995	2.1	1,713	0.6	3,426	1.2	5,995	2.1
22	7,747	4.55	2,213	1.3	4,427	2.6	7,747	4.55
23	2,862	1.05	817.68	0.3	1,635	0.6	2,862	1.05
24	8,880	2.1	2,537	0.6	5,074	1.2	8,880	2.1
25	1063.51	0.7	303.86	0.2	607.72	0.4	1063.51	0.7
26	612.08	0.7	174.88	0.2	349.76	0.4	612.08	0.7
27	2,081	0.7	594.44	0.2	1188.88	0.4	2,081	0.7
28	146.72	0.35	41.92	0.1	83.84	0.2	146.72	0.35
29	2,304	1.4	658.24	0.4	1316.48	0.8	2,304	1.4
30	514.08	0.35	146.88	0.1	293.76	0.2	514.08	0.35
31	0	0	0	0	0	0	0	0
TOTALS	34,590	15	9,883	4	19,766	8	34,590	15

The Stream Exclusion with Grazing Land Management Practice (SL-6) offers 75% cost share for off stream watering, establishment of a rotational grazing system, stream crossings, and stream exclusion fencing with a 35 foot setback (required). The LE-1T (Livestock Exclusion with Riparian Buffers for TMDL Implementation) is very similar to the SL-6 except that 85% cost share is provided and applicants may not receive funding to install hardened winter feeding pads. It was estimated that approximately 35% of fencing in the watershed would be installed using these practices.

The Livestock Exclusion with Reduced Setback Practice (LE-2T) only requires a 10 foot setback for stream fencing. Cost share is provided for stream fencing and cross fencing, stream crossings, and off stream waterers at a rate of 50%. It was estimated the 35% of livestock exclusion would be accomplished through the LE-2T practice.

The WP-2T system includes streamside fencing, hardened crossings, and a 35-ft buffer from the stream. This practice includes an up-front cost share payment of 50 cents per linear foot of fence installed to assist in covering anticipated fencing maintenance costs. In cases where a watering system already exists, a WP-2T system is a more appropriate

choice. Despite the additional payment for maintenance costs, this practice is seldom used because it does not provide cost share for the installation of a well. Consequently, it was estimated that only 10% of fencing in the watersheds would be accomplished using the WP-2T 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, USDA-NRCS's CREP is an excellent option. This practice provides cost share and incentive payments ranging from 50% to 115% for fencing and planting materials. It is estimated that 20% of fencing in the watersheds will be installed through CREP.

Land Based Agricultural BMPs

In order to meet the sediment reductions outlined in the TMDL, best management practices to treat land-based sources of the pollutants must also be included in implementation efforts. Tables 6-5 and 6-6 provide a summary of pasture and cropland BMPs by subwatershed needed to achieve water quality goals.

Table 6-5. Pasture BMPs needed to reach the TMDL

Subshed	Improved pasture management (acres)	Streambank stabilization (linear feet)	Reforestation of highly erodible pasture (acres)
1	4	0	0
3	12	0	0
10	45	0	0.2
11	48	0	0.2
12	51	0	0.1
14	1	0	0
15	2	0	0
20	495	500	1.6
21	1	0	0
22	434	1,000	1.4
23	415	500	1.4
24	638	1,000	2.1
25	100	0	0.3

26	279	0	0.9
27	68	0	0.2
28	36	0	0.1
29	307	500	1.1
30	26	0	0.1
31	95	0	0.3
TOTALS	3,057	3,500	10

Table 6.6 Cropland BMPs needed to reach the TMDL

Subshed	Cover crops (acres)	Continuous no-till (acres)
10	0	0.6
11	0.7	1.1
13	0.7	1
20	4.2	6.5
22	2.0	3.0
23	1.1	1.6
24	3.8	5.9
26	2	3.2
27	0.7	1.1
29	2.8	4.4
31	1.0	1.6
TOTALS	19	30

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. Once you move beyond two times the buffer width, it was assumed that the runoff would be in the form of channelized flow rather than the sheet flow that a buffer can trap. The 100-foot buffers were paired with livestock exclusion projects

accomplished through CREP so that landowners could maximize financial incentives for taking the larger portion of pasture out of production.

Improved Pasture Management

Establishment of rotational grazing systems for cattle was recommended 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 in order to establish these systems. In cases where livestock exclusion is not necessary, improved pasture management was prescribed. Like a grazing system, improved pasture management allows a farmer to better utilize grazing land and associated forage production. Improved pasture management 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 ($\geq 60\%$) 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.
- Chain harrow pastures to break-up manure piles after livestock are removed from a field at least twice a year to uniformly spread the manure load, or manage manure distribution through rotational grazing

Cropland Management Practices

A series of cropland management practices are included to control cropland runoff contributing sediment to the streams. Continuous no-till is a practice that is becoming widely adopted in the region. By reducing tillage of the soil, farmers are able to conserve valuable soil and fertilizer and increase organic matter, which is an important factor in

determining soil quality. Cover crops are planted on an annual basis in order to prevent soil erosion following harvest of crops like corn and soybeans when the soil would typically be left exposed.

Forest Harvesting Practices

The main source of sediment on forested lands in the Little Calfpasture River watershed is commercial forest harvesting operations. In Virginia, loggers are required to protect water quality, and the VDOF developed BMPs as guidelines for proper timber harvesting for Virginia's loggers. To ensure voluntary compliance with these guidelines, the VDOF began conducting Best Management Practice Field Audits in 1993. Conducted four times a year, the field audits provide a useful tool in gauging the status of Virginia's water quality protection efforts. If loggers do not follow "best management practices" on harvest sites, sediment deposition may occur, and that can cause them to face civil penalties under the Silvicultural Water Quality Law. The forest harvesting BMP is a system of integrated conservation practices that are designed to prevent off-site sediment impact, protect stream crossings, and neutralize storm water runoff. Logging data provided by the Virginia Department of Game and Inland Fisheries showed that the agency harvested timber on 228 acres in the watershed over a 10 year period. This data was used to develop an estimate of overall harvesting in the watershed for this same 10 year period of time in the amount of 350 acres. Of this land, it was estimated that approximately 11% (40 acres) was not receiving the extent of BMP implementation needed, and would thus be suitable for BMP implementation over the ten year timeline of this plan (explained in greater detail in the Goals and Milestones section of the plan). The reduction in sediment associated with implementation of these practices on 40 acres amounts to an estimated 5% of the overall forest load.

6.2.3 Lake Management Control Measures

The TMDL calls for a 34% reduction of sediment sources at the outlet of the lake. Most of this sediment is assumed to come from mudflats exposed during lake drawdown, The mudflats consist of fine silt and sediment eroded from upstream and deposited as velocities drop while transiting the lake. These fine deposits are readily detached by rainfall and transported into the lake. Spreadsheet modeling showed that a 74.3% overall reduction in loading from the mudflats could achieve the downstream reductions called

for in the TMDL. Several management actions are recommended to help achieve this overall reduction through changes in lake management: trash and debris removal/diversion, vegetation of exposed mudflats, reduced periods of drawdown depths and/or periods, and excavation of some of the exposed mudflats.

Reducing the number of days that the lake is drawn down each year and limiting the depth to which the lake is lowered will produce the greatest reduction in sediment loading from the dam at the lowest cost. The primary purpose of lowering the lake in the fall is to remove large debris that has collected in the lake over the year. Consequently, partners will work with Rockbridge and Augusta Counties to identify and clean up illegal dumping sites where much of this debris is coming from. Two sites have already been identified, and partnerships will be pursued for clean up days. Should clean up of these dumping sites prove insufficient in offsetting the need for extended periods of lake lowering for clean outs, other clean out methods could be considered including dragging the lake or using a barge to pull out large debris from shallower areas.

Excavation of deposited sediment is another way to reduce sediment loading downstream. Several high priority excavation projects were identified in cooperation with the National Capital Area Council. Stabilization of exposed sediments when the lake is drawn down is another strategy to reduce runoff from the exposed mudflats. Different re-vegetation strategies should be evaluated including annual seeding by boat with grasses such as rye as well as grains.

Trash and Debris Reduction

Part of the rationale for the practice of lake drawdown during the non-camping season is for maintenance purposes, as large amounts of debris are washed into the lake from upstream. In addition, illegal dump sites at several locations on the border of the lake have sprung up in lieu of sufficient county trash disposal sites being available to the public in this area. The Goshen Reservation staff must wait sufficient time after the initial drawdown to allow vehicles access to remove downed trees, refrigerators, hay bales, and all manner of trash that gets washed into the lake during runoff events. While annual cleanups by volunteers, such as VMI cadets, can help alleviate part of the problem, the cultural norm of dumping trash at illegal spots must be addressed through education and the provision of alternate legal dump sites. Another alternative control measure for the

upstream contributions could be a diversion near the lake inlet that could prevent larger items from entering the lake. Trash and debris reduction is a necessary component of changing the current lake drawdown schedule.

Reduced depth and/or period of lake drawdown

Reducing the depth and/or time period during which the lake is drawn down each year would reduce the time and extent of mudflats exposed to eroding forces. The extent of exposed mudflats at various drawdown depths was quantified in the TMDL report and extended in Figure 6-1 to estimate the exposed area at interim drawdown depths of 1-foot intervals.

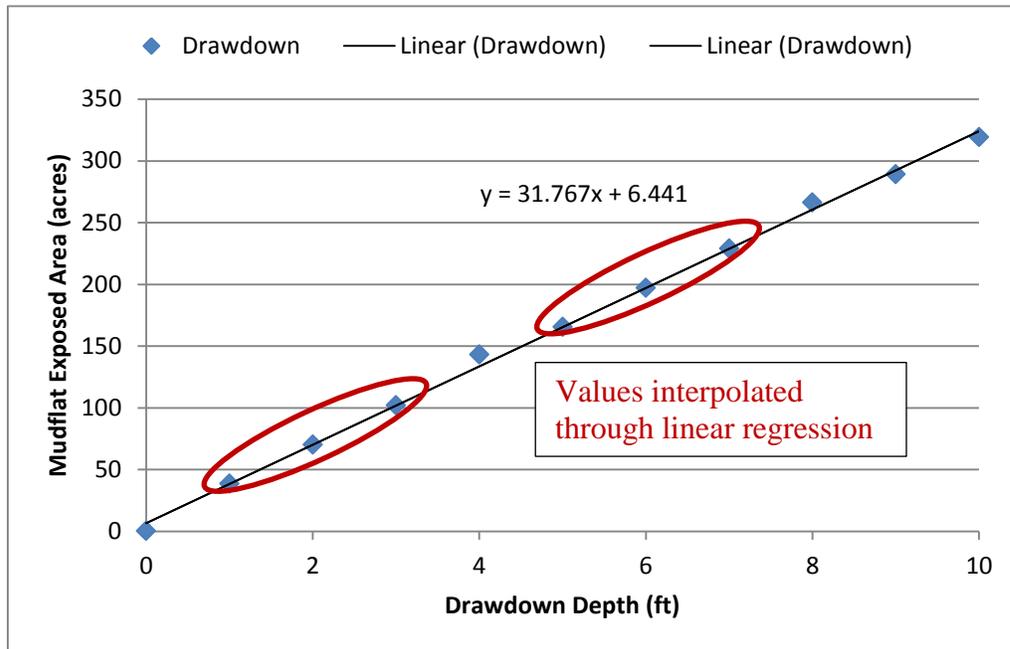


Figure 6-1. Exposed Mudflat Areas at various Drawdown Depths

The mudflats were simulated the same as the “degraded riparian pasture” land use with sediment loads represented as the exposed area times the calculated unit-area sediment load of 1.882 tonnes/ac-yr. The greater the drawdown depth and period, the greater the exposed mudflat area and the larger the sediment load from the mudflats, as shown in Table 6-6. Under current management where the lake is drawn down 10 feet for a period of 8 months, the mudflat load amounts to 319 acres times 1.882 tonnes/ac-yr, or 400.2 tonnes/yr, as also shown in Table 6-7.

Table 6-7. Mudflat Loads under Alternative Drawdown Scenarios

Drawdown depth (ft)	Area Exposed (ac)	Annual Sediment Load (tonnes/yr)	Mudflat load (tonne/yr), 1 month drawdown	Mudflat load (tonne/yr), 2 months drawdown	Mudflat load (tonne/yr), 3 months drawdown	Mudflat load (tonne/yr), 4 months drawdown	Mudflat load (tonne/yr), 5 months drawdown	Mudflat load (tonne/yr), 6 months drawdown	Mudflat load (tonne/yr), 7 months drawdown	Mudflat load (tonne/yr), 8 months drawdown
0	0	0	0	0	0	0	0	0	0	0
1	38.2	71.9	6.0	12.0	18.0	24.0	30.0	36.0	41.9	47.9
2	70.0	131.7	11.0	21.9	32.9	43.9	54.9	65.8	76.8	87.8
3	101.7	191.5	16.0	31.9	47.9	63.8	79.8	95.7	111.7	127.7
4	143	269.1	22.4	44.9	67.3	89.7	112.1	134.6	157.0	179.4
5	165.3	311.1	25.9	51.8	77.8	103.7	129.6	155.5	181.4	207.4
6	197.0	370.8	30.9	61.8	92.7	123.6	154.5	185.4	216.3	247.2
7	228.8	430.6	35.9	71.8	107.7	143.5	179.4	215.3	251.2	287.1
8	266	500.6	41.7	83.4	125.2	166.9	208.6	250.3	292.0	333.7
9	289	543.9	45.3	90.6	136.0	181.3	226.6	271.9	317.3	362.6
10	319	600.4	50.0	100.1	150.1	200.1	250.1	300.2	350.2	400.2

Interpolated points.

Load under current management

UAL = 1.882 tonnes/ac-yr (calculated from "LCalf_Results.xls" Existing Loads and Areas).

The values in Table 6-8 reflect the % reduction corresponding to the loads in Table 6-7. After reducing other sediment sources by the percentages called for in the TMDL, a 74.3% reduction of the upland mudflat loads was needed to effect a 34% load reduction at the outlet of the watershed. This can be achieved by various combinations of reduced drawdown depth and duration, as shown by the green highlighted range in Table 6-8.

Table 6-8. Mudflat Load Percent Reductions under Alternative Drawdown Scenarios

Drawdown depth (ft)	Area Exposed (ac)	Annual Sediment Load (tonnes/yr)	%Mudflat load reduction 1 month drawdown	%Mudflat load reduction 2 months drawdown	%Mudflat load reduction 3 months drawdown	%Mudflat load reduction 4 months drawdown	%Mudflat load reduction 5 months drawdown	%Mudflat load reduction 6 months drawdown	%Mudflat load reduction 7 months drawdown	%Mudflat load reduction 8 months drawdown
0	0	0	100%	100%	100%	100%	100%	100%	100%	100%
1	38.2	71.9	98.5%	97.0%	95.5%	94.0%	92.5%	91.0%	89.5%	88.0%
2	69.8	131.7	97.3%	94.5%	91.8%	89.0%	86.3%	83.5%	80.8%	78.1%
3	101.74	191.5	96.0%	92.0%	88.0%	84.1%	80.1%	76.1%	72.1%	68.1%
4	143	269.1	94.4%	88.8%	83.2%	77.6%	72.0%	66.4%	60.8%	55.2%
5	165.28	311.1	93.5%	87.0%	80.6%	74.1%	67.6%	61.1%	54.7%	48.2%
6	197.04	370.8	92.3%	84.6%	76.8%	69.1%	61.4%	53.7%	46.0%	38.2%
7	228.81	430.6	91.0%	82.1%	73.1%	64.1%	55.2%	46.2%	37.2%	28.3%
8	266	500.6	89.6%	79.2%	68.7%	58.3%	47.9%	37.5%	27.0%	16.6%
9	289	543.9	88.7%	77.4%	66.0%	54.7%	43.4%	32.1%	20.7%	9.4%
10	319	600.4	87.5%	75.0%	62.5%	50.0%	37.5%	25.0%	12.5%	0%

Max. Depth for a 71.4% Reduction:	10.0	10.0	7.5	5.5	4.4	3.6	3.1	2.7
Scenario:	A	B	C	D	E	F	G	H

Interpolated points

Range containing 71.4% reductions

It is understood that weather is an important factor in the lake management schedule, and that wet weather during drawdown periods delays clean out and that dry periods during spring time delays bringing the lake back up to full pond. Another factor that affects scheduling includes the need to periodically drawdown the lake as an emergency measure in preparation for major storms. Therefore, flexibility in the lake management drawdown schedule is needed to accommodate these natural variations to be expected with regard to weather. The NCAC-BSA have selected Scenario C (7.5 feet drawdown for 3 months) from Table 6-8 as a target during anticipated wet years, and Scenario D (5.5 feet drawdown for 4 months) as a target during anticipated dry years.

Vegetation of exposed mudflats

Since the mudflats are currently exposed for approximately 8 months out of the year, providing them with some type of vegetative cover would help to stabilize these sediments and make them less likely to erode into the lake. The mudflat areas delineated in Figure 6-2 represent potential areas for re-vegetation. In order to explore the efficacy of this strategy, 20 acres is included in the implementation plan to be targeted within Area #1 or other area deemed most suitable by the Steering Committee.

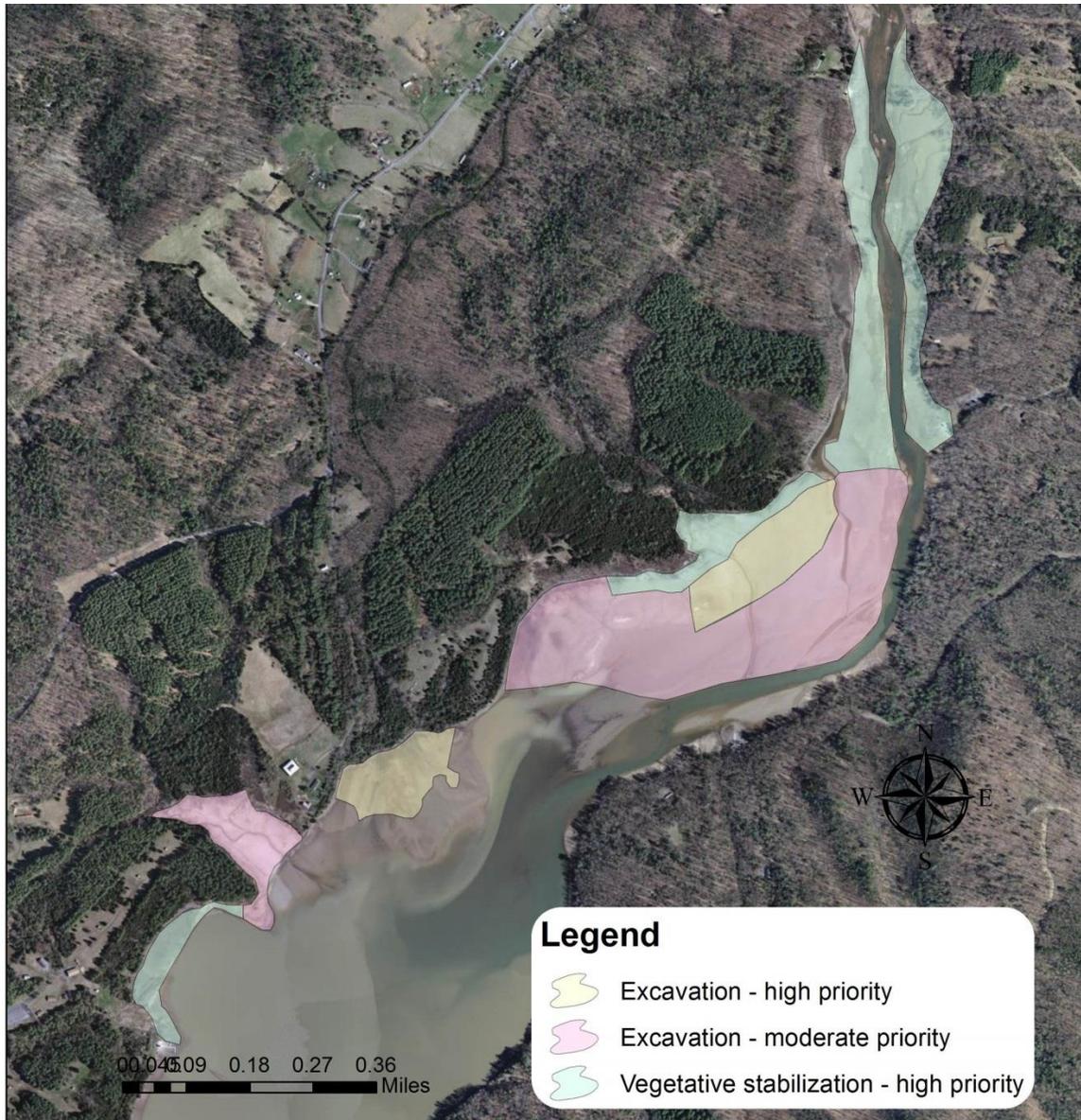


Figure 6-2. Potential Mudflat Areas for Revegetation or Harvesting

Removal or harvesting of exposed mudflats during drawdown

While extensive dredging is very expensive, selective excavation of exposed mudflats during drawdown could place this good topsoil back on local farmers’ fields and reduce the extent of mudflats contributing to in-lake sediment concentrations. This strategy will be implemented on 20 acres of mudflats in Areas #2 and #3, or other area deemed most suitable by the Steering Committee.

Stabilization of Emergency Spillway and Disposal Area

Since completion of the TMDL, a new emergency spillway was constructed on the east side of the Lake Merriweather dam. Recent aerial imagery revealed considerable rilling and erosion both from the new grassed spillway and from the soil disposal area from construction. Stabilization is required in this area to reduce sediment loading rates in both areas to pre-construction rates for compliance with the TMDL. A summary of all implementation strategies for the lake are shown in Table 6-9.

Table 6-9. Summary of Lake Management BMPs needed to reach the TMDL

BMP	Extent	Units
Vegetative planting of exposed mudflats	20	acres
Reduced depth of drawdown (wet/dry)	7.5/5.5	feet
Reduced period of drawdown	4	months
Mudflat excavation	20	acres
Stabilization of emergency spillway and disposal areas	26.3	acres

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

The following general tasks associated with agricultural and 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).
- Develop and distribute educational materials, provide examples of similar projects that have been successful. Conduct watershed wide mailings.

- Organize educational programs for farmers including farm tours and field days in partnership with VA Cooperative Extension.
- Partner with VA Cooperative Extension to implement a series of pilot fencing BMPs using poly flex fencing and portable solar powered waterers
- Work with VA Cooperative Extension and the Augusta County Correctional Center to implement livestock exclusion fencing and silvopastoral practices on the property

Lake Management Programs

- Partner with Virginia Military Institute (VMI) cadets and Washington and Lee and VMI Fishing Clubs on a community service project to clean up an illegal dumping site above Lake Merriweather
- Partner with the NCAC-BSA to develop an Eagle Scout project/program wherein scouts would focus on shoreline stabilization by planting trees and shrubs around Lake Merriweather
- Work with the NCAC-BSA to obtain grant funds to complete high priority mudflat excavation projects
- Work with a local non-profit organization such as Rockbridge Area Conservation Council to implement a sediment monitoring program downstream of Lake Merriweather to evaluate the impact of the proposed BMPs
- Partner with the Virginia Native Plant Society to plant cypress trees on the mudflats surrounding Lake Merriweather during drawdown
- Work with the National Capital Area Council to reach out to boy scouts and their families regarding the problems facing the Little Calfpasture River and what they can do to help
- As part of the new drawdown management process, work with Rockbridge County Emergency Services to ensure that a comprehensive public notification system is in place to alert local residents when the lake is being drawn down.

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.

It is anticipated that one position would be sufficient to reach out to farmers in the watershed regarding agricultural BMPs and work with the NCAC-BSA to obtain funding

for mudflat excavation and stabilization projects at Lake Merriweather. This position would also be responsible for coordination of any special monitoring programs downstream of the lake and dam. The position could be housed at the Natural Bridge Soil and Water Conservation District, which has been responsible for the implementation of several TMDL projects in recent years.

7. COSTS AND BENEFITS

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

Specifically, sediment in the river will be reduced to a level at which the river is once again capable of supporting a healthy and diverse population of aquatic life. While the primary benefit of implementation efforts will be improved ecological integrity of the Little Calfpasture River, other benefits will be experienced as well. The Little Calfpasture River and the Maury River just downstream of the impairment are highly valued community resources that are widely utilized for recreational activities including fishing, boating and swimming. The sediment plume entering the Maury River from the Little Calfpasture River is highly visible for several days after a rain event. Reducing sediment loading upstream will improve recreational uses of the river, particularly those like fishing that depend upon a healthy aquatic community.

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 lake management 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, and rotational grazing will each provide economic benefits to land owners. The stabilization or excavation of eroding mudflats around Lake Merriweather will provide the NCAC-BSA with improved opportunities for recreation on the lake. The cleanup of illegal dumping sites above the lake will save the NCAC-BSA time and money with respect to cleaning out the lake each year, and will benefit the local community as well. Additionally, money spent by landowners and other stakeholders in the process of implementing this plan will stimulate the local economy.

7.1 Costs

7.1.1 Agricultural BMPs

The costs of agricultural best management practices included in the implementation plan were estimated based on data for Rockbridge and Augusta Counties from the VADCR Agricultural BMP Database, the NRCS, Headwaters SWCD and Natural Bridge 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-6, LE-1T, LE-2T, and CREP. The cost of fence maintenance was identified as a deterrent to participation. Financial assistance possibilities for maintaining fences include an annual 25% tax credit for fence maintenance, and an upfront incentive payment on \$0.50 per linear foot to maintain stream fencing as part of the WP-2T practice. Typically the average cost of fence maintenance is significantly higher. In developing the cost estimates for fence maintenance shown in Table 7-1, a figure of \$3.50/linear foot of fence was used. It was estimated that approximately 10% of fencing would need to be replaced over the 10 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 7-1 shows total agricultural BMP costs for the Little Calfpasture watershed.

Table 7-1. Agricultural BMP implementation costs

Practice	Cost-share code	Units	Unit cost	Total cost
Livestock exclusion with riparian buffers	CREP	system	\$36,872*	\$302,349
Livestock exclusion with riparian buffers	LE-1T/SL-6T	system	\$35,985*	\$516,379
Livestock exclusion with riparian buffers	WP2T	system	\$15,105*	\$61,929
Livestock exclusion with reduced setback	LE-2T	system	\$35,510*	\$509,564
Streambank stabilization	WP-2A	feet	\$214	\$749,000
Exclusion fence maintenance (10 yrs)	N/A	feet	\$3.50	\$34,590
Rotational grazing/Improved pasture management	SL-9	acres	\$28	\$85,596
Reforestation of erodible pasture	FR-1	acres	\$600	\$9,000
Continuous no-till	SL-15A	acres	\$100	\$1,900
Cover crops	SL-8B	acres	\$60	\$15,750
Forest harvesting BMPs	N/A	acres	\$50	\$10,125
TOTAL ESTIMATED COST				\$2,293,182

* Livestock exclusion system estimates were calculated using tax parcel data for each subwatershed. While average estimated costs are shown, actual system costs were calculated using more site specific data to improve the accuracy of cost estimates.

7.1.2 Lake Management BMPs

The costs of recommended lake management BMPs were estimated using USDA-NRCS FY15 cost estimates for vegetative treatment area (Practice: 635-1), DCR's cover crop practice (Practice: SL-8B), as well as an average cost for hauling fill dirt. The direct costs of changing the lake drawdown schedule should be minimal, though the associated costs of altered maintenance need to be assessed. Mudflat excavation costs are based on the average cost of hauling fill dirt (per cubic yard) with an average excavation depth of 2 feet. Several members of the lake management working group noted that the cost of excavating the mudflats could be greatly offset by the sale of topsoil for both agricultural operations and construction.

Table 7-2. Lake Management BMP implementation costs

Practice	Cost-share code	Extent	Units	Unit cost	TOTAL
Vegetative planting of exposed mudflats	SL-8B	20	acres	\$60	\$9,000
Reduced depth of lake drawdown (wet/dry)	NA	7.5/5.5	feet	—	—
Reduced period of lake drawdown (wet/dry)	NA	3/4	months	—	—
Mudflat excavation	NA	20	acres	\$25	\$1,613,333
Stabilization of emergency spillway and disposal area	635-1	26.3	acres	\$600	\$15,780
TOTAL ESTIMATED COST*					\$1,638,113

* Total Costs do not include offsetting income from the sale of excavated material as topsoil.

7.2 Technical Assistance

Technical assistance costs were estimated for one full time position using a cost of \$60,000/position per year. This figure is based on the existing staffing costs included in a recent Virginia Department of Environmental Quality grant agreement with the Natural Bridge Soil and Water Conservation District for a similar implementation project in Rockbridge County. Based on the 10 year timeline for achieving implementation goals (described in great detail in the Implementation Timeline section of this plan), this would make the total cost of technical assistance approximately \$600,000. When factored in to the cost estimate for BMP implementation shown in Tables 7-1 and 7-2, this would make the total cost of implementation approximately \$4.53M.

7.3 Benefit Analysis

The primary benefit of implementing this plan will be cleaner water in the Little Calfpasture River. Specifically, sediment in the river will be reduced to a level at which the river is once again capable of supporting a healthy and diverse population of aquatic life. While the primary benefit of implementation efforts will be improved ecological integrity of the Little Calfpasture River, other benefits will be experienced as well. The Little Calfpasture River and the Maury River just downstream of the impairment are highly valued community resources that are widely utilized for recreational activities

including fishing, boating and swimming. The sediment plume entering the Maury River from the Little Calfpasture River is highly visible for several days after a rain event. Reducing sediment loading upstream will improve recreational uses of the river, particularly those like fishing that depend upon a healthy aquatic community. The Virginia Department of Game and Inland Fisheries completed a creel survey of the Maury River in 2004 in which they interviewed people recreating on the river to estimate its economic value to Rockbridge County. Their analysis of these interviews indicated that the average recreater makes around 15 trips to the river each year and spends just under \$30/trip. Around 80% of these recreaters spent most or all of their money within Rockbridge County (VADIGF, 2004). The results of this survey suggest that the economic value of the Maury River to Rockbridge County is substantial, and that improvements to water quality in the Little Calfpasture may in turn result in greater recreational use of the Maury River downstream and greater economic benefits to the community.

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 lake management 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 and lake management, and reduced trash and debris inputs to the lake 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. Many of the practices implemented in the headwaters of the Little Calfpasture will also help to address a bacteria impairment that extends 12.36 miles downstream to its confluence with Smith Creek.

7.3.1 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 7-3 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 moon blindness associated with Leptospirosis infections (VCE, 1998). A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills.

Table 7-3. Example of increased revenue due to installing off-stream waterers (Surber et al., 2005)

Typical calf sale weight	Additional weight gain due to off-stream waterer	Price	Increased revenue due to off stream waterer
500 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 an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40 % and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80 % of the cost of growing or maintaining an animal, and pastures providing feed at a cost of 0.01 to 0.02 cents/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.

7.3.2 Lake Management Practices

Each year, the Goshen Scout Camp receives approximately 7,000 visitors including campers and staff. The camp relies heavily on Lake Merriweather in order to provide campers with experiences in boating and swimming. The accumulation of excess sediment deposits along the shoreline limits their use of the lake considerably. In addition, the presence of large debris in the lake bottom and in front of the dam presents a boating hazard for campers and necessitates costly cleanouts of the lake several times a year. The NCAC-BSA typically cleans out the lake three to seven times a year at a cost of \$1,500-\$3,000. Typically, the lake must be drawn down in order to complete a clean out, which also requires a significant time commitment on the part of the scouts. By limiting the amount of debris washing in to the lake, the need for clean outs and associated draw downs is lessened, resulting in a cost and time savings to the NCAC-BSA as well as considerable downstream water quality benefits. Vegetative stabilization of mudflats

along the lake's shoreline will also provide benefits to campers at the Scout Camp since new habitat will be created for wildlife. In addition, campers may participate in plantings, thereby learning new skills with respect to restoration

In addition to the benefits to individual landowners, the economy of the local community will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside the impaired areas. Building contractors and material suppliers who deal with installation, fencing, and other BMP components can expect to see an increase in business during implementation. Additionally, income from maintenance of these systems should continue long after implementation is complete. As will be discussed in greater detail in Chapter 10, a portion of the funding for implementation can be expected to come from state and federal sources. This portion of funding represents money that is new to the area and will stimulate the local economy. In general, implementation will provide not only environmental benefits to the community, but economic benefits as well, which, in turn, will allow for individual landowners to participate in implementation.

7.3.3 Watershed Health and Associated Benefits

Focusing on reducing sediment in the Little Calfpasture River watershed will have associated watershed health benefits. Reductions in streambank erosion, excessive nutrient runoff, and water temperature are additional benefits associated with streamside buffer plantings. In turn, reduced nutrient loading and erosion and cooler water temperatures improves habitat for fisheries, which provides benefits to anglers and the local economy.

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

million from declining quail hunter expenditures (VDGIF, 2009). Funding is available to assist landowners in quail habitat restoration (see Funding Sources section).

8. MEASUREABLE GOALS AND MILESTONES

The end goal of implementation is a healthy biological community in the Little Calfpasture River. Two types of milestones will be used to evaluate progress over the implementation period: implementation milestones and water quality milestones. The implementation milestones establish goals for the extent of the different best management practices installed within certain time frames, while the water quality milestones establish the corresponding goals for improvements in water quality.

Given the scope of work involved with implementing this TMDL, full implementation and de-listing from the Virginia Section 305(b)/303(d) list could be expected within 10 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.

8.1 Milestone Identification

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures and areas of highest interest first. For instance, the TMDL study indicated that altering the lake drawdown schedule to minimize the length of time the lake was well below full pool would result in considerable sediment reductions downstream. This may provide the highest return on water quality improvement with little cost to the property owner. In addition, the TMDL study indicated that loadings from degraded riparian pasture and pasture contribute approximately 66% and 40% of the total sediment load in Little Calfpasture River, respectively. Consequently, concentrating on implementing pasture management practices within the first several years may provide the highest return on water quality improvement with less cost to landowners.

The overall timeline for implementation has been divided into two stages: 2018–2022 and 2023–2027. Implementation of practices included in Stage 1 is expected to result in considerable water quality improvements with respect to the benthic community, and can be implemented in a relatively short period of time. Stage 2 includes practices that present more challenges with respect to implementation, but are needed for de-listing.

Table 8-1 shows the implementation extents by stage and BMP, while Table 8-2 shows the breakdown of Stage 1 for Lake Management, and Table 8-3 shows the percent of each given land use type that receives each BMP in each implementation stage.

Table 8-1. BMP implementation costs by Stage.

Stage	Agricultural BMPs	Lake Management*	Technical Assistance	TOTAL
Stage 1 (Yrs 1-5)	\$1,592,055	\$825,447	\$300,000	\$2,717,502
Stage 2 (Yrs 6-10)	\$701,127	\$812,667	\$300,000	\$1,813,794
TOTAL	\$2,293,182	\$1,638,113	\$600,000	\$4,531,295

* Lake Management BMP timeline includes an interim Stage 1 period in the first two years of implementation (see Table 7-3)

Table 8-2. Timeline for implementation in the Little Calfpasture River watershed

Source Type	BMP Description	BMP code	Units	Stage 1 Extent	Stage 1 % Land Use	Stage2 Extent	Stage 2 % Land Use
Livestock stream exclusion	Livestock exclusion with riparian buffers	SL-6/LE-1T	feet/systems	25,943/11	20%	8,648/4	7%
Livestock stream exclusion	Livestock exclusion with riparian buffers	WP-2T	feet/systems	7,412/3	6%	2,471/1	2%
Livestock stream exclusion	Livestock exclusion with riparian buffers	CREP	feet/systems	14,824/6	11%	4,941/2	4%
Livestock stream exclusion	Livestock exclusion with reduced setback	LE-2T	feet/systems	25,943/11	21%	8,648/4	7%
Livestock stream exclusion	Fence maintenance	N/A	feet	7,412	N/A	2,471	N/A
Pasture	Grazing land management	SL-9	acres	2,293	37%	764	12%
Pasture	Reforestation of erodible pasture	FR-1	acres	10	0.9%	0	0%
Cropland	Small grain cover crops	SL-8B	acres	22.5	9.4%	7.5	3.1%
Cropland	Continuous no till	SL-15A	acres	14.3	6%	4.8	2%
Forest	Forest Harvesting BMPs	N/A	acres	30.4	0.07%	10.1	0.02%
Lake Management	Vegetative planting of exposed mudflats	N/A	acres	10	3.1%	10	3.1%
Lake Management	Reduced depth of	N/A	feet	7.5/5.5	N/A	8.2/6.1	N/A
Lake Management	Reduced period of	N/A	months	3/4	N/A	3/4	N/A
Lake Management	Mudflat excavation	N/A	acres	10	3.1%	10	3.1%

* N/A = not applicable

Average annual remaining sediment load, tonnes/yr (% reduction): Stage 1: 2,182 (45.4%); Stage 2: 1,759 (56%)
Future conditions load (from TMDL study) = 3,998.5 tonnes/yr

An interim planning period will be included during the first two years of Stage 1 of lake management practice implementation (Table 8-3). During this two year period, the wet and dry drawdown scenarios will be evaluated and vegetative stabilization methods will be tested. In addition, planning for an excavation project will occur to ensure that there is a detailed plan for the removal and disposal of excavated sediment and that all of the proper permits are obtained.

Table 8-3. Breakdown of Stage 1 for Lake Management BMPs, including interim Stage 1 period

BMP	Units	Years 1-2 Extent	Years 1-2 % Land Use Treated	Years 3-5 Extent	Years 3-5 % Land Use Treated
Vegetative planting of exposed mudflats	acres	2	0.6%	8	2.5%
Reduced depth of drawdown (wet/dry)	feet	7.5/5.5	NA	7.5/5.5	NA
Reduced period of drawdown (wet/dry)	months	3/4	NA	3/4	NA
Mudflat excavation	acres	2	0.6%	8	2.5%
Stabilization of emergency spillway and disposal area	acres	0	0%	26.3	100%

8.2 Water Quality Monitoring

Improvements in water quality will be evaluated through water quality monitoring conducted at VADEQ monitoring stations located in the watersheds as shown below in Figure 8-1. Descriptions of these stations are provided in Table 8-4. The map shows stations that are part of VADEQ's Biological Monitoring Program, wherein monitoring of benthic macroinvertebrates takes place in the fall and spring each year. The frequency of monitoring depends upon a number of factors, all of which are weighed by DEQ biologists. Typically, a station will be sampled multiple times within a 6-year assessment window. The frequency is determined based on the state of the benthic community at the site and the overall priority of the drainage area (e.g. TMDL development or implementation watersheds receive a higher priority). Monitoring at the station above Lake Merriweather shown in Figure 8-1 will continue for at least two years once implementation begins in order to gauge the effectiveness of practices implemented above the lake. DEQ has committed to long term annual benthic monitoring at the station located below the lake as the result of a special standard that was adopted for a 0.76 mile segment of the Little Calfpasture directly below the Goshen Dam in the 2009 Triennial Review. Consequently, monitoring at this station will continue throughout implementation. In addition, DEQ will continue collection of field parameters and dissolved oxygen monitoring at this station. Monitoring data collected below the lake will be used to

determine the impact of lake management practices on water quality and the benthic community. This information will be instrumental in evaluating changes to the draw down schedule and to adjust management strategies accordingly.

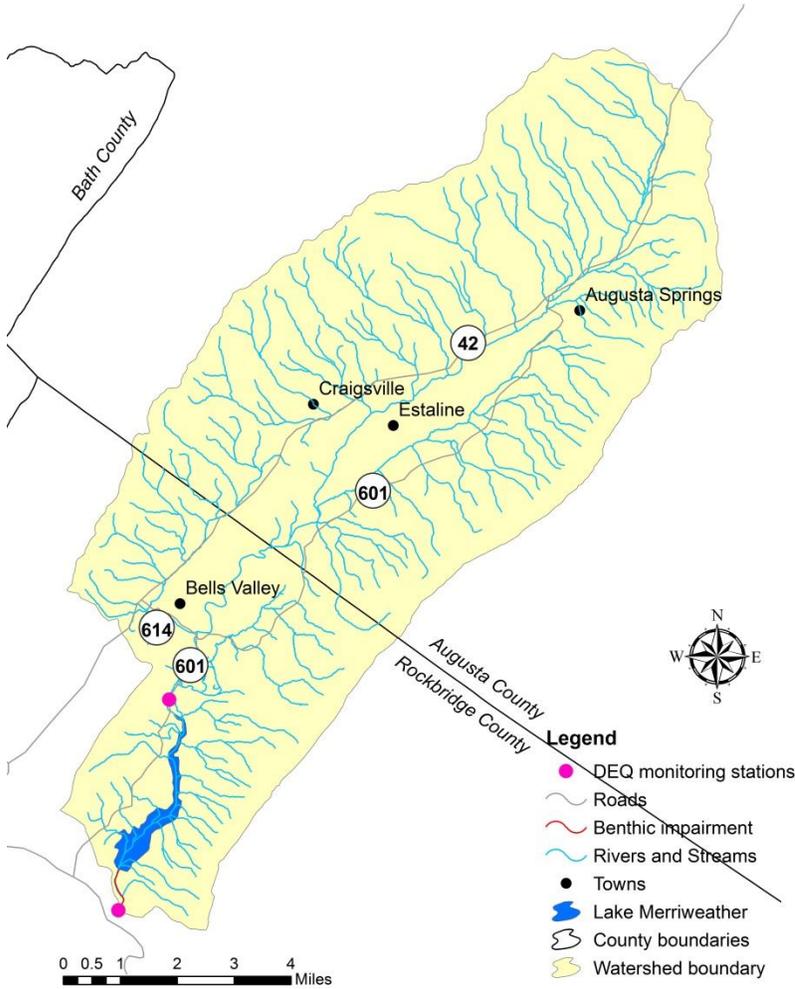


Figure 8-1. VADEQ bioassessment monitoring stations following TMDL IP completion

Table 8-4. VADEQ station location descriptions along Little Calfpasture River

Station ID#	Description
2-LCF000.02	Above confluence with Calfpasture River
2-LCF004.80	Above Lake Merriweather off Rt. 601, private ford

There is the potential for additional monitoring of total suspended solids (TSS) based on the availability TMDL implementation funds or other sources. In monitoring TSS, we

would be able to determine the point at which the TMDL goal of a TSS concentration no greater than 3 mg/L no more than 22% of the time was met. This type of feedback would be useful in determining the effectiveness of alterations to the lake drawdown schedule and depth in addition to shoreline stabilization and agricultural BMPs. TSS monitoring would be conducted pre and post implementation during lake drawdown events to capture the overall impact of implementation efforts. Monitoring could be conducted by VADEQ staff, or by partner organizations, including Washington and Lee University and Rockbridge Area Conservation Council (RACC).

Another type of monitoring that would also be very helpful would be coincident flow monitoring on the Calfpasture River above the confluence with the Little Calfpasture River, on the Little Calfpasture River below the dam, and on the Maury River just below the confluence. This monitoring especially while the lake level is being reduced in the fall and in preparation for large storm events would be useful in documenting the influence of the Little Calfpasture and dam releases on the Maury River. It was also suggested during planning that additional monitoring be conducted downstream of the Little Calfpasture's confluence with the Maury River to evaluate downstream impacts from sediment. Monitoring could be conducted by VADEQ staff, or by a partner organization including Washington and Lee.

8.3 Targeting

Implicit in the process of a staged implementation is targeting of best management practices. Targeting ensures optimum utilization of limited technical and financial resources.

8.3.1 Lake Management Practices

The lake management working group discussed targeting of mudflat excavation projects to reduce the potential for sediment runoff from exposed mudflats during drawdown periods. A series of potential mudflat excavation sites were identified and shared with the NCAC-BSA to determine which sites were of highest priority to them with respect to utilization of the lake for recreational purposes. In addition, sites were evaluated based on the ability to move equipment in for excavation and the volume of sediment that would be removed. Two high priority excavation projects were identified for implementation,

while another priority site was identified for vegetative stabilization (Figure 6-2). In addition, several dumping sites were identified for cleanup projects upstream of Lake Merriweather in Rockbridge County.

8.3.2 Augusta County Correction Center: Agricultural BMP Demonstration Project

The agricultural working group discussed potential targeting strategies for agricultural BMP implementation. The Augusta County Correctional Center was identified as a high priority property for livestock exclusion and pasture management practices, because of the size of the pasture acreage, livestock population, and proportion of pasture with unrestricted stream access. The group discussed a partnership between the Correctional Center and VCE to complete an innovative pilot project on the property that includes livestock exclusion and silvopastoral practices. During the implementation planning process, DEQ worked with VCE staff to develop a management plan for the Augusta Correctional Center due to the fact that a large amount of stream fencing is needed at the site and the nature of the property poses unique restrictions with respect to BMP implementation. A planning meeting was held with staff from the Correctional Center, VADEQ, Headwaters SWCD, NRCS and Chesapeake Bay Foundation to develop a project plan for the site that addresses their management needs with respect to safety and operation of the farm while maximizing water quality benefits. Follow up site visits were scheduled in order to complete measurements and develop a detailed project plan to address all aspects of the agricultural operation. Livestock exclusion fencing and rotational grazing will be a part of the overall implementation plan for the Correctional Center. NRCS completed a plan for the property that includes 54,693 feet of fencing (including stream exclusion and cross fencing). Details of the plan are shown in Table 8-5 and Figure 8-2. The overall estimated project cost is \$299,000. Safety considerations may impact the potential for tree plantings, with grassed buffers offering a more practical management solution based on visibility needs. Since the property is owned and operated by a state agency, the agricultural BMP cost share programs available through the state and federal government are not an option with respect to funding project implementation at the property. Therefore, additional grant funds will be needed to complete the project.

Table 8-5. Augusta County Correctional Center NRCS Conservation plan components

Fence	Pipeline	Riparian buffer	Stream crossings	Watering facility	Water well	Pumping plant
54,693 feet	15,960 feet	15.8 acres	7	13	2	2

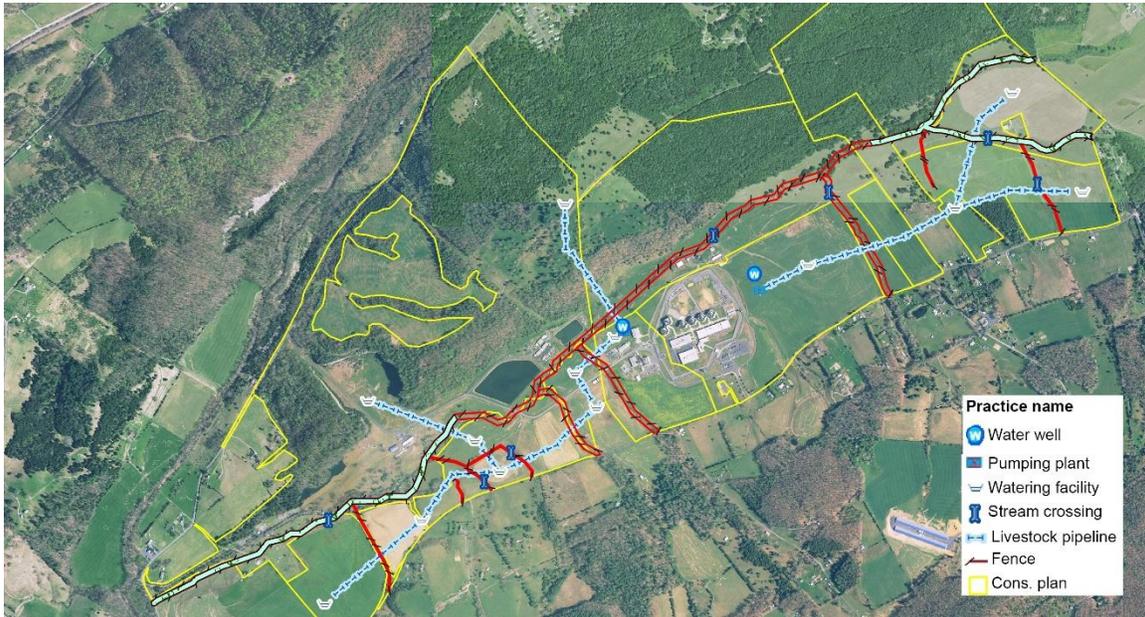


Figure 8-2. NRCS Conservation Plan: Augusta County Correctional Center

8.3.3 Livestock Exclusion Prioritization

Livestock exclusion from streams can be very costly. In order to maximize the water quality benefits of livestock stream exclusion, segments of the stream needing fencing were prioritized based on two key factors: 1) proximity to Lake Merriweather and 2) acres of degraded riparian pasture in the subwatershed containing the stream segment. All of the subwatersheds were ranked based on these factors, and the two rankings were averaged to come up with an overall priority. A map of potential streamside fencing required for streams in the watersheds is shown in Figure 8-2. Subwatersheds shown in dark blue contain the stream segments that are most likely to have the greatest impact on water quality when fencing. While the segments located in the lighter blue subwatersheds will still result in water quality improvements, they are less likely to be as significant as the dark blue subwatersheds with respect to water quality in the impaired segment below the lake.

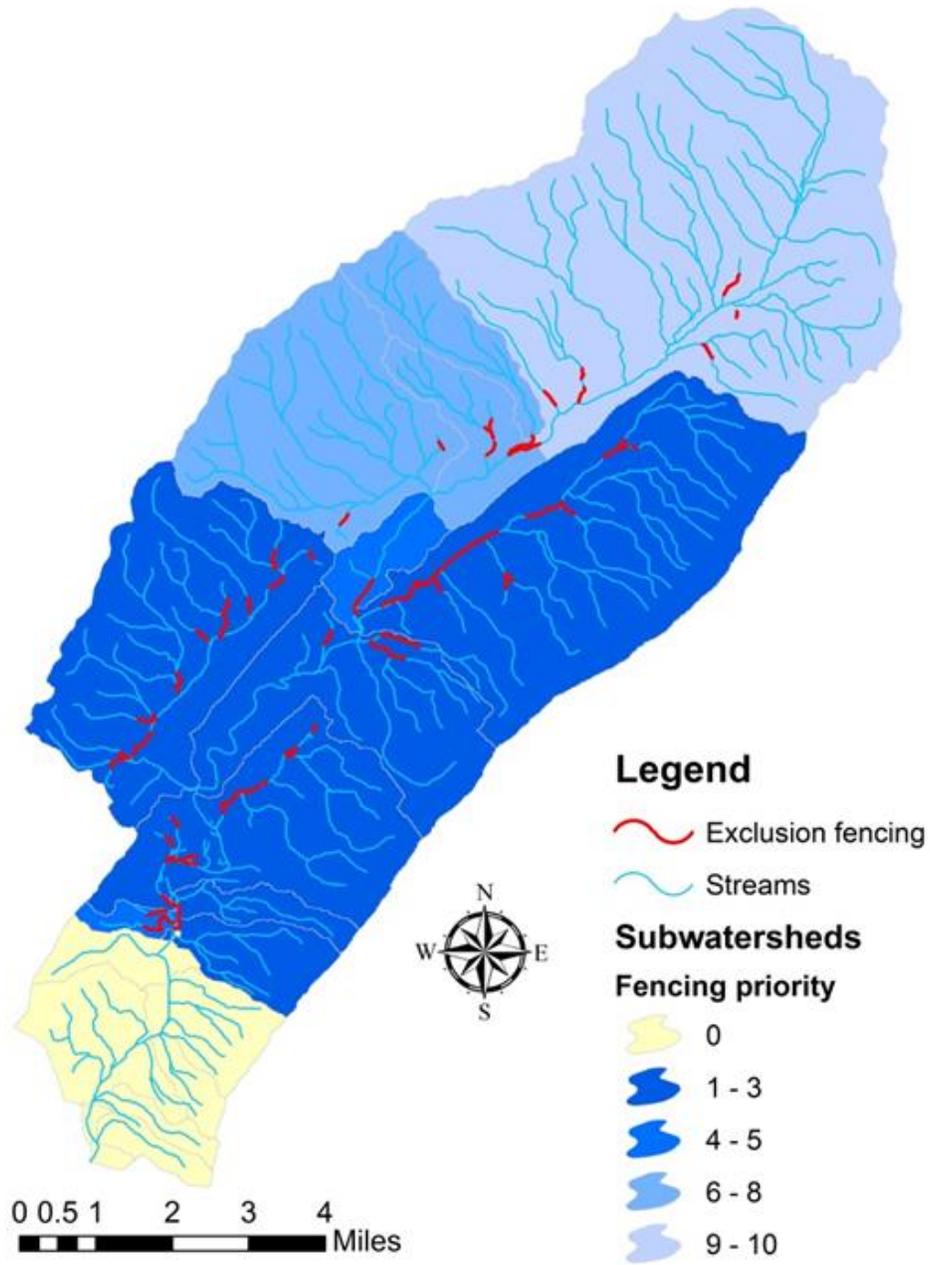


Figure 8-3. Potential stream exclusion fencing by sub-watershed

9. PARTNERS 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 Natural Bridge Soil and Water Conservation District covers all of the project area sub-watersheds with respect to administration of the VA Agricultural BMP Cost Share Program. The following sections in this chapter describe the responsibilities and expectations for the various components of implementation.

9.1 Partner Roles and Responsibilities

9.1.1 Agricultural and Residential Landowners

SWCD and NRCS conservation staff often consider characteristics of farms and farmers in the watersheds that will affect the decisions farmers make when it comes to implementing conservation practices. For example, the average size of farms is an important factor to consider, since it affects how much cropland or pasture a farmer can give up for a riparian buffer. The age of a farmer may also influence their decision to implement best management practices. Table 9-1 provides a summary of relevant characteristics of farms and producers in Augusta and Rockbridge Counties from the 2012 Agricultural Census. These characteristics were considered when developing implementation scenarios, and should be utilized to develop suitable education and outreach strategies.

Table 9-1. Characteristics of farms and farmers in Augusta and Rockbridge Counties, VA (USDA, 2012)

Characteristic	Augusta	Rockbridge
Number of farms	1,706	833
Land in farms (acres): full owners	89,408	64,002
Rented land in farms (acres): part owners	86,574	54,222
Owned land in farms (acres): part owners	63,647	44,042
Operators identifying farming as their primary occupation	832	353
Operators identifying something other than farming as their primary occupation	874	480
Average age of primary operator	59	61
Average size of farm (acres)	152	202
Average market value of farmland and buildings (\$/acre)	\$6,256	\$4,296
Average net cash farm income of operation (\$)	\$20,308	\$2,239
Average farm production expenses (\$)	\$120,931	\$39,055

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

This implementation plan is unique in that participation from one large property owner, the NCAC-BSA, is critical to its success. Without alterations management of the drawdown of Lake Merriweather, in addition to excavation and shoreline stabilization practices, the Little Calfpasture River will remain impaired below the Goshen Dam. Therefore, it is imperative that the NCAC-BSA are a partner in implementation efforts, and that their needs as the owner and operator of the Goshen Scout Camp be considered when implementing the management strategies included in this plan.

9.1.2 Natural Bridge Soil and Water Conservation District (SWCD) and Natural Resource Conservation Service (NRCS)

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

Dedicated staff is currently not available to coordinate implementation of lake management BMPs, additional monitoring and overall project outreach. Assistance will be needed with overall coordination of these activities in addition to locating funding for projects including lake management BMPs and implementation of agricultural BMPs at the Augusta County Correctional Center.

9.1.3 Augusta and Rockbridge Counties

Decisions made by local governments regarding land use and zoning will play an important role in the implementation of this plan. This makes the Augusta and Rockbridge County Boards of Supervisors and the Planning Commissions key partners in long term implementation efforts. Currently, both counties have zoning and land use policies in place that support the preservation of agricultural land and encourage good stewardship of natural resources. In addition, Rockbridge County administers an easement agreement program, which has helped to encourage land conservation across the county. The cleanup of illegal dumping sites upstream of Lake Merriweather may also require participation from Augusta and Rockbridge County staff. Any efforts to

create additional opportunities for proper disposal of refuse would also be coordinated with county staff and elected officials.

9.1.4 National Capital Area Council – Boy Scouts of America (NCAC-BSA)

As noted previously, the NCAC-BSA will play a key role in implementation efforts. Without their active participation, the TMDL goals cannot be reached and the benthic community cannot be restored. The NCAC-BSA were very involved in the development of this plan, attending all of the lake management meetings and reviewing lake management scenarios. While they are open to implementing the strategies included in the plan, management factors and funding must also be considered. Assistance with the development of grant funding proposals for excavation and restoration projects will be needed, and some degree of lake drawdown will be required by the Scouts in the fall and winter to complete cleanouts. Monitoring of downstream impacts of alterations in the drawdown schedule should be coordinated with the NCAC-BSA so that the impacts are properly captured.

9.1.5 Virginia Cooperative Extension

Virginia Cooperative Extension will play a key role in project outreach, including coordination of farm tours and field days. In addition, Extension will assist with outreach to the Augusta County Correctional Center with respect to planning and implementation of agricultural BMPs on the property. This may include assistance with grant writing, project design and planning, and implementation.

9.1.6 Virginia Department of Environmental Quality

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

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

9.1.7 Virginia Department of Conservation and Recreation

The Virginia Department of Conservation and Recreation (VADCR) administers the Virginia Agricultural Cost Share Program, working closely with Soil and Water Conservation Districts to provide cost share and operating grants needed to deliver this program at the local level and track implementation. In addition, VADCR administers the state's Nutrient Management Program, which provides technical assistance to producers in appropriate manure storage and manure and commercial fertilizer. VADCR's Division of Dam Safety and Floodplains will be an important partner with respect to the operation and management of the Goshen Dam. DCR's dam safety staff works to ensure that dams are properly and safely designed, built, operated and maintained.

9.1.8 Other Potential Local Partners

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

- Rockbridge Area Conservation Council
- James River Association
- VA Save Our Streams
- Upper James RC&D
- Chesapeake Bay Foundation
- Virginia Tech
- VA Department of Forestry
- VA Master Naturalists
- Washington and Lee University
- VA Military Institute

9.2 Integration with Other Watershed Plans

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

9.2.1 Augusta County Comprehensive Plan

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

- Work with partner agencies, including the Headwaters SWCD and the Natural Resources Conservation Service, to promote agricultural BMPs and nutrient management planning and resource management planning.
- Participate in state and regional programs to protect local waterways, the James and Shenandoah Rivers, and the Chesapeake Bay
- Support ongoing source water protection efforts, including adoption of new Source Water Protection Overlay Districts developed by the Augusta County Service Authority.

In addition, the comprehensive plan features a table of performance standards that includes recommendations of 100 foot stream buffer zones and reforestation of flood plains in agricultural and rural conservation areas (Augusta County, 2015). These recommendations and the policies listed above clearly support the recommendations of this water quality improvement plan. When possible, efforts should be made to integrate these shared goals, thereby saving time and resources while achieving the same end result.

9.2.2 Virginia's Phase II Chesapeake Bay Watershed Implementation Plan

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

<http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay.aspx>.

9.3 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. In relation to these TMDLs, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes.

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.

9.4 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. TMDL 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 no longer maintaining water quality standards. 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.

10. FUNDING

A list of potential funding sources available for implementation has been developed. Detailed descriptions can be obtained from the Headwaters and Natural Bridge SWCDs, VADCR, Natural Resources Conservation Service, and Virginia Cooperative Extension. While funding is being provided to the both SWCDs for agricultural BMPs and technical assistance for farmers, an additional funding commitment is needed to fully implement the agricultural and lake management practices included in the plan. Funding from foundations, corporations and other private donors should also be considered.

10.1 Virginia Agricultural Best Management Practices Cost-Share Program

The cost-share program is funded with state and federal monies through local SWCDs. SWCDs administer the program to encourage farmers and landowners to use BMPs on their land to better control transportation of pollutants into our waters due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Program participants are recruited by SWCDs based upon those factors, which have a great impact on water quality. Cost-share is typically 75% of the actual cost, not to exceed the local maximum.

10.2 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 liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. This program can be used independently or in conjunction with

other cost-share programs on the stakeholder's portion of BMP costs. It is also approved for use in supplementing the cost of repairs to streamside fencing.

10.3 Virginia Agricultural Best Management Practices Loan Program

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

10.4 Virginia Small Business Environmental Assistance Fund Loan Program

The Virginia Small Business Environmental Assistance Fund, administered through VADEQ, is used to make loans or to guarantee loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural BMPs. The equipment must be needed by the small business to comply with the federal Clean Air Act, or it will allow the small business to implement voluntary pollution prevention measures. The loans are available in amounts up to \$50,000 and will carry an interest rate of 3%, with favorable repayment terms based on the borrower's ability to repay and the useful life of the equipment being purchased or the life of the BMP being implemented. There is a \$30 non-refundable application processing fee. The Fund will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act.

10.5 Virginia Water Quality Improvement Fund

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

for both point and non point source pollution remediation are administered through VADEQ. Most WQIF grants provide matching funds on a 50/50 cost-share basis.

10.6 Conservation Reserve Program (CRP)

Through this program, cost-share assistance is available to establish cover of trees or herbaceous vegetation on cropland. Offers for the program are ranked, accepted and processed during fixed signup periods that are announced by FSA. If accepted, contracts are developed for a minimum of 10 and not more than 15 years. Payments are based on a per-acre soil rental rate. To be eligible for consideration, the following criteria must be met: 1) cropland was planted or considered planted in an agricultural commodity for two of the five most recent crop years, and 2) cropland is classified as "highly-erodible" by NRCS. Application evaluation points can be increased if certain tree species, spacing, and seeding mixtures that maximize wildlife habitats are selected. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. The payment to the participant is up to 50% of the cost for establishing ground cover. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration.

10.7 Conservation Reserve Enhancement Program (CREP)

This program is an "enhancement" of the existing USDA CRP Continuous Sign-up. It has been "enhanced" by increasing the cost-share rates from 50% to 75% and 100%, increasing the rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Pasture and cropland (as defined by USDA) adjacent to streams, intermittent streams, seeps, springs, ponds and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, to mixed hardwood trees on pasture, must be established in widths ranging from the minimum of 30% of the floodplain or 35 feet, whichever is greater, to a maximum average of 300 feet. Cost-sharing (75% - 100%) is available to help pay for fencing to exclude livestock from the riparian buffer, watering facilities, hardwood tree planting, filter strip establishment, and wetland restoration. In addition, a 40% incentive payment upon completion is offered and an average rental rate of \$70/acre on stream buffer area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area.

The 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.

10.8 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. Approximately 65% of the EQIP funding for the state of Virginia is directed toward "Priority Areas." These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. EQIP offers 5 to 10-year contracts to landowners and farmers to provide 75% cost-share assistance, 25% tax credit, and/or incentive payments to implement conservation practices and address the priority concerns statewide or in the priority area. Eligibility is limited to persons who are engaged in livestock or agricultural production. Eligible land includes cropland, pasture, and other agricultural land in priority areas, or land that has an environmental need that matches one of the statewide concerns.

10.9 Wildlife Habitat Incentive Program (WHIP)

WHIP is a voluntary program for landowners who want to develop or improve wildlife habitat on private agricultural lands. Participants work with NRCS to prepare a wildlife habitat development plan. This plan describes the landowner's goals for improving

wildlife habitat and includes a list of practices and a schedule for installation. A 10-year contract provides cost-share and technical assistance to carry out the plan. In Virginia, these plans are prepared to address one or more of the following high priority habitat needs: early grassland habitats that are home to game species such as quail and rabbit as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share assistance of up to 75% of the total cost of installation (not to exceed \$10,000 per applicant) is available for establishing habitat. Types of practices include: disking, prescribed burning, mowing, planting habitat, converting fescue to warm season grasses, establishing riparian buffers, creating habitat for waterfowl, and installing filter strips, field borders and hedgerows. For cost-share assistance, USDA pays up to 75% of the cost of installing wildlife practices.

10.10 Wetland Reserve Program (WRP)

This program is a voluntary program to restore and protect wetlands on private property. The program benefits include providing fish and wildlife habitat, improving water quality, reducing flooding, recharging groundwater, protecting and improving biological diversity, and furnishing recreational and esthetic benefits. Sign-up is on a continuous basis. Landowners who choose to participate in WRP may receive payments for a conservation easement or cost-share assistance for a wetland restoration agreement. The landowner will retain ownership but voluntarily limits future use of the land. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10-year duration. Under the permanent easement option, landowners may receive the agricultural value of the land up to a maximum cap and 100% of the cost of restoring the land. For the 30-year option, a landowner will receive 75% of the easement value and 75% cost-share on the restoration. A ten-year agreement is also available that pays 75% of the restoration cost. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and

may lease the land for hunting, fishing, or other undeveloped recreational activities. At any time, a landowner may request that additional activities be added as compatible uses. Easement participants must have owned the land for at least one year.

10.11 National Fish and Wildlife Foundation

The National Fish and Wildlife Foundation administers the Chesapeake Bay Stewardship Fund, which is dedicated to the protection and restoration of the Chesapeake Bay. The Stewardship Fund is supported through partnerships with government agencies and private corporations, and typically awards \$8 million to \$12 million per year through two competitive grant programs and a technical assistance program. Larger “Innovative Nutrient and Sediment Reduction Grants” are available to nonprofits, local governments and state agencies, while smaller “Small Watershed Grants” are available to nonprofits and local governments. A request for grant proposals is typically issued in the spring of each year, and awards are made in the late summer/early fall. Additional information on the program may be found at: <http://www.nfwf.org/chesapeake/Pages/home.aspx>.

10.12 Virginia Natural Resources Commitment Fund

The fund was established in the Virginia Code as a sub fund of the Water Quality Improvement Fund in 2008. Monies placed in the fund are to be used solely for the Virginia Agricultural BMP Cost Share Program as well as agricultural needs for targeted TMDL implementation areas.

10.13 Clean Water State Revolving Fund

EPA awards grants to states to capitalize their Clean Water State Revolving Funds (CWSRFs). The states, through the CWSRF, make loans for high-priority water quality activities. As loan recipients make payments back into the fund, money is available for new loans to be issued to other recipients. Eligible projects include point source, nonpoint source and estuary protection projects. Point source projects typically include building wastewater treatment facilities, combined sewer overflow and sanitary sewer overflow correction, urban stormwater control, and water quality aspects of landfill projects. Nonpoint source projects include agricultural, silvicultural, rural, and some urban runoff control; on-site wastewater disposal systems (septic tanks); land conservation and riparian buffers; leaking underground storage tank remediation, etc.

10.14 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 Army Corps of Engineers.

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APPENDICES

APPENDIX A: Meeting Summaries

APPENDIX B: Public Outreach

APPENDIX C: Public Comments

Little Calfpasture Water Quality Improvement Plan Community Meeting

August 2, 2016

Goshen Volunteer Fire Department

Attendees

Ann Olson	Jay Gilliam	Buster Lewis
John Pancake	Paul Bugas	Dustin Ambrose
Jim Manley	Chris Wise	Steve Smiley
John Coffman	Kip Brooks	Don Buck
Clarence Byram	Barbara Walsh	Sammy Vest
Doug Thompson	Phil Walsh	Elaine Simpson
Kent Burtner	Charles Rowe	Robert Simpson
Jerry Higgins	Sonney Thompson	Lila Davidson
Roosevelt Rowe	Norris Campbell	Phyllis Vess
Rudy Bazzrea	Donald Vess	Gene Sours
Winston Campbell	Janet Campbell	Richard Meeks
Harold Thompson	Brenda Thompson	Margaret Spencer
Sandra Stuart	Anthony Stephens	Tara Sieber (DEQ)
Lee Cummings (NBSWCD)	Charlie Simmons (NRCS)	Julie Gentry (DEQ)
Don Kain (DEQ)	Nesha McRae (DEQ)	Mike Jolly (Boy Scouts)
Gene Yagow (VATech)	Brian Benham (VATech)	
Paul Bugas (DGIF)	Spencer Suter	

Summary

Nesha McRae welcomed attendees and provided background information on the benthic (biological) impairment to be addressed through a water quality improvement plan for the Little Calfpasture River watershed. The impaired segment is located just downstream of Lake Merriweather and extends 0.82 miles downstream to the confluence with the Calfpasture River. The water quality improvement plan will include implementation actions that can be implemented both upstream and downstream of the lake in addition to lake management strategies. The 2008-2009 study of the watershed completed by DEQ

was reviewed including the primary benthic stressors identified in the process: sediment, dissolved oxygen, and a change in available food supply immediately below the dam. Nesha explained that the low dissolved oxygen problem was addressed by putting a 3 foot riser on the cold water dam outlet to ensure that highly oxygenated water is discharged from the dam. In addition, a special standard was implemented for the benthic monitoring station immediately downstream from the dam to allow for a zone of recovery for the benthic community. This special standard was adopted due to the fact that a change in available food supply is expected to occur immediately downstream from a dam, resulting in a less diverse benthic community at this location. This is what was observed downstream from Lake Merriweather. Consequently, the study focused on sediment sources in the watershed and the reductions needed. DEQ staff explained that reductions from Lake Merriweather are called for in the study in order to restore the benthic community. This will be a challenge since it places a large portion of the workload on one property owner. DEQ staff explained that while the agency has a past history of regulatory action surrounding the dam and lake beginning with a fish kill in 1992, the implementation of the plan to be developed will be voluntary and incentive based. Landowners will not be required by DEQ to implement BMPs including those related to lake management.

DEQ staff explained the process that will be used to develop the plan and the role that the local community can take in this effort. There will be an agricultural working group as well as a lake management working group, which will discuss specific management strategies to be implemented to address these sediment sources. A steering committee will also be formed in order to review the draft plan and potentially assist with future implementation efforts following completion of the plan.

DEQ staff shared some of the expected challenges that may be encountered during the planning process and during implementation. Building trust within the local community can often be challenging, especially when the water quality problem is very complex in its nature. Livestock exclusion will also present a number of challenges within the agricultural community.

The group reviewed some of the things that have happened in the watershed since the initial DEQ study was completed in 2009 that could impact water quality. A number of best management practices have been implemented since 2009 including 8.5 miles of livestock exclusion fencing. The consent order held by DEQ and the amendment to this order regarding operation of the dam on Lake Merriweather were terminated in 2014, so the Boy Scouts are no longer required to keep the lake at full pool. Concerns were expressed regarding the operation of the lake and how lake lowering events would impact sediment levels in the Little Calfpasture River. DEQ staff responded that turbidity is typically higher when the lake is lower, and that is something that will have to be addressed through BMPs in the water quality improvement plan.

Several participants noted that they have observed high levels of turbidity in several tributaries of the Little Calfpasture River in the past two years. They explained that they thought these problems are due to recent logging activities. DEQ staff offered to follow up on this. Failing septic systems were noted as a real concern in the community. While this issue isn't related to sediment, it is a problem. Nesha responded that DEQ has grant programs that could be utilized to provide BMP cost share to help landowners repair or replace failing systems. It was noted that there is a 30 day public comment period following the public meeting during which participants can send written comments to DEQ regarding content presented at the meeting.

**Little Calfpasture Water Quality Improvement Plan
Lake Management Working Group Meeting
September 20, 2016**

Attendees

John Pancake (landowner)

Don Kain (VADEQ)

Robert Foresman (Rockbridge County)

Karen Kline (VATech)

Gene Yagow (VATech)

Nesha McRae (VADEQ)

Paul Low (RACC)

Sandra Stuart (RACC)

Jay Gilliam (landowner, NBSWCD)
Pat Calvert (Riverkeeper)
Mike Jolly (CA Boy Scouts)
Ron Sprouse (landowner)
Buster Lewis (Rockbridge County BOS)
Philip Barbash (CA Boy Scouts)

Summary

Nesha McRae (VADEQ) began the meeting with a review of the Little Calfpasture Total Maximum Daily Load study, along with some of the past history of regulatory actions pertaining to the dam dating back to the early 90's. It was explained that while DEQ previously had a consent order and associated amendment in place that included specific requirements regarding daily operation of the dam, these orders were terminated in September of 2014. DEQ staff explained that the approach that will be taken during development and implementation of the water quality improvement plan will be a voluntary one. The role of the lake management working group will be to explore and identify strategies to address sediment coming in to the Little Calfpasture River from Lake Merriweather. A participant asked why the consent orders were terminated in 2014. DEQ staff explained that the conditions of the initial consent order were met by the Boy Scouts. In addition, conditions of the amendment no longer applied following the water quality standards change that occurred during the 2008 water quality assessment for the DEQ monitoring station immediately downstream of the dam. A participant asked how DEQ was allowed to change this standard, and whether or not there was any expectation that conditions at the site would improve over time and the statewide VSCI scoring criteria could be reapplied to this site. DEQ staff explained that there is a provision in the Clean Water Act that allows states to change standards due to impacts from impoundments and that there was not an expectation that the previous standard could eventually be met at this site. A participant asked whether DEQ was monitoring downstream on the Maury River below the confluence with the Little Calfpasture River. DEQ staff said that they did have a site on the Maury, but could not recall the river mile at which it is located.

Gene Yagow (VATech) shared a presentation with the group on water quality trends in the river and recent changes that have taken place in the watershed that could impact water quality. Gene described how sediment concentrations typically change in the river

when the lake is drawn down versus when it is maintained at full pool (turbidity in the river is typically higher when the lake is lowered). This could be due to the fact that water in the lake has more residence time when it is at full pool, allowing sediment to settle out. In addition, when the lake is lowered, large mudflats are exposed allowing for erosion of compacted sediment, which is then discharged from the dam. Material may also be resuspended from the lake bottom and from the plunge pool below the dam, both resulting in more turbid water downstream. Gene noted recent changes in land use in the watershed including some logging below the dam. In addition, the Boy Scouts received a grant to complete a dredging project from the Army Corps of Engineers in 2015. The ACOE supervised the project and contracted out dredging to a company out of PA (Hammond). Gene asked the representatives from the Boy Scouts where the dredged material had been placed. Mike Jolly explained that the material had been placed in a low area on the Boy Scouts property where it could not run off into a waterbody. It has been stabilized with vegetation and ACOE staff performed an inspection of the disposal site and found it to be in compliance with associated regulations. Mike noted that there was quite a bit of debris in the material removed during dredging, and that a fence has been installed around the disposal site. He also noted that there has been poor communication between the ACOE and DEQ regarding this project and associated permit requirements. DEQ staff is working on getting an estimate of the amount of material removed from the lake from staff at the ACOE. One participant asked if the scouts could share contact information for the person they worked with on this effort at the ACOE. Mike could not recall a name but said that he could follow up with contact information.

The group moved on to discuss current management of the lake and the schedule for drawing it down in the fall. Typically the lake is lowered from a depth of 26 feet to 17 feet beginning in September. The lake may not be drawn down faster than 6" in 24 hours in accordance with the Department of Conservation and Recreation's Dam Safety regulations. The Boy Scouts only open two gates at a time during this process and perform releases in the evenings when people aren't out on the river. The cold water discharge remains in operation until you get down below 22 feet. One participant asked if the lake was always drawn down to 17 feet. Mike explained that this is not always the case. The purpose of the draw down is to clean debris out of the lake, so if they reach 20

feet and it looks like that will be sufficient in order to reach deposited debris, they stop there. It was also noted that much of the sediment in the lake is deposited on the left side of the bend at the top (on the western side of the upper end of the lake), which can be seen from aerial imagery. One participant asked whether there are any sort of state or federal criteria in place with respect to the timing and duration of releases from the lake. It was noted that DCR's Division of Dam Safety does not have any such criteria in place beyond the 6" max draw down/24 hour criteria. They are charged with regulating dam safety and do not address water quality impacts. Mike noted that the Boy Scouts recently received an award from the VA Association of Lakes and Watersheds for operating the safest dam in Virginia. It was suggested that stream ecology and biology (e.g. spawning seasons for aquatic life) could be considered with respect to determination of the best time to draw down the lake and when it needed to be returned to full pool. Another participant asked about the purpose of lowering the lake each year. Mike explained that they lower it in order to clean debris out that has accumulated over the past year. They must leave the lake lowered long enough for the mud flats to dry out so that equipment can be brought out to help clear material. They typically wait until January when the ground is frozen to complete the clean up. The lake is then brought up to 24 feet in April and returned to full pool by Memorial Day.

The group moved on to discuss potential management strategies to be included in the plan. Gene shared a series of options including excavation of exposed mudflats, altering the drawdown schedule for the lake, establishing vegetation on the mudflats, and addressing the debris that is washing in to the lake from upstream. Gene also noted some new research regarding the practice of bypassing the rising limb of storm surges into lakes. He explained that lakes often trap coarse sediment and allow fine materials to move downstream. This is problematic since it is the fine material that typically fills in downstream habitat for aquatic insects. If you bypass the rising limb of a storm surge, you may be able to avoid trapping some of this material and pass along a coarser distribution of sediment, more conducive to aquatic habitat. This option could be explored for Lake Merriweather.

Mike asked what is involved in dredging the lake and how to determine how much material should be removed. It was noted that this is something an engineer would calculate based on certain conditions in the lake. A participant stated that he thought more data is needed in order to determine exactly where the sediment is coming from within the lake. He suggested completing a sediment fingerprinting study. Gene commented that he didn't think this would be very informative since much of the sediment from the shoreline and mudflats is deposited in the lake bottom and that the process of resuspension and deposition is constant. This would make it difficult to discern the origin of sediment discharged downstream using fingerprinting methods (sediment from the mudflats and the lake bottom would likely have the same signature).

One participant suggested looking in to ways to catch some of the debris that is washing in to the lake at the top, which would allow for a shorter draw down time and lower draw down level for future cleanouts. Mike explained that the lake receives a lot of debris during flash floods including large, round hay bales. Another participant noted that flash flooding has become more intense and frequent in the watershed in recent years. Mike noted that the Scouts had talked with the ACOE about diverting and filtering water immediately downstream of their footbridge at the top of the lake some time ago. Ultimately, plans for such a project did not move forward though. The group agreed that this is something that could still be explored. Mike stated that based on his observations made from the bridge at the top of the lake, it takes about 4 hours for flood waters to travel from Craigsville down to the lake, and that they are typically carrying quite a bit of sediment and other debris with them. DEQ staff asked the group whether they thought it would be helpful to prioritize a series of mudflat excavation projects for the lake, targeting areas contributing the greatest amount of sediment to the lake when it is lowered. The group agreed that this could be an effective way to address part of the problem.

One participant stated that the Natural Bridge Soil and Water Conservation District administers large amounts of cost share every year to help farmers in the watershed to install BMPs. He further stated that if the lake were kept at full pool year round, the Boy scouts could then do their part as well to help keep the river healthy. Another participant

asked whether there was room for negotiation on the draw down process for the lake (keeping the water level higher and leaving the lake below full pool for a shorter period of time). Phil Barbash (Boy Scouts) responded that they were willing to consider adjusting this process to help reduce sediment coming out of the lake. He also noted that the scouts must consider their own liability though in terms of campers swimming and boating in the lake and getting injured due to debris etc. The group discussed the issues with disposal of large items such as sofas, refrigerators and tires in Rockbridge and Augusta Counties, both of which are struggling with illegal dumping. Many local residents do not have any disposal facilities nearby that will accept this sort of refuse, thus they end up dumping it in the woods. We will need to get both counties involved in this issue whether it be through increasing accessibility of legal disposal sites, monitoring illegal dump sites, or organizing local clean ups for the materials. One participant asked what the Boy Scouts do with the material that they pull out of the lake. Some of it is burned and other items are taken to appropriate disposal sites.

One participant asked if there are lakes similar to Lake Merriweather in Virginia with respect to downstream sediment issues. It was noted that College Lake located in Lynchburg has similar issues, and that they have not yet succeeded in identifying appropriate management solutions. One participant suggested that the exposed mudflats and eroding shoreline around the lake could be revegetated with cypress trees. The Native Plant Society has had some success with these kinds of plantings and might be willing to provide some assistance. Another participant asked the Scouts whether they had ever consulted with an engineer about the rate at which the lake is filling in and what needed to be done to preserve it. He suggested that this could be cost prohibitive due to the extent of dredging that would be required and recommended removing the dam. Phil responded that this is not an option, and that without the lake, they would not have a camp.

The group discussed the next meeting date and location. Nesha offered to follow up on some of the suggestions made during the meeting and see if the scout camp would be available to host the next meeting. Two dates that will be considered are October 25 and November 1st at 2:00 p.m. Nesha will provide the next meeting date when she distributes

the notes to participants. The meeting was then adjourned.

Little Calfpasture River Water Quality Improvement Plan
 Agricultural Working Group Meeting: Rockbridge Baths Fire Hall
 September 27, 2016

Participants

Rosalie Bull	Pat Calvert (JRA)	Gene Yagow (VA Tech)
Karen Kline (VA Tech)	Tom Stanley (VCE)	Lee Cummings (NBSWCD)
Donald Vess	Sandra Stuart (NBSCD)	Conrad Wyrick (DEQ)
Phyllis Vess	Nesha McRae (DEQ)	

Summary

Nesha McRae, from the Virginia Department of Environmental Quality (VADEQ) provided an overview of the role of the agricultural working group in the planning process. She also shared updates on the project regarding planning activities that have occurred since the public meeting held in August. She provided a brief summary of the discussion that took place at the lake management working group meeting held last week. At the meeting, the group discussed illegal dumping of trash above Lake Merriweather and how it was part of the reason that the Boy Scouts have to draw the lake down each fall (to clean out large debris). Participants noted that in addition to the dumping site up at the bluffs on 601, there is another site on 601 going up to Craigsville across the Wilson bridge. DEQ and VATEch staff has also been working with the Game Commission to identify and map forest harvesting sites in the watershed and account for changes in land use and potential sediment loading to the river. DEQ staff shared a summary of agricultural BMPs installed since the TMDL was completed, noting that they will be credited towards implementation goals established in the plan. Preliminary estimates of livestock exclusion fencing needed in the watershed have been developed, with an overall estimation of 13 miles of fencing needed in the watershed. A large portion of this fencing is in one particular subwatershed where the Augusta Correctional Center is located. The group discussed the fact that the Correctional Center has over 200 livestock,

all of which have unrestricted access to Smith Creek, a tributary of the Little Calfpasture River. One participant noted that the farm at the center is managed by VA Agricultural Services, a state organization. The center has worked with VA Cooperative Extension and VA Tech on research projects in the past, and receives some assistance from VA Tech on general farm management. The VA Tech Veterinary School has also done some research out at the farm. DEQ staff suggested that they could work with VCE to approach the prison about installing livestock exclusion fencing. Unfortunately, the prison won't be able to use prisoners on site to assist with installation and maintenance since it is a medium security prison. One participant noted that the center just recently updated its wastewater treatment facility as well (about 18 months ago)

The group moved on to discuss the general status of agriculture in the Little Calfpasture River watershed. It was noted that the farming population in the watershed is aging and that few young farmers are returning to farm family farms. The older population is less interested in trying new things on their farms including livestock exclusion fencing.

The group was asked whether there are any new or innovative management practices that they thought should be considered for inclusion in the plan. It was noted that VCE recently held a fencing field day where they looked at the use of poly flex fencing to keep cattle out of the stream. This fencing costs around \$0.18/ft and has a life span of 10-20 years. Something like this could be paired with the portable solar powered watering system the VCE staff has been working with up in Augusta County as a less expensive, less management intensive option to keep cows out of the stream. One participant noted that there is a new poultry operation in the watershed on Troxell Gap Road above the prison. They have two poultry houses and are in need of a little storage shed. They have had trouble getting cost share for a facility.

Obstacles to livestock exclusion were discussed. The loss of shade and land was noted as a significant management problem. One participant noted that someone at VATEch has been conducting research on silvopastoral practices. While this practice requires a big management commitment and requires farmers to take a longer term view on their operation, it can be implemented along with rotational grazing in order to provide shade

for livestock and better utilize pastures. The researcher at Tech, John Fike, could be consulted about the potential for a research project in this area up at the prison.

The group discussed the best ways to reach out to farmers. In this particular area, there really aren't many active community groups that can assist with outreach, nor is there a very large agricultural community. There are a few absentee landowners, but not many, and some leasing of land for grazing in the watershed. One on one communication and mailings were identified as the two more effective means of getting the word out about water quality issues and BMP implementation. Participants were only aware of two farmers in the watershed who have cropland, and it only totals 50-60 acres making cropland BMPs a low priority. The group discussed potential meeting locations. It was noted that the Craigsville Fire Department might have a meeting room and that the Goshen Fire Department would be a little closer for participants for the next meeting. The next meeting will be held on either Tuesday, October 25 or Tuesday, November 1. The group agreed that 6:30 was a suitable time to meet since it will be getting dark by then in late October.

In order to gauge local interest in different BMP options and identify the most suitable livestock exclusion fencing systems for inclusion in the plan, a survey was distributed to meeting participants. Everyone was asked to rank a series of BMPs along with a series of obstacles to livestock exclusion. The results are summarized in the two tables below:

Table 1. Potential best management practices for consideration. Average rankings are shown below (8 total) with 1 being the highest priority practice and 7 being the very lowest priority.

Best management practice	Description	Rank (1-8)
Streamside livestock exclusion fencing	Excluding livestock from streams with fencing, providing alternative water sources or limited access points to the stream	1
Streambank stabilization	Sloping back and stabilizing eroding or undercut streambanks using vegetation and other natural materials. May also include placement of in stream structures using rocks and logs to prevent further erosion.	2
Rotational grazing	Establishing a series of grazing paddocks with cross fencing and rotating livestock to maximize forage production while preventing overgrazing	4

Forested streamside buffers	Planting trees and shrubs in strips (35 foot minimum) along streams adjacent to pasture and cropland	2
Grassed streamside buffers	Planting grasses in strips (35 foot minimum) along streams adjacent to pasture and cropland)	3
Forestation of crop, pasture or hayland	Convert existing pasture, crop or hayland to forest (hardwood or conifers)	7
Continuous no-till	Cropland is planted and maintained using no-till methods, only effective in reducing bacteria for cropland receiving manure applications (not commercial fertilizer)	5
Cover crops	A cover crop (e.g. rye, barley) is planted and left on crop fields through the winter to keep soil covered until a field is planted again in the spring.	6

Table 2. Obstacles to streamside livestock exclusion. Average rankings are shown below (5 total) with 1 being the most common obstacle to address and 5 being the least common obstacle.

Obstacle	Rank (1-5)
The cost of installing fencing and off stream water is too high, even with cost share assistance from federal and state programs	2
Cannot afford to give up the land for a 35 foot buffer	2
General maintenance of fencing is time consuming and expensive	1
Grazing land is rented with short term leases and landowners are not interested in installing and/or maintaining streamside fencing and off stream water	3
People do not trust the government and do not want to work through state and federal cost share programs to installing fencing systems	3

**Little Calfpasture Water Quality Improvement Plan
Lake Management Working Group Meeting
October 25, 2016**

Attendees

John Pancake (landowner)

Drac Peyton (CA Boy Scouts)

Charles Simmons (USDA-NRCS)

Karen Kline (VA Tech)

Gene Yagow (VA Tech)

Nesha McRae (VADEQ)

Paul Low (RACC)

Sandra Stuart (RACC)

Jay Gilliam (landowner, NBSWCD)

John Wise (landowner)

Ibrahim Ahmadisharaf (VATech)

Buster Lewis (Rockbridge County BOS)

Mike Jolly (CA Boy Scouts)

Philip Barbash (CA Boy Scouts)

Summary

Nesha McRae (VADEQ) began the meeting with a review of the meeting summary that was prepared and distributed following the first Lake Management Working Group meeting in September. Updates were provided since that meeting regarding a potential clean up effort at the bluffs site and the agricultural working group meeting also held in September. DEQ staff contacted Rockbridge and Augusta County staff regarding illegal dumping in the watershed. Rockbridge County staff visited the bluffs site and took photos to determine what kind of effort it would take to clean up at the site. There is quite a bit of large debris there. DEQ staff has also contacted VMI to see about a potential project for the cadets, since removing a lot of the material will require ropes and pulleys. It was noted that the last clean up project at the site was in 1995, and that it was a joint project between the county Emergency Coordinator and the Boy Scouts. They could be approached to partner on something in 2017 as well. Augusta County staff has not received any reports of illegal dumping in the area in the past three years, which is how far back they keep their records of such reports. Following the Agricultural Working Group meeting in September, an Agricultural Stewardship Act complaint was filed with VDACS against the Augusta County Correctional Center. VDACS staff has followed up with staff at the prison as well as the complainant and is hoping that a voluntary solution can be identified working in partnership with VA Cooperative Extension.

Gene Yagow (VATech) shared a presentation with the group on potential best management practices and strategies to reduce sediment coming out of the lake. He showed a map highlighting four potential areas around the lake for excavation and discussed prioritization of those sites. Options for revegetating projects were also discussed along with estimates of sediment reductions associated with each potential project area identified on the map. Gene shared dredging cost estimates (per cy of

sediment removed) based on the costs of the ACOE funded dredging project that took place at the lake in fall of 2015. Gene noted that when he compared these values with the average dredging project cost reported by the ACOE for 2015, the values for the Lake Merriweather project were extremely high (\$935.48/cy versus \$23.64/cy). Some of this may be due to the scale of the project since equipment mobilization is a fixed cost. The group discussed why the ACOE did not dredge a larger area once they had equipment out at the lake. Several participants thought that this was due to the fact that the ACOE had prepared a plan and designs for the project several years before it was completed and could not deviate from this plan due to permitting requirements. Nesha offered to follow up with the ACOE regarding the overall project costs and determine why they were so much high than national averages reported by the agency for 2015.

Gene also presented a series of alternative drawdown scenarios for the lake, showing examples of actual drawdown schedules from previous years along with estimated sediment loads that would come out of the lake under each scenario. Gene explained that these loads were not simulated using the TMDL model. They were based on estimates of sediment loads for different land uses including the exposed mudflats that appear when the lake is drawn down.

Gene shared a map of the watershed just below the dam with aerial imagery showing a disturbed area where soil erosion appeared to be occurring. Gene explained that this area was the site of the emergency spillway project recently completed for the dam, and that it could benefit from some vegetative controls to prevent further erosion. He provided estimates of the sediment load coming from this area using an average sediment loading rate for the disturbed area. Gene noted that there are a few opportunities for sediment to enter the water downstream of the dam including: resuspension of sediment in the plunge pool just below the dam, drainage from the emergency spillway which needs additional stabilization practices put in place, and a couple of stream crossings that are heavily rilled and thus actively eroding.

Gene noted that the upstream diversion project that the Boy Scout had considered previously would be another option to include in the plan. Another participant added that options for filtering out debris before it gets into the lake should also be explored. The

costs and associated engineering to design something to keep large material out of the lake should be considered since this would allow the Boy Scouts to adjust their drawdown schedule when they go in each winter to remove debris. Mike Jolly noted that the four areas Gene identified for excavation would be very easy to get to with basic equipment. The primary challenge/expense would be appropriate disposal of the material. Gene suggested exploring marketing options for the material since it would be very good soil. One participant suggested looking at the Rockbridge County 100 year flood database to identify any locations on the Boy Scout property where the material could be disposed of. The group agreed that the permitting requirements for disposal of dredged materials need to be explored. One participant asked whether the Boy Scouts thought that their bridge at the top of the lake was in danger of damage from large debris coming downstream during flood events. Mike Jolly responded that he didn't think that was a concern for them.

One participant suggested exploring the cost of all of the sediment making its way downstream to the Maury River (47 miles of river) in terms of impacts to the fishery and other forms of recreation. He suggested looking at DGIF creel surveys and contacting the Rockbridge County Service Authority to get an estimate of any additional treatment costs they typically incur.

The group discussed the example of College Lake in Lynchburg that was mentioned at the last meeting and the management strategies that were being explored. This lake is filling in slowly and reverting back to a wetland. Currently, a proposal to take out the dam is being considered in order to let the lake revert back to a wetland. It was determined that the situation at this site is not comparable enough to Lake Merriweather to draw ideas from.

One participant shared concerns about the Maury River backing up into the Little Calfpasture as a result of high flows from the Calfpasuture. Another participant asked the Boy Scouts about the intended use of the emergency spillway. They explained that the spillway is only to be used in cases of emergency, and will kick in once the lake reaches 50 feet. Another participant asked the Boy Scouts about the ACOE's role in

managing the lake. It was explained that they have limited staff available to assist with overall management but that they have expressed an interest in assisting with projects over the years to ensure the safety and viability of the dam. Mike Jolly noted that they really rely on DCR Division of Dam Safety to answer questions about day to day operation of the dam. DCR is also charged with completing regular dam inspections (the Scouts have one coming up soon). Overall, they have a very good relationship with DCR, but not very regular interactions with ACOE staff.

DEQ staff reviewed next steps for the project. There will be one more lake management working group meeting in the early spring once Nesha returns from maternity leave. During this meeting, a final implementation scenario will be selected, costs will be shared and a timeline will be agreed upon. This meeting will be followed by a steering committee meeting to review the draft plan, and a final public meeting will be held in the summer. The meeting was adjourned at 3:30.

Little Calfpasture River Water Quality Improvement Plan

Agricultural Working Group Meeting: Rockbridge Baths Fire
Hall November 1, 2016

Participants

Sandra Stuart	Phyllis Vess	Ebrahim Ahmadisharaf
Donald Vess (RACC/NBS)	Tom Stanley (VCE)	(VATech)
Nesha McRae (DEQ)	Gene Yagow (VA Tech)	Conrad Wyrick (DEQ)
Karen Kline (VA Tech)		

Summary

Nesha McRae, from the Virginia Department of Environmental Quality (VADEQ) reviewed the meeting summary from the last agricultural working group meeting with the group and provided a series of updates since the meeting. She explained that Rockbridge and Augusta County staff has been contacted regarding illegal dumping sites in the watershed. Rockbridge County staff visited the site out at the bluffs and discussed options for cleaning out the site including partnering with VMI and their cadets. The Boy Scouts may also be interested in assisting with the effort. Tom Stanley provided an update on the Augusta County Correctional Center property that was discussed at the last working group meeting. Following the meeting, an Agricultural Stewardship Act complaint was filed with the VA Department of Agriculture and Consumer Services (VDACS) against the Correctional Center due to the fact that their livestock have access to the stream. After speaking with VDACS staff, the complainant agreed to retract their complaint to allow time for VA Cooperative Extension staff to work with the prison to pursue a voluntary solution to the problem. Tom explained that he was hopeful that this will serve as an opportunity to explore some innovative demonstration practices on the prison property. He has yet to hear back from the farm manager, but continues to call and leave messages for him. DEQ staff explained that while the prison cannot qualify to receive financial assistance through NRCS or the VA Agricultural BMP cost share program, they may be able to apply for grant funds to support implementation efforts through the 319 program. Hopefully this will be an incentive for the prison to cooperate voluntarily so that the situation is not pursued through VDACS's regulatory program. Details on demonstration projects to be implemented on the property could be included in the plan to assist in securing future funding. DEQ staff will work with VCE staff to identify project specifics and outline them in the plan.

DEQ staff reviewed the results from the survey that was completed by participants at the last working group meeting. Nesha explained that the BMP implementation scenario that has been developed for the watershed was based on the rankings that participants assigned to different BMPs. Livestock exclusion from stream, streamside buffers and streambank stabilization were ranked as the three most important practices. In addition, estimates of the types of livestock exclusion systems included in the plan and their

relative proportion of overall fencing was based on the obstacles of exclusion fencing that were ranked by participants in the survey. The group reviewed the implementation scenario beginning with livestock exclusion estimates and associated costs. DEQ staff explained that these estimates were developed using aerial imagery of the watershed. Pasture land along streams was identified and the length of fencing needed was delineated. County tax parcel data was then used to determine how many different fencing projects were needed. It is estimated that a total of 40 properties need to be fenced. One participant asked what proportion of streams in the watershed need to be fenced to meet goals of the TMDL study that was completed in 2010. DEQ staff explained that a total of 66% of streams will need to be fenced out from livestock. Fencing installed since the study was completed was credited towards achieving this goal when the estimates shared with the group were developed. The group discussed the different cost share rates associated with each practice, and the fact that 85% cost share was available for a 35 foot buffer practice, while 50% cost share was available for a 10 foot setback practice. These practices can be combined by a landowner as long as they are installed in different fields. Since technical staff from the Soil and Water Conservation District were unable to attend the working group meeting, these cost estimates will be shared with them for review as well. DEQ staff shared expected overall costs along with the average cost to landowners in the watershed.

The group reviewed streambank stabilization practice estimates, which Nesha explained would most likely be installed with livestock exclusion fencing. These projects typically involve around 500 feet of stream. Consequently, estimates were developed for seven streambank stabilization projects for a total of 3,500 feet of stabilization. One participant asked what this typically involves. Nesha explained that typically, the stream banks are laid back to a more gentle slope, stabilized and revegetated. Often times in-stream structures are put in place (rocks, logs) in order to redirect streamflow to avoid additional scouring of banks and return the stream to its natural hydrology. Another participant asked whether DEQ has implemented many streambank stabilization projects through the TMDL program. Nesha responded that they have seen the greatest success in areas where there is the potential for establishment of a trout fishery. In these cases, DEQ has been able to partner with the SWCD and Trout Unlimited to complete projects. Several

examples of successful streambank stabilization projects in Rockbridge County were discussed by the group including a project on the Maury River and one on Hays Creek in Indian Bottom.

The group discussed pasture management and rotational grazing. DEQ staff explained that the implementation scenario presented is based on this practice being implemented on a large portion of pasture in the watershed (over 80%). This does not translate to a large number of acres of the practice, but it will require a high level of participation from landowners. One participant asked what improved pasture management includes. Nesha explained the DEQ has a practice for which they provide a \$25 annual incentive payment for a period of three years if certain pasture conditions are met (forage height and % cover, lime and fertilizer application according to soil testing, rotational grazing to facilitate better manure distribution). However, the feedback that DEQ has received from SWCD's on this practice to date has been relatively negative. Participation rates have been low since many farmers feel that the required benchmarks are too challenging to meet. Nesha explained that in other areas, SWCDs have directed their efforts to improve pasture conditions by promoting rotational grazing and appropriate stocking rates. These measures can have a considerable impact on runoff of sediment from pastures.

Lastly, the group reviewed estimates for cropland BMPs. DEQ staff noted that at the last meeting, participants stated that there is very little cropland in the watershed. While it appears that there are only three properties with cropland in the watershed, there is some tillage and some fields that could use cover crops on these properties. One is an organic farm, making no till a challenge. Another is the prison property, which one participant estimated has about 60 acres of cropland that they are tilling. This could be a good opportunity to work with them on cover crops and no till practices. The organic farm might also be interested in cover crops. The group agreed to increase the amount of cover crops in the plan to 30 acres in order to accommodate potential interests. A small amount of continuous no till will also be included in the plan.

The group discussed funding available for implementation efforts. Nesha explained that typically, SWCDs apply for implementation grants from DEQ once plans are approved by EPA. One participant asked whether DEQ allows for more flexibility with respect to

BMPs offered through the 319 program. Nesha responded that the 319 program has a BMP manual with specifications for practices that have to be followed in order to receive grant funding. However, the program has supported demonstration projects in the past that are not included in traditional cost share programs offered across the state. The group discussed opportunities to receive 100% cost share for livestock exclusion, which were offered through the state several years ago. The state no longer offers cost share at 100%; however, there are opportunities to supplement state and federal cost share with other grant funds. DEQ staff noted that the Natural Bridge SWCD is planning on working with the James River Association to supplement state and federal cost share funds with additional grant money to bring cost share for livestock exclusion up to 100% in the Cedar Creek and Buffalo Creek watersheds. An opportunity like this could be pursued in the Little Calfpasture as well.

The group discussed a timeline for implementation efforts. DEQ staff provided some guidance, explaining that grants for implementation are typically offered for 2-2.5 years with an option to come back for additional funding if efforts are successful. A ten year timeline was suggested for implementation efforts and participants were in agreement. Stage 1 will cover the first five years of implementation. Karen Kline (VA Tech) explained that we typically include a larger proportion of the overall implementation goals in the first five years. One participant asked how progress will be evaluated and suggested a role for citizen monitoring in gaging progress moving forward. DEQ staff agreed that supporting citizen monitoring along with water quality updates meetings has shown to be a great way to educate the local community on the impacts that BMPs are having on water quality.

Nesha reviewed next steps for the project. She explained that this will serve as the final agricultural working group meeting. A steering committee meeting will be held in the spring in order to review the draft plan and make plans for the final community meeting. Nesha asked that participants in the agricultural working group attend the steering committee meeting in order to ensure that local interests and concerns are reflected in the plan. The final community meeting will be held in the early summer. DEQ staff thanked participants for their attendance, and the meeting was adjourned.

Little Calfpasture Water Quality Improvement Plan**Lake Management Working Group Meeting****March 29, 2017****Attendees**

Peter Olivares (VADEQ Intern)
Nesha McRae (VADEQ)
Jay Gilliam (Landowner, NBSWCD)
Gene Yagow (VATech)
Mike Jolly (Boy Scouts of America)
Lee Cummings (NBSWCD)

Brian Benham (VATech)
Lee Cummings (NBSWCD)
Karen Kline (VATech)
Sandra Stuart (NBSWCD)
Charles Simmons (NRCS)

Summary

Nesha McRae (VADEQ) welcomed the group and explained that the priorities for the meeting were to review lake management strategies implementation scenarios and associated costs, and to agree upon a timeline for implementation. Nesha explained that implementation of these practices would be voluntary, and thus up to the Boy Scouts to agree upon to implement. Consequently, DEQ and their contractor, VA Tech BSE, held a conference call with the Scouts the previous week to go over implementation options and ensure that those presented to the working group would be acceptable options for them to implement. Nesha also shared with the group that she had distributed an announcement about the availability of project funding from the National Fish and Wildlife Foundation's Chesapeake Bay Stewardship Fund. Proposals are due in May. She suggested working on developing a proposal to implement lake management and agricultural BMPs as part of a comprehensive plan.

Gene Yagow (VA Tech) began his presentation on implementation scenarios with a review of the TMDL and associated water quality issues in the river. Gene explained that the majority of instances during which there was a difference in total suspended solids concentrations above and below the lake occurred at very low concentrations of sediment, meaning that the overall difference was not that great with respect to the concentration of sediment. Thus it makes more sense to focus on making reductions to the overall sediment load rather than meeting an instream concentration of sediment. Gene also explained how the goal of a 34% reduction in sediment coming from the lake

was calculated based on exposed acres of mudflats during drawdown periods. The mudflats were assigned a unit area sediment load, which was applied to the exposed acres. Based on these calculations and the load reductions expected to future loads from other sources, Gene determined that a 74.3% reduction was needed from the mudflats. A table showing a series of different drawdown scenarios for the lake was shared with the group, varying the length and depth of the drawdown. Any of these scenarios shown would be sufficient to meet the TMDL goal. One participant asked why the scenarios didn't start with having no drawdown at all, or include 1 and 2 month drawdown periods as well. Gene offered to make these calculations, but explained that based on communications with the Boy Scouts, some drawdown of the lake is needed in order to clean out debris each year and deal with large rain events. Gene noted that the emergency spillway is a new source of sediment in the watershed below the dam, which is evident on aerial imagery showing the formation of rills. This site needs to be stabilized to avoid further erosion, which would cost approximately \$15,000 per year, according to rough estimates by Gene.

Gene shared a table with the group showing the costs of implementing various practices over a period of two stages. Gene pointed out that we do not have cost data for the altered drawdown schedule. Mike Jolly (BSA) agreed that this would largely be a staff time expense. Mike is the primary operator of the dam. While there is other staff on hand who know how to operate it, they are not familiar enough with the hydrology of the lake and the river to make decisions regarding when to draw it down. Consequently, leaving the lake at full pool for longer may require training of additional staff in case Mike is not available to make these management decisions. Nesha noted that it would be good to include some degree of mudflat harvesting occurring in the first stage of implementation despite the higher cost of the practice. She explained that DEQ typically requests that proposals for implementation funds address stage 1 goals of implementation plans. Consequently, if the Scouts were interested in trying out this practice at a limited extent, it would be good to include a small number of acres in the first stage. One participant asked if the material removed from the mudflats would be considered dredged material since the lake will have been drawn down at the time of excavation. Nesha agreed to follow up on this.

The group discussed the drawdown scenarios presented, and the Boy Scouts suggested picking a wet weather scenario (Scenario A) and a dry weather scenario (Scenario B). Scenario A (wet weather) involved a drawdown time of 3 months, with a drawdown depth of 6.68 feet, while scenario B (dry weather) involved a drawdown time of 4 months, and a drawdown depth of 4.96 feet. The group was in support of this approach. Mike Jolly noted that they recently had an inspection of the dam by DCR and were told that they needed to operate the bottom gate at least once a year. The Scouts are reluctant to open this gate due to the large amount of sediment that is likely to be flushed out. There are 10 gates on the dam and Mike noted that they do not operate the two end gates due to increased scour of the shoreline that occurs when these gates are open. In order to complete much of the mudflat excavation, Mike thought that the lake would need to be lowered about seven feet, which would take some time as he is legally only allowed to lower the lake six inches per 24 hours. It was agreed that Stage 1 could focus on harvesting sediment from Area I on the map Gene shared with the group, which is at the uppermost portion of the lake.

One participant asked about the vegetative stabilization practice included in the implementation scenario and specifically, what types of plants could tolerate these conditions. Participants suggested cattails and cypress trees, but concerns remained about establishing these plants since they will be under water much of the year. UPDATE: Nesha and Gene spoke with NRCS staff about potentially trying to establish a cover crop of rye each year, broadcasting seeds by boat. If the lake is lowered 6 inches a day, the seed could be spread at the point in time when it would be submerged for a day or so. This could be tested out in a little pool prior to attempting it at the lake scale. This would be a relatively inexpensive management strategy to provide some degree of cover on the mudflats during periods of exposure.

It was noted that there is significant value to the material that is dredged, which should be considered when estimating the cost. It was noted that there is a local excavator with a farm near the lake who might be interested in doing the excavating and could also use some of the material on his farm as well. It was also noted that a private company may have been contracted to clean up the debris dumped at the bluffs site, Mike offered to follow up on this possibility.

Nesha noted the importance of monitoring TSS concentrations below the dam both before and after implementation efforts begin. Any grant proposal for BMP implementation developed for the project should also include a request for monitoring funds. One participant shared that it would be nice to partner with the local universities on such an effort.

The group moved on to discuss a timeline for the two stages. Nesha noted that the agricultural working group had suggested a 10 year timeline for the agricultural practices. One participant suggested adopting a 10 year timeline with three stages (2 years, 4 year and 4 years). The first two years would be spent exploring the feasibility of the various strategies and how effective they will be. This could include a series of pilot projects to test such as excavation of the uppermost mudflat and establishment of a cover crop on a portion of this area. The group agreed on this timeline and approach.

One participant asked whether flood control is a permitted use of the dam and is thus described in their operational permit from DCR. Nesha offered to follow up on this. The group discussed whether it would have to be specifically identified as a designated use in order for the dam to be used in such a manner. Another participant suggested that it would be worthwhile to complete additional sediment monitoring beyond the confluence of the Little Calfpasture with the Maury River. This might inform us as to the impact of the sediment further downstream and the overall health of the river.

Nesha thanked the group for their participation and noted that the next step with the project will be a steering committee meeting to review the draft plan. This meeting will be held on April 11th at 1:30 at the Rockbridge Baths Fire Hall. Everyone is welcome to attend. During the meeting, the group will review the draft plan, which will be distributed the week prior to the meeting and discuss plans for the final public meeting.

DEPARTMENT OF ENVIRONMENTAL QUALITY**NOTICE OF PUBLIC MEETING AND PUBLIC COMMENT**

The Department of Environmental Quality (DEQ) and the Department of Conservation and Recreation (DCR) seek written and oral comments from interested persons on the development of a Total Maximum Daily Load (TMDL) Implementation Plan for the Little Calfpasture River in Rockbridge County. The Little Calfpasture River was listed on the 1996 303(d) TMDL Priority List and Report as impaired due to violations of the State's general (benthic) standard for aquatic life. This impairment extends for 0.82 miles from the Lake Merriweather Dam to the confluence with the Maury River.

Section 303(d) of the Clean Water Act and §62.1-44.19:7.C of the Code of Virginia require DEQ to develop TMDLs for pollutants responsible for each impaired water contained in Virginia's 303(d) TMDL Priority List and Report. In addition, Section 62.1-44.19:7.C of the Code of Virginia requires expeditious implementation of total maximum daily loads when appropriate. The IP should provide measurable goals and the date of expected achievement of water quality objectives. The IP should also include the corrective actions needed and their associated costs, benefits, and environmental impacts. DEQ completed a benthic TMDL for the Little Calfpasture River in January 2009. The TMDL was approved by the Environmental Protection Agency in April 2010. The TMDL report is available on the DEQ website at: <http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx>

The Virginia Department of Environmental Quality will host a public meeting to initiate the development of a TMDL Implementation Plan for the Little Calfpasture River on **Tuesday, August 2, 2016 at 7:00 p.m.** at the Goshen Volunteer Fire Hall (140 Main Street, Goshen VA).

A 30-day public comment period for the meeting will begin on August 3, 2016 end on September 1, 2016. Written comments should include the name, address, and telephone number of the person submitting the comments and should be sent to Nesha McRae,

Department of Environmental Quality, P.O. Box 3000, Harrisonburg, VA, 22801, telephone (540) 574-7850 or e-mailed to nesha.mcrae@deq.virginia.gov.

Invitation to first public meeting:

July 13, 2016

I am writing to invite you to a community meeting and ice cream social to kick off the development of a water quality improvement plan for the Little Calfpasture River in Augusta and Rockbridge Counties. The Virginia Department of Environmental Quality (DEQ) and partners will be hosting the meeting on ***Tuesday, August 2nd from 7:00 – 8:30 p.m. at the Goshen Volunteer Fire Department (140 Main Street, Goshen VA)***. Special thanks to the Rockbridge Area Conservation Council and the Natural Bridge Soil and Water Conservation District for their generous sponsorship of the ice cream social!

The Little Calfpasture River is on Virginia’s list of “dirty waters” because a section of the river reaching downstream from Lake Merriweather to the river’s confluence with the Maury does not support a healthy and diverse population of aquatic life. A previous study completed by DEQ showed that sediment is the primary pollutant to blame for this problem. When excess sediment covers the river bottom, it fills in the spaces between rocks and smothers the aquatic life that typically lives in these spaces. These aquatic insects serve as the foundation of the food chain in our rivers and streams, meaning that this problem also impacts fish, birds and mammals in the Little Calfpasture River drainage area.

The plan that we will develop can serve as a road map to help correct this problem. We will be looking at the entire drainage area or watershed of the Little Calfpasture River in this planning process, so we will be reaching out to landowners both above and below the lake for their help. The plan follows a study of the creeks completed back in 2009 by DEQ (formally known as a Total Maximum Daily Load (TMDL)). The study identified the sources of sediment in the water and the reductions needed in order for the river to support a healthy aquatic community.

Using local input, we will develop a plan that can be implemented voluntarily by the community. We hope to draw from experiences that local landowners have had implementing conservation practices and collect ideas on community outreach strategies. As a landowner along the river or one of its tributaries, your participation in the development of this plan is critical to ensuring that it includes strategies that the local community can support. This meeting will be an excellent opportunity to learn about the problems facing the river and share your thoughts on what can be done to help. We hope to see you on the 2nd, please feel free to call with questions in the meantime.

Sincerely,



Nesha McRae

Non Point Source TMDL Coordinator, VADEQ

Phone: (540)574-7850

Email: nesha.mcrae@deq.virginia.gov

COMMUNITY MEETING

to create a clean up
plan for the

Little Calfpasture River

August 2, 2016

7:00-8:30 p.m.

Goshen Volunteer Fire Department
140 Main Street, Goshen VA

Calling All Little Calfpasture Watershed Residents:

The Little Calfpasture watershed includes all of the land area that drains to the river when it rains. Currently, the river is considered unhealthy due to high amounts of sediment in the water, which is harming stream life. As a result, the Little Calfpasture River has been placed on Virginia's dirty waters list. When waterways are placed on this list, it triggers the state to initiate its clean up process. In partnership with local residents and local community organizations, the Virginia Department of Environmental Quality will develop a plan outlining the best ways to address this problem in the river. If you are interested in learning more about the problems facing the Little Calfpasture River and what you can do to help, please join us!



*Come and enjoy **free** ice **cream** with your friends and neighbors, sponsored by Rockbridge Area Conservation Council and the Natural Bridge Soil and Water Conservation District while you learn what you can do to help the Little Calfpasture River!*

For more information, contact:

Nesha McRae, VADEQ
(540) 574-7850
nesha.mcrae@deq.virginia.gov



DEPARTMENT OF ENVIRONMENTAL QUALITY**NOTICE OF PUBLIC MEETING AND PUBLIC COMMENT**

The Department of Environmental Quality (DEQ) and the Department of Conservation and Recreation (DCR) seek written and oral comments from interested persons on the development of a Total Maximum Daily Load (TMDL) Implementation Plan for the Little Calfpasture River in Rockbridge County. The draft TMDL Implementation Plan for the Little Calfpasture River can be found here: <http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLImplementation/TMDLImplementationPlans.aspx>

The Little Calfpasture River was listed on the 1996 303(d) TMDL Priority List and Report as impaired due to violations of the State's general (benthic) standard for aquatic life. This impairment extends for 0.82 miles from the Lake Merriweather Dam to the confluence with the Maury River.

Section 303(d) of the Clean Water Act and §62.1-44.19:7.C of the Code of Virginia require DEQ to develop TMDLs for pollutants responsible for each impaired water contained in Virginia's 303(d) TMDL Priority List and Report. In addition, Section 62.1-44.19:7.C of the Code of Virginia requires expeditious implementation of total maximum daily loads when appropriate. The IP should provide measurable goals and the date of expected achievement of water quality objectives. The IP should also include the corrective actions needed and their associated costs, benefits, and environmental impacts. DEQ completed a benthic TMDL for the Little Calfpasture River in January 2009. The TMDL was approved by the Environmental Protection Agency in April 2010. The TMDL report is available on the DEQ website at: <http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx>

The Virginia Department of Environmental Quality will host a public meeting to wrap up the development of a TMDL Implementation Plan for the Little Calfpasture River on **Thursday, May 18, 2017 at 7:00 p.m.** at the Goshen Volunteer Fire Hall (9696 Maury River Road, Goshen VA).

A 30-day public comment period for the meeting will begin on May 19, 2017 end on June 19, 2017. Written comments should include the name, address, and telephone number of the person submitting the comments and should be sent to Nesha McRae, Department of Environmental Quality, P.O. Box 3000, Harrisonburg, VA, 22801, telephone (540) 574-7850 or e-mailed to nesha.mcrae@deq.virginia.gov.

Second public meeting invitation:

May 8, 2017

Dear ,

Over the past nine months, The Virginia Department of Environmental Quality and partners have been working with your community to develop a plan to restore the Little Calfpasture River. We will present this draft plan at a community meeting on ***May 18th at 7:00 p.m. at the Goshen Volunteer Fire Hall (9696 Maury River Road, Goshen, VA)***. Partners will be setting up informational displays at the meeting, so this will be a great chance to learn about the help that is out there for landowners who want to do their part to clean up the river. The Natural Bridge Soil and Water Conservation District will be providing refreshments as well!

The stretch of the Little Calfpasture River that we are concerned with runs from below the Goshen Dam to the river's confluence with the Maury. This reach of the stream has been placed on Virginia's list of "dirty waters" because it does not support a healthy and diverse population of aquatic life. A study of the river completed in 2009 revealed that this is due to excessive amounts of sediment coming in to the river. This sediment covers the river bottom, filling in valuable habitat for stream life. The plan that we have developed addresses the entire drainage area for the Little Calfpasture River, from its headwaters up in Great North Mountain all the way down to the confluence with the Maury River. The plan is meant to serve as a road map to correct the sediment problem facing the river.

We made many efforts involve the community in creating this plan including agricultural and lake management focus group meetings and the formation of a steering committee. The draft plan includes a series of management strategies for Lake Merriweather and the Goshen Dam, as well as actions that landowners can take to help the river. Examples include altering the lake drawdown schedule in the fall, excavating sediment from mudflats exposed during drawdown periods, excluding livestock from streams, and implementing rotational grazing systems. The plan also includes a timeline, education and outreach strategies, costs and benefits, and potential funding sources.

The meeting on May 18th will kick off a 30-day public comment period during which anyone can offer feedback on the plan (available after the 19th at <http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLImplementation/TMDLImplementationPlans.aspx>).

As a landowner in the community, your participation in the implementation of this plan is very important. We hope that you will be able to join us to learn more about the river!

Sincerely,



Nesha McRae

TMDL Coordinator, VADEQ

phone: 540-574-7850; email: nesha.mcrae@deq.virginia.gov

COMMUNITY *MEETING*

to present a clean up plan for the

Little Calfpasture River

May 18, 2017
7:00-8:30 p.m.

Goshen Volunteer Fire Department 9696
Maury River Road, Goshen VA

Calling All Little Calfpasture Watershed Residents:

The Little Calfpasture watershed includes all of the land area that drains to the river when it rains. Currently, the stretch of the river below the Goshen Dam is considered unhealthy due to high amounts of sediment in the water, which is harming stream life. As a result, the Little Calfpasture River has been placed on Virginia's dirty waters list. When waterways are placed on this list, it triggers the state to initiate its clean up process. In partnership with local residents and local community organizations, the Virginia Department of Environmental Quality has developed a plan outlining the best ways to address this problem in the river. If you are interested in learning more about this plan and what you can do to help, please join us!



Come and enjoy **cookies and lemonade** with your friends and neighbors, sponsored by the Natural Bridge Soil and Water Conservation District while you learn what you can do to help the Little Calfpasture River!

For more *information*, contact
Nesha McRae, VADEQ
(540) 574-7850
nesha.mcrae@deg.virginia.gov



**Response to Comments Document for Little Calfpasture TMDL
Implementation Plan Development**

Introduction:

The first public meeting for the Little Calfpasture River TMDL Implementation Plan was held on August 2, 2016. This project included the development of a series of implementation scenarios to meet a sediment TMDL for the Little Calfpasture River in addition to incremental water quality milestones. The final public meeting for the project was held on May 18, 2017. The draft implementation plan was presented at the meeting and made available on the Virginia Department of Environmental Quality (DEQ) website at that time. A 30-day public comment period was held after both meetings. During the public comment periods, comments were received from Mr. Jay Gilliam, Ms. Sandra Stuart, and Mr. Jerry Higgins. The full text of the original comments and DEQ's responses to those comments are provided below.

Public Meeting #1 (Comment period: August 3, 2016 – September 1, 2016)***Comments from Mr. Jay Gilliam:***

My first awareness of the pollution problem in the Little Calfpasture came in late 1992 when I observed a fish kill from the swinging bridge immediately downstream of the Calfpasture and the Little Calfpasture rivers. Watching the state agencies of the Commonwealth of Virginia “manage” this problem over the last 25 years is a source of bitter disappointment to me.

If it were not for the existence of Lake Merriweather, the sediment carried by the Little Calfpasture would be delivered downstream to the Maury River in a normal system and there would be very little significant sediment deposition degradation in the receiving water bodies. Because the lake has captured much of the normal amounts of sediment, building up on the lake bed, and because the lake management procedures undertaken by the owners of the lake, a great deal of downstream ecological impairment has and is taking place. The stream section covered by the LCTMDL ends at the confluence with the Calfpasture (the beginning of the Maury River). In fact, the damage resulting from

these unfortunate intentional practices extends far downstream throughout the 43 mile course of the Maury and into the James River and the lower Chesapeake Bay.

The Virginia DEQ permits the owners of the lake to lower the lake level by manipulating the dam during the months that it is not in primary use by the National Capital Area Council of the Boy Scouts of America as a recreational facility (October – April usually). The exposed “mudflats” are vulnerable to storm events during these months and greatly increased amounts of sediment pollution are flushed over the dam and into the impaired section and below. In the past this practice had been prohibited by a DEQ consent order but later dismissed. There is no reason for this practice except to allow fall, winter, and spring storm events to flush massive amounts of sediment that has accumulated over the years into the downstream system. The benefit of this practice to the owners is that by allowing this flushing they will not need to employ more responsible (and expensive) methods of preventing the lake from turning back into wetlands. Ariel photos for the area prior to the construction of the lake show the area as a rare contiguous wetland. This sediment pollution degrades the biological integrity of the downstream ecosystem. It is detrimental to the sport fishing industry as well as requiring increased water treatment at public water supplies downstream.

There is one simple and very inexpensive action that can contribute significantly to the mitigation of this problem. **Require that the lake be kept at full pool year around.** Some of the suspended sediment will still be flushed by storm events but much less than under the current unfortunate program.

Another, better solution, would be to remove the dam, mine the deposited sediment, and manage the stream back into a natural channel. There is little doubt in my mind that the costs of doing this would be objectionable to the current owners, but in my mind that is the most effective long term solution.

I offer my participation on any committees created to further the LCTMDL implementation plan. There are many additional concerns that I have about the management of this lake. They concern the lack of oversight and regulation of releases of water from the dam and the resulting public safety concerns for unwitting individuals

participating in outdoor recreation downstream. I am aware that laws that might address this concern either do not exist or are administered by another state agency.

My awareness of this travesty has convinced me to run successfully for election as director from Rockbridge County to the Natural Bridge Soil and Water Conservation District (NBSWCD) in five consecutive elections. The NBSWCD efficiently administers many thousands of state dollars to help farm families to implement best management practices. More degrading sediment comes from Lake Merriweather than any (if not all) the farms in Rockbridge. To participate in these activities when the sediment from this lake is tolerated is beyond ridiculous.

DEQ response to Mr. Jay Gilliam:

Dear Jay,

Thank you for your comments on the development of the Little Calfpasture Water Quality Improvement Plan, and for your participation in the planning process to date. Your comments on the management of the lake and its impact on the Little Calfpasture River demonstrate your passion for this valuable natural resource and your dedication to restoring the ecology and water quality of the river.

Your concerns about the mudflats that are exposed when Lake Merriweather is drawn down are shared by DEQ. Like you, we believe that this is a significant source of sediment in the lake and in the Little Calfpasture River downstream of it. We too are concerned about the impact of lowering the lake for an extended period of time with respect to erosion and subsequent sediment discharges into the Little Calfpasture River. We plan on presenting the option of maintaining the lake at full pool as a management strategy to the Lake Management Working Group. In addition, other management strategies will be considered to fully address sediment coming from the mudflats and the lake bottom, including vegetation stabilization techniques, targeted mudflat excavation, and engineered practices to reduce scouring. We have been working with our contractors at Virginia Tech, and with faculty at James Madison University to conduct a broad literature review of lake management and shoreline stabilization practices so that all potential management strategies may be considered. We hope the Lake Management

Work Group members will identify additional practices for consideration to address downstream sediment issues.

As we have found with implementation plan development in other communities, selecting a diverse suite of management strategies typically results in the highest levels of BMP implementation since property owners are provided with a wide variety of options. Therefore, we want to be sure to consider all options to better control this sediment load, and target our efforts at areas within the lake that are contributing the greatest portion of the load. As we learn more about the innovative strategies that are being employed in other states to address sediment loading in lakes, I have grown more hopeful that we will be able to identify some solutions to address sediment in Lake Merriweather and its impact to our waterways downstream. In addition to practices that target lake management options, we will also target more conventional practices within the watershed, including agricultural, residential, and forestry BMPs.

DEQ has no authority to require that Lake Merriweather be maintained at a certain level, either through our Enforcement Division or our Water Division in which the TMDL implementation program resides. Our approach to date with all TMDL implementation in Virginia has been a voluntary, incentive based one. Unlike some of DEQ's other program areas wherein permits are issued and enforced, TMDL implementation and nonpoint source pollutant management programs at DEQ are strictly voluntary. The Little Calfpasture TMDL implementation plan presents a unique challenge to this approach in that so much of the success of implementation depends on cooperation from one property owner in the watershed. Therefore, we consider it critical that we work as closely as possible with the Capital Area Boy Scouts and local stakeholders in identifying management solutions for Lake Merriweather in order to maximize the likelihood that recommended strategies will be employed, and to ensure that we have selected a set of strategies that the community has confidence in and can support. As you noted, if the Boy Scouts do not employ new management strategies, it will not be possible to restore the Little Calfpasture River downstream, even with considerable efforts from the agricultural community.

Thus our only option moving forward with implementation is to identify management strategies that the Boy Scouts are willing to adopt voluntarily and explore incentives such as grant programs that will encourage their participation. We plan to work with concerned stakeholders in concert with the Boy Scouts to select a set of strategies that the community feels confident will correct water quality problems downstream.

Regarding your concerns about inclusion of the comments and study results that you submitted during TMDL development, these documents are indeed included in the file of record for the Little Calfpasture TMDL. While the complete report published by Dr. Deva Borah is not included in the comment response document available on the DEQ website, Dr. Borah's comments and the DEQ responses to these comments are a part of the document posted on our website (<http://www.deq.virginia.gov/portals/0/DEQ/Water/TMDL/Comments/lcalfcr.pdf>). Due to the size of Dr. Borah's report and limitations on data storage on our website, DEQ TMDL staff felt that referencing the report and providing a detailed list of comments submitted as a result of the report would be sufficient to capture concerns revealed as a result of Dr. Borah's work on this effort.

Your continued participation in the development of this plan is appreciated and will assist us with respect to identifying suitable implementation strategies and tools for local engagement. As a landowner along the river downstream of the dam, your concerns are very important to us as we move forward with planning efforts, and we expect that they are shared by other downstream landowners and conservationists. I appreciate the effort that you have put into protecting and restoring the Little Calfpasture River, and I hope that we can adequately address and accommodate your concerns as we develop this water quality improvement plan. Please feel free to contact me should you have any further questions.

Sincerely,



Nesha McRae

Non Point Source TMDL Coordinator

DEQ Valley Regional Office

Comments from Ms. Sandra Stuart:

1. Will the lake management group also consider the operation of the dam and the lack of sufficient warning in an emergency to those downstream, especially those very close to the dam?
2. Will the operation & management manual for the dam (DCR) be available?
3. The special exception for the Little Calf below the dam: please explain what this means. And, is there any timeline or oversight of the exception?
4. Why does the CWA not apply to this river?
5. Why is Lake Merriweather not listed as a significant lake in the commonwealth?
6. Why was the Consent Order rescinded when the situation remains unresolved?

I think that's it. Looking forward to getting started with the Lake Mgnt group.

Thanks,

Sandra

In addition to the comments above, the following information was submitted as an attachment to Ms. Stuart's comments:

CHRONOLOGY of CONSTRUCTION, OPERATION, and MAINTENANCE of

LAKE MERRIWEATHER and GOSHEN DAM

See acronyms, abbreviations and sources at end of chronology record

Introduction

From the chronology following this introduction, you can see that the problems of water quality, sedimentation, and dam safety are long-standing. Virginia's SWCB, DCR, DGIF, VDH, and DEQ and the U.S. EPA, USACE, and U.S. FWS have all worked very hard to try and make the dam safe and the Little Calfpasture River clean. Even so, a permanent, comprehensive and integrated solution still eludes us.

For example, in 2013, the primary state dam regulatory agency, Virginia Department of Conservation and Recreation (DCR), accepted the recommendation from the Boy Scouts of America (BSA) that the lake be lowered for lengthy periods in the non-camping season. This contradicted the DEQ order to maintain minimum levels to prevent sediment flushing from the lake. DCR did not require analysis of alternate management techniques for inspection, removal of debris, tree-planting, and removal of sediment to maintain lake depth that would help protect downstream water quality.

DCR also approved the BSA's Emergency Action Plan without response to public comments. Among the comments that RACC made to DCR on the Plan in July 2013 were the need for a more effective communications plan for informing those on the river when the lake is being significantly lowered and, in the event of a flood and potential overtopping of the dam, a horn alarm. The current system of informing only the Rockbridge county emergency management office – which then issues a text message or email to those who are able to subscribe – has proved to be ineffective and unreliable. A text or email to let people know of a flood in the middle of the night is not helpful – especially in a rural area where cell phone and internet service are either not available or affordable for many residents in the area, and it is likely unavailable to recreational users on the river.

Another state agency, the Department of Game and Inland Fisheries (DGIF), oversees the Goshen-Little North Mountain Wildlife Management Area (WMA) which borders the Goshen Reservation with regulatory authority focused on wildlife impacts. As you can see in the following chronology list, the department has been involved in several efforts

to help restore the Little Calfpasture River below the dam. Another fish kill would trigger DGIF enforcement; however, benthic monitoring has continually shown that healthy aquatic life cannot be supported under existing conditions (*Administrative Code 9VAC25-260-310, Part VII, gg.*). The river has been polluted for so long that fish to kill are likely scarce.

The Virginia Department of Health requires an annual report of the self-inspection of the wells on the six camps on the Reservation, all of which showed bacterial problems by August 2014, the most recent report. After treatment the wells passed inspection. In October 2015, a unrepairable leak in the waste lagoon was reported. DEQ & VDH recommended closure of the pond and this was completed in April 2016. The Rockbridge division of VDH is responsible for oversight of the wastewater treatment on the Reservation. Recent (2015) records show that a gray water system built in 1999 at one of the camps was still adequate; however, in anticipation of growth, construction plans were approved for updating the system.

The state agency with the primary responsibility for water quality, the Department of Environmental Quality (DEQ), issued a Notice of Violation in 1993, followed by a Consent Order from the State Water Control Board (SWCB) requiring the BSA to implement an alternate method for draining the lake without opening the subsurface discharge or to construct a settling basin for removing sediment when using the subsurface discharge. In 1998, the SWCB revised the order to require maintaining a full pool, except in emergencies, and to submit quarterly reports to DEQ. In more than two decades since 1993, the existing records showed inconsistent and negligent compliance. DEQ reported that the special Consent Order was canceled in September 2014, which leaves water quality issues unresolved.

The 2010 TMDL drafted by DEQ and approved by the U.S Environmental Protection Agency (EPA) suggests models to help bring the Little Calfpasture back to health, but it is a voluntary document and BSA has chosen not to volunteer. DEQ says the BSA has never responded in any way to the TMDL. In August 2014, BSA informed DEQ of their lake management plan. The plans do not include a plan to deal with the sediment problem. DEQ will continue ambient monitoring above and below the dam on the Little

Calfpasture bi-monthly; however, they have told us (RACC) they have no plan to implement the TMDL in the near future. (*Sept 2015: On request from NBSWCD, DEQ agreed to implement the TMDL in the summer of 2016.*)

Upon asking the TMDL division of EPA in October 2014 what, if anything, could be done, we were told that it was up to the U.S. Army Corps of Engineers (USACE or Corps). At the same time, the Corps reiterated that Goshen Dam is a recreational dam, *not* a flood control dam.

In 1979, the Corps had listed the dam as “High” hazard in accordance with the Federal dam safety guidelines. Then in August 2006, they issued their *Dam Safety Evaluation Study* and *Final Environmental Assessment*, which recommended armoring the dam and keeping the lake at full pool. Otherwise, the Corps has informed us that its responsibility for Goshen Dam is limited to the protection of wetlands and that they have “no dog in the fight” over water quality.

In 2013, the Corps replaced the weir and conducted an engineering inspection before the construction of a new spillway. The engineering report of that visit, we are told, was done for a private party and is not available to the public. The resulting construction dealt only with engineering safety and did not include features for water quality or aquatic wildlife passage. Subsequently, the Corps also arranged for permanent mitigation credits for a small wetland below the dam. (FOIA submitted July 2016)

In addition to the many state and federal agencies who have been involved in different aspects of the problems with Goshen Dam, the Maury Service Authority (MSA) withdraws and treats drinking water for Lexington and Rockbridge county 10 miles below the dam. During the last several years, the MSA has requested that BSA alert them when lowering the gates because whenever the lake is lowered, the resulting silt turns up in the plant and has to be specially treated at extra cost. Notification would allow the MSA, at least, to anticipate and implement the needed changes to the treatment system. As of 2015, the BSA will only agree to inform the county emergency management office, even while insisting that lowering the lake is not an emergency.

Although the Goshen Scout Reservation is a totally private, non-profit facility, RACC has also reached out directly to the organization and initially received a polite, but non-committal response. The lake is the primary element of the very desirable camping program for the 10,000 campers and 250 staff from the D.C. area who enjoy the experience of being there for 6 weeks in the summer. The sediment accumulation in the lake; however, is an ongoing problem for the BSA. The lake is silting up despite being lowered (flushed) every year. In 2013, the average depth was 6.68 feet and the deepest portion behind the dam, 20 feet – 6 feet less than when the dam was built in 1966. For this reason, we assumed BSA would benefit by considering the options offered in the 2010 TMDL, and we invited them – by phone and email (Apr 2014) and letter (Oct 2014) – to consider finding ways to allow the Little Calfpasture to be restored. Unfortunately, we have not received responses from the BSA.

Meanwhile, sediment discharged from Goshen Dam continues to impact water quality downstream, including Goshen Pass. In December 2014, in the Calfpasture River, which does not receive water from the dam, the rocks were obviously clean and the water clear, but in the Little Calfpasture, which receives the dam discharge, the rocks were very slippery and heavily coated. Where the Maury River begins at the confluence of the Little Calfpasture with the Calfpasture, the difference in water quality between the two tributaries is obvious from the Swinging Bridge with a muddy stream from the Little Calfpasture contrasting vividly with the clear water of the Calfpasture, and then flowing noticeably in a plume down to Goshen Pass. Trout Unlimited sponsored monitoring of the two rivers for a year, and the results are noted in the *Chronology* which follows.

As a non-profit organization, BSA pays no taxes to Rockbridge County; however, we (RACC) hope there can be consideration for those who live and work in Rockbridge County, as well as for the environment. Most of the dwellings in the path of any dam breach have been there for decades before the dam was built, and their owners have important safety needs, but they also desire to have clean water in the river that passes by their houses.

In addition, local citizens consider Goshen Pass a very special place and visit it frequently for picnics, reunions, tubing, kayaking, swimming, birding, hiking, and for

fishing and hunting year round. In addition, tourism is a major contributor to the local economy and the Pass is a very desirable tourist destination.

All 43 miles of the Maury River run through Rockbridge County and, for all the reasons described above, we need to protect it. However, as the following chronology shows, despite multiple agencies' efforts – or perhaps because of the fragmentation of regulatory authorities – the impact of Lake Merriweather and Goshen Dam on the Little Calfpasture, Maury, James, and Chesapeake Bay watershed continue without resolution. As the agency from which the federal authorities for water quality are delegated to states, we believe that EPA, Virginia DEQ, and VDH have key roles to play in directing the process toward a comprehensive solution that ensures the protection of water quality, wildlife, human health, and the environment.

January 2016

Continuation of chronology sent to DEQ in 2015.

Sep 2013 Lake lowered for winter “maintenance” (RC emergency management office)

Nov 2013 The Nature Conservancy sells 0.43 non-tidal permanent wetland mitigation credits to NCAC-BSA. (Letter to Shirley Contracting – USACE file)

Nov 2013 NCAC-BSA total revenues - \$16,374,505; total expenses - \$12, 080,323; net assets - \$38,490,953. (CitizenAudit.org – BF)

Invitation by email to BSA by RACC to discuss the problems of water quality below the dam. (No response)

Paul Low et al presentation at Geological Society of America 63rd annual meeting:
Identifying Seasonal Drawdown Events of Lake Merriweather: Implications for Water Quality in the Little Calfpasture and Maury Rivers.
 (2000-2013) . (BF)

Corps reiterates that their only oversight of Lake Merriweather is protection of wetlands. The dam is not for flood control, recreation only. Engineering report for pre-construction visit unavailable. (USACE file)

DCR: DEQ's prohibition of opening lower gate inappropriate and lowering the lake in the winter is "simply good practice." (Email – DCR dam safety file)

DCR: DEQ reports that the 1998 Consent Order is no longer in effect. Ambient monitoring bi-monthly and benthic monitoring spring and fall is the only water quality protocol in place. BSA informs DEQ of their plans for maintaining the lake; no plan for sediment control included. (Notes on meeting – DEQ file)

Lake lowered for winter maintenance. (RC emergency management)

Request by letter from RACC to BSA to discuss water quality problems below Goshen Dam. (No response as of Jan 2015 – BF)

Email questions to DEQ and EPA TMDL coordinators about operation & maintenance of Goshen dam: recommend USACE as the contact agency. (BF)

DCR: certificate approved entitling BSA to operate and maintain Goshen dam for six years pursuant to the Dam Safety Act (Section 10.1-604 et seq, Code of Virginia). (DCR file)

Trout Unlimited monthly ambient monitoring of Little Calfpasture begun at confluence with Calfpasture. Width 32 ft; water temp 42.6 degrees, air 63.3; turbidity 50 cm/11NTU; conductivity 200.5 (CitSci.org)

DCR: BSA operating and maintenance manual for Goshen Dam not required. (Email DCR)

Dec 2014 Little Calfpasture below dam listed impaired for *e.coli* and benthic - macroinvertebrate bioassessments.(DEQ integrated report 2014) [There are no Commonwealth TMDL standards for D/O or sediment, even

though unsafe levels of these criteria are scientifically recognized. EPA website: water quality standards.]

Consent Order requirements cease and BSA no longer required to report lake lowering to Va SWCB.

Little Calfpasture: 33 ft wide; water temp 39 degrees, air 44; turbidity 63 cm/8 NTU; conductivity 156.7 (CitSci.org)

RACC sends letter to EPA, Region 3, to request enforcement of 2010 TMDL. (See *Introduction* to this chronology)

Little Calfpasture: 36 ft wide; water temp 37.9 degrees, air 52; turbidity 54 cm/9.8 NTU; conductivity 137.3 (CitSci.org)

Little Calfpasture: 53.5 ft wide; water temp 47.8 degrees, air 58; turbidity 33 cm/21NTU; conductivity 104.7 (CitSci.org)

Apr 2015 After inquiry about status, RACC letter to EPA reported lost. Letter and packet resent. (Telephone call: sws)

BSA begins refilling lake. Little Calfpasture flow very slow and muddy; width diminishes from 53.5 feet across to 39 feet; water temp 63 degrees, air 76; turbidity 35cm/19NTU; conductivity 117.9 (CitSci.org)

Canooers requested benthic monitoring and turbidity and sediment deposit measurements be performed on mouth of Little Calfpasture into the Maury. (DEQ - BF)

Little Calfpasture: 33 feet width, water temp 76.2 degrees, air 80; turbidity 96 cm/ 5NTU; very low flow; conductivity 117.2. (CitSci.org)

EPA, Region 3, declines to review RACC request, suggests contacting Va TMDL coordinator, who had already been contacted (see Oct 2014 above); and DCR dam safety engineer, who had already been contacted (see Nov and Dec 2014 above).

Little Calfpasture: 26 feet wide; air temp 81 degrees, water temp 83.1 degrees; turbidity 100 cm/4 NTU; conductivity 155.9 (CitSci.org)

Jul 2015 Little Calfpasture: 31 feet wide after rain, air temp 78 degrees, water temp 83 degrees; turbidity 78cm/ 6NTU; conductivity 159.5 (CitSci.org)

NBSWCD sends letter to DEQ Director requesting that the 2010 TMDL for Little Calfpasture be implemented.

Little Calfpasture: 20.5 feet wide, air temp 78 degrees, water temp 81.1 degrees; turbidity 89 cm/5NTU; conductivity 174.6 (CitSci.org)

NCAC-BSA book value of all assets at end of 2014: \$53,254,040. (CitizenAudit.org - BF)

DEQ Director replies that an IP for the Little Calfpasture River will be initiated for the summer of 2016. (BF)

BSA reported to lowering lake to RC emergency who let MSA know, but the lowering is not reported on the emergency alert system to the 1500 people requesting to be informed. RACC requests again that BSA report directly to MSA and to those registered on the emergency alert system for dams. Emergency coordinator agrees and apologized for mistake. (BF)

Little Calfpasture: 18 ft wide; water temp 74.7 degrees, air 72; turbidity 120 cm/0 NTU; conductivity 178.15. Scouts had built a beaver-style “dam” directly above monitoring site. (CitSci.org)

Little Calfpasture: 40 ft wide; water temp 62.1 degrees, air 69; turbidity 35cm/19 NTU; conductivity 192.5 (CitSci.org)

Unable to repair leak in waste lagoon (sewage pond) near Camp Olmstead. VDH and DEQ recommend closure.

Dredging of Lake Merriweather by Eastern Construction & Excavation, Inc. (BF)

Little Calfpasture: 32 ft wide; water temp 42.3 degrees, air 50; turbidity 48 cm/12 NTU; conductivity 143.3 (CitSci.org)

Request from BSA to expand gray water system at Olmstead Dining Hall granted by health department (Lex/RC DH - BF)

RACC: letter to Tom Smith, Virginia Natural Preserves Program Director, requesting assistance in restoring water quality in the Pass (BF)

Reply from Director Smith: trails rehabilitated, invasive plant inventory a priority, no mention of water quality. (BF)

VDH records for self-inspection of the wells at the six camps on the reservation (2014) pass except for bacterial problems in August, which were successfully treated. (BF)

RACC: follow-up letter to Director Smith requesting specific information on plans for addressing impairment of Maury River in Goshen Pass (BF)

Letter from William Hazel, MD, Virginia Secretary of Health & Human Services, replying on behalf of Director Smith about the problem of *E.coli*, indicates that VDH intervenes in reported cases of waterborne illnesses and that DEQ is in charge of water quality. [References made to VDH website did not prove helpful for restoring water quality.] (BF)

RACC: follow-up letter to Dr. Hazel updating his information on SWPOZ in RC and questioning the value of the VDH information online for the Goshen impairment. (BF)

RACC watershed committee: citizen monitoring request sent to DEQ for benthic monitoring of the Little Calfpasture. (BF)

Closure plan for waste lagoon (camp sewage pond) approved by DEQ. (BF)

FOIA to DEQ for NCAC-BSA file. (BF)

TMDL Little Calfpasture organizational meeting, DEQ, VaTech, NBSWCD. (BF)

RACC watershed committee sends FOIA request to USACE for information on Corps recommendations, studies, emails in 2013, 2014, 2015 about Goshen Dam.
(BF)

Public meeting on L.Calf TMDL held at Goshen Firehouse well attended. Comment period available to public until Aug 31. (BF)

DEQ notifies RACC that benthic monitoring is being monitored twice yearly and remains a source of high priority. (BF)

DEQ Response to Ms. Sandra Stuart:

Dear Sandra,

Thank you for your comments on the development of the Little Calfpasture Water Quality Improvement Plan, and for your participation in the planning process to date. The chronology that the Rockbridge Area Conservation Council (RACC) has prepared on the management of the lake and its impact on the Little Calfpasture River demonstrates the importance of your organization within the local community. The history of Lake Merriweather, its impact on the ecology and water quality of the Little Calfpasture River downstream, and the regulatory and non regulatory efforts that have been made to address these impacts is complex and extensive. We hope that the water quality improvement plan currently under development for the Little Calfpasture River watershed will sufficiently reflect this history, while proposing management solutions that can be supported by all stakeholders in the watershed.

I have listed your detailed comments and questions in italics below, and have included responses below each item:

1. Will the lake management group also consider the operation of the dam and the lack of sufficient warning in an emergency to those downstream, especially those very close to the dam?

The goal of the lake management group will be to identify management strategies to reduce the amount of sediment that is released from the lake downstream into the Little Calfpasture

River. This will include the operation of the dam. DEQ will encourage DCR Dam Safety, Rockbridge County, and Capital Area Boy Scouts staff to address downstream safety issues in any management recommendations included in the plan. Existing concerns about appropriate issuance of warnings to downstream landowners prior to releases from the dam should be communicated to Rockbridge County and the Capital Area Boy Scouts directly since a warning system has already been developed, and can be refined by these entities.

2. Will the operation & management manual for the dam (DCR) be available?

DEQ has contacted DCR Division of Dam Safety staff regarding development of the Little Calfpasture TMDL implementation plan. They will be included in all project correspondence and consulted on all operational issues that fall under their regulatory authority. Should review of any materials submitted to DCR by the Boy Scouts for permitting purposes become necessary to the identification and selection of management strategies to include in the implementation plan, DEQ will make this request. If RACC is interested in obtaining specific operation and management materials for the dam held by DCR, this request should be made directly to the Division of Dam Safety.

3. The special exception for the Little Calf below the dam: please explain what this means. And, is there any timeline or oversight of the exception?

Because removal of the dam on Lake Merriweather is currently not an option and the aquatic life use cannot be fully met in the Little Calfpasture River immediately downstream of the dam while the dam remains, a change in the aquatic life designated use was required. Such changes to designated uses are allowed under federal regulations. Under 40 CFR 131.10(g), states may remove a designated use which is not an existing use or establish sub-categories of a use if the state can demonstrate that attaining the designated use is not feasible because, “dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use.”

As a part of triennial standards review, VADEQ proposed a special standard for aquatic life use that would apply to the Little Calfpasture River below the Goshen Dam. The following special standard was proposed on 3/31/2008 and approved by the State Water Control Board on

10/17/2008.

“Little Calfpasture River from the Goshen Dam to 0.76 miles above its confluence with the Calfpasture River has a stream condition index (A Stream Condition Index for Virginia Non-Coastal Streams, September 2003, Tetra Tech, Inc.) of at least 20.5 to protect the subcategory of aquatic life that exists here as a result of the hydrologic modification. From 0.76 miles to 0.02 miles above its confluence with the Calfpasture River, aquatic life conditions are expected to gradually recover and meet the general aquatic life uses at 0.02 miles above its confluence with the Calfpasture River.” (SWCB, 2008)

This special standard allows for a zone of recovery from dam impacts that cannot be mitigated, but ensures that the general standard is to be maintained at station 2-LCF000.02. Results from benthic sampling in 2001 demonstrated that meeting the general standard at this location is possible, but additional measures must be taken to ensure that the standard is consistently met. If these measures are taken, the general standard should be consistently met at station 2-LCF000.02 and impacts from the Goshen Dam will be limited to a less than 0.76 mile section of the Little Calfpasture River and will not impact the Maury River.

This special standard does not have a timeline or effective termination date. DEQ is responsible for oversight of compliance with this standard, which is accomplished through our ambient monitoring program. While we are not currently monitoring at station LCF000.78, it remains a part of our ambient monitoring network, through which we rotate on and off stations over time. In addition, station LCF000.02, located at the mouth of the river, is currently being monitored and serves as an excellent indicator of overall stream health.

4. Why does the CWA not apply to this river?

The Clean Water Act does apply to the Little Calfpasture River, as has been demonstrated by DEQ’s listing of segments of the river on our impaired waters list, and development of the Little Calfpasture River benthic TMDL.

5. Why is Lake Merriweather not listed as a significant lake in the commonwealth?

DEQ prioritizes Virginia’s lakes for monitoring and assessment based on their designated uses. The current agency guidance on the monitoring and assessment of targeted lakes and reservoirs is found in the Department Guidance Memo No. 09-2005 “Monitoring and

Assessment of Lakes and Reservoirs" (April 2009). GM09-2005 defines "significant lakes and reservoirs":

*"A significant lake/reservoir is defined as: a publicly accessible lake/reservoir that is a public water supply and/or 100 acres or more in size **and** is included in Section 187 list of reservoirs with nutrient criteria."*

Since Lake Merriweather does not meet the definition provided above, it is not included on DEQ's list of significant lakes.

6. Why was the Consent Order rescinded when the situation remains unresolved?

DEQ's 1993 Consent Order was terminated in 2014 after DEQ Enforcement staff determined that the Capital Area Boy Scouts had addressed operational issues resulting in the fish kill that occurred on the Little Calfpasture River in 1992. The Boy Scouts no longer utilize the subsurface release mechanism that was responsible for this fish kill. The 1998 amendment was issued in response to a benthic survey immediately downstream of the dam. The special standard that was proposed for this segment of the river was approved during the 2009 Triennial Review, allowing for termination of the 1998 Consent Order in 2014 as well.

RACC's continued support for and participation in the development of this plan is important to us with respect to identifying suitable implementation strategies and tools for local engagement. As a well-known and respected organization within the watershed community, RACC can serve as a key partner in communicating local stakeholder concerns and assisting with education and outreach regarding water quality and conservation in the watershed. I appreciate the effort that you and others at RACC have put into protecting and restoring the Little Calfpasture River, and I hope that we can adequately address and accommodate your concerns as we develop this water quality improvement plan. Please feel free to contact me should you have any further questions.

Sincerely,



Neshia McRae

Non Point Source TMDL Coordinator

DEQ Valley Regional Office

Comments from Mr. Jerry Higgins:

I attended the meeting in Goshen on August 2 regarding the Little Calfpasture Water Quality Improvement Project. I was particularly interested in the discussions regarding the possible presence of direct sewer piping to creeks from residences, and failing septic tank drain-fields in the watershed. Please keep in mind that the Maury Service Authority has a drinking water supply intake on the Maury River, not too many miles downstream. The possible contribution of raw sewage to the water is of concern regarding that downstream drinking water supply and public health.

Thanks for the opportunity to make a comment on this project.

Jerry Higgins

Executive Director

Maury Service Authority

DEQ Response to Mr. Jerry Higgins:

Dear Mr. Higgins,

Thank you for your comments on the development of the Little Calfpasture Water Quality Improvement Plan, and for your participation in the planning process to date. I understand and appreciate your concerns regarding the presence of failing septic systems and straight pipes in the Little Calfpasture River watershed and potential impacts on drinking water supplies. While this particular project will focus on ways to reduce sediment in the Little Calfpasture River, DEQ has supported a number of efforts across the state to help homeowners address failing septic systems and straight pipes. The Virginia Water Quality Improvement Fund is one source of grant funding administered by DEQ that has been available to provide financial assistance to landowners to correct these problems. I would be happy to work with you to explore other funding opportunities to launch a residential septic

cost share program in the watershed. In addition, we have worked with a number of partners across the state to develop education and outreach materials regarding the importance of septic system maintenance and potential water quality impacts. These materials can be easily adapted to suit the needs of Rockbridge County should you be interested in conducting any outreach in the area.

The Maury River Service Authority's participation in the development of this plan is important to us with respect to identifying suitable implementation strategies and tools for local engagement. I appreciate your comments on our first community meeting for the Little Calfpasture River Water Quality Improvement Plan, and I hope that we can adequately address and accommodate your concerns as we develop this water quality improvement plan. Please feel free to contact me should you have any further questions.

Sincerely,



Nesha McRae

Non Point Source TMDL Coordinator

DEQ Valley Regional Office

Public Meeting #2 (Comment period: May 19, 2017 – June 23, 2017)

Comments from Mr. Jay Gilliam:

Comments on the Water Quality Improvement Plan for the Little Calfpasture TMDL

My comments will start with positive observations.

The Natural Bridge Soil and Water Conservation District (SWCD) requested in 2015 that the implementation process for the TMDL be initiated. We were promised that it would

begin in the summer of 2016 and that is what happened. I have attended all of the public meetings and participated in the lake management committee. The staff of DEQ has done an exemplary job of gathering information and publishing a well written document that is cohesive and understandable.

I agree with the description of the problem and some of the proposals to mitigate the problem. There is one element of this strategy that I strongly disagree with. The owners of Lake Merriweather stated in one of the early lake management meetings that the only reason for the dewatering of the lake is to remove debris that is carried into the lake from upstream. I contend that this is a spurious and disingenuous obfuscation, made to obscure the real reason for the destructive management practice.

The practice of dewatering the lake from fall to spring is intended to allow the exposed lake bottom to be scoured by storm and weather events and flush excess sediment deposits over the dam. By allowing this to happen the owners forestall the day that the lake will need to be dredged (a considerable expense) or become too shallow for their purposes. There is also some benefit to minimize maintenance to shore structures such as docks. My opinion is that the debris removal argument is a red herring to facilitate a flushing process that has a significant degradation effect to the entire 43 miles of the Maury River, the James River, and eventually the Chesapeake Bay.

There is one effective and very inexpensive solution. Keep the lake at full pool year round. Table 7 on page 19 of the plan illustrates that 100% of the mudflat sediment reduction is achieved if the lake is kept at full pool year round.

The owners have been unwilling to do this and apparently there is no legal mechanism to require them to. The agricultural BMPs are always desirable and, if implemented, will slow the deposit of new sediment into the lake. Education and outreach are always worthwhile to encourage stakeholder “buy in”. I do not believe that it is the responsibility of the taxpayer to shoulder the cost of the lake management practices described in table 10 on page 24. Maintaining the lake at full pool year round will accomplish the same sediment reduction goal at no cost to the public. The owners should bear the cost of properly maintaining their own private lake.

The fact is that DEQ staff are required to take all stakeholder input at face value and not question its veracity. It is also true that there is no regulation that would require the lake owners to abandon their destructive policy and adopt a better one. I reluctantly acknowledge that. After watching this long process of an attack on the integrity of the river since a fish kill event that occurred in 1992 (25 years), I have come to the conclusion that the owners know the results of their strategy but do not care because their constituents live several hundred miles away and will never be aware of the issue.

I make these comments as an individual and downstream riparian property owner. I have not coordinated with the SWCD or any other group. The comments only represent my personal opinion.

Jay Gilliam – Steeles Tavern, Virginia

DEQ Response to Mr. Jay Gilliam:

Dear Mr. Gilliam,

First and foremost, thank you for your participation in the development of the Little Calfpasture Water Quality Improvement Plan. Your input throughout the process was incredibly valuable and meaningful. Your insight into the history of the complex issues surrounding water quality in the Little Calfpasture helped us to identify key partners in the planning process and bring them to the table very early on in this effort. I believe that this early engagement was a critical factor in the development of a plan for which there is stakeholder buy in and support. As you noted in your comments, TMDL implementation is voluntary in nature, making buy in during the planning process a key component to successful implementation.

Thank you for preparing and submitting comments on the Little Calfpasture Water Quality Improvement Plan. We understand your concerns about flushing of sediment from the lake during draw down events and impacts downstream on both the Little Calfpasture and Maury Rivers. While keeping the lake at full pool throughout the year would be the most cost effective strategy to address this problem, it was made clear during the planning process that this was not an option for the National Capital Area

Council of the Boy Scouts. However, as you have noted, the plan does demonstrate the impact that this would have on water quality should it become an option in the future. While DEQ cannot enforce the lake management strategies included in the plan, we are committed to monitoring the health of the river as we move forward into implementation, and intend to remain a partner in this effort in the years to come.

Thank you again for all of the time and energy you have dedicated to this effort, your community is very lucky to have someone like you working so tirelessly to protect and improve local water quality!

Very best,



Nesha McRae, VA DEQ, Valley Regional Office

Comments from Ms. Sandra Stuart:

Comments on Little Calfpasture TMDL

23 June 2017

First, I want to commend Nesha McRae and the Virginia Tech BSE technical team for all the work they did on this TMDL. I have attended all the working group and public meetings and found their efforts creditable and inclusive of all the stakeholders. The resulting TMDL is clear: success of the TMDL requires a great deal of volunteer cooperation from NCAC-BSA.

Everyone knows the cause of the sediment impairment is mismanagement of the lake. And, although agricultural BMPs upstream might be a slight help with the sediment, without the participation of NCAC-BSA, nothing will be accomplished. Everyone also knows that sediment will eventually fill up the lake. It has accumulated 6-7 feet of sediment despite the constant flushing over the years. Meanwhile, the NCAC-BSA pretends that they need to lower the lake to clear debris. Since there are other ways to

collect debris which could be evaluated, this excuse is distressing.

It is also disheartening. The sediment is obvious far downstream and is causing noticeable degradation of Goshen Pass, a special place for Rockbridge residents and a designated Virginia Natural Preserve. The scouts who come are from Maryland and Northern Virginia so they have little knowledge of the effects they have on the surrounding community. Also, NCAC-BSA pays no taxes to Rockbridge County, yet they accept no responsibility for the damage they are causing in our community.

The cost of dredging to keep the lake useful for the scout camping program in the summer would, of course, be very high. Even so, this is part of being a responsible owner and caretaker. NCAC-BSA could choose to exemplify the “Outdoor Code” they profess in their literature and “Leave no Trace” in our river but after 50 plus years of ignoring their downstream neighbors, it would be a surprise to have them change. Perhaps, though, they might volunteer to give the TMDL a chance.

Despite my misgivings, I do realize that the TMDL plan is all that can be done, and I am grateful for DEQ’s efforts.

I do have a few particular comments/questions:

1. One of the lake management practices needed, page E-2, is to stabilize the emergency spillway and disposal area below the dam. Gene mentions some vegetative control on page 8, but I couldn’t find the practice in the lake management section that would address this problem.
2. DCR- Dam Safety has indicated that lowering the lake for the nine months of off-season camping is “good dam safety practice.” Since the operation of the gates is involved in the practices being suggested in the TMDL, why is DCR-DS not included as a partner?
3. On page 4, the last time aquatic life met standards was 2001. Maybe add that it was a DGIF benthic sampling of 61 VSCI?

[As an aside, I wonder if 2001 was a drought-like time prior to the 2002 drought. The

passing sampling that Steve reported at the public meeting on May 18, 2017, was performed at a time that Mike Jolly thought he couldn't fill the lake if it didn't rain, so there was very little water coming over the dam. On the bright side, it appears that the L. Calf can still rebound if the lake is not lowered!]

3. On page 7, the reference to "logging below the dam." Was this logging done in the area of the .83-mile impaired Little Calfpasture on NCAC-BSA property? Who had oversight of the project? Rockbridge County, Erosion and Sediment, did not. DOF? Since this is not included in the implementation plan, maybe the reference should be eliminated?

4. Also on page 7, the USACE dredging project was not a "grant" but part of the WRDA 1996 special project \$6M allotment.

5. On page 19, since the sediment reduction goal for the lake is 34%, it would help to highlight 6 and 7 in Table 7.

6. On page 30, it sounds as if TSS monitoring is necessary to evaluate the alternate drawdown scenarios effectively. Would this be conducted by DEQ?

7. Also on page 30, last sentence, RACC can also be a monitoring partner.

DEQ Response to Ms. Sandra Stuart:

Dear Mrs. Stuart,

First and foremost, thank you for your continued participation in the development of the Little Calfpasture Water Quality Improvement Plan. Your input throughout the process was incredibly valuable. Your insight into the complex issues surrounding water quality in the Little Calfpasture has helped us craft a plan that we hope helps to better address all aspects of the issues at hand. Responses to your comments are listed below. Please feel free to contact me should you have any further questions or concerns about this project.

Thank you again for all of the time and energy you have dedicated to this effort, your community is very lucky to have someone like you working so tirelessly to protect and improve local water quality!

Comments and responses:

1. One of the lake management practices needed, page E-2, is to stabilize the emergency spillway and disposal area below the dam. Gene mentions some vegetative control on page 8, but I couldn't find the practice in the lake management section that would address this problem.

This practice is listed in the lake management section in Table 8.

2. DCR- Dam Safety has indicated that lowering the lake for the nine months of off-season camping is “good dam safety practice.” Since the operation of the gates is involved in the practices being suggested in the TMDL, why is DCR-DS not included as a partner?

DCR's Division of Dam Safety and Floodplains has been added to the list of implementation partners on page 32 under Virginia Department of Conservation and Recreation.

Technical Document - DCR's Division of Dam Safety and Floodplains has been added to the list of implementation partners in Section 9.1.7 under Virginia Department of Conservation and Recreation.

3. On page 4, the last time aquatic life met standards was 2001. Maybe add that it was a DGIF benthic sampling of 61 VSCI?

A statement was added on page 4 above Table 1 clarifying that VADEQ monitoring indicated that the aquatic life standard was met on the impaired stream segment with a VA Stream Condition Index score of 61 (60 or greater is considered unimpaired).

Technical Document - A statement was added in Section 3.4.1 clarifying that VADEQ monitoring indicated that the aquatic life standard was met on the impaired stream segment with a VA Stream Condition Index score of 61 (60 or greater is considered unimpaired).

3. On page 7, the reference to “logging below the dam.” Was this logging done in the area of the .83-mile impaired Little Calfpasture on NCAC-BSA property? Who had oversight of the project? Rockbridge County, Erosion and Sediment, did not. DOF? Since

this is not included in the implementation plan, maybe the reference should be eliminated?

This statement was based on VA Tech's analysis of aerial imagery of the watershed over time. A change in land use directly below the dam was noted during this analysis. There was some degree of uncertainty about the nature of the land disturbing activity, which has been clarified on page 7. Since the mention of this activity is part of the working group meeting summary and thus the formal record of this planning process, we feel that it should be left in the plan.

Technical Document - There was some degree of uncertainty about the nature of the land disturbing activity, which has been clarified in Section 5.3.

4. Also on page 7, the USACE dredging project was not a "grant" but part of the WRDA 1996 special project \$6M allotment.

A statement has been added to the meeting summary on page 7 further clarifying the source of project funds.

Technical Document - A statement has been added to the meeting summary in Section 5.3 further clarifying the source of project funds.

5. On page 19, since the sediment reduction goal for the lake is 34%, it would help to highlight 6 and 7 in Table 7.

The selected wet and dry weather scenarios have been highlighted in Table 7 and identified in a note below the table.

No changes were made to the Technical Document as the values in Table 6-7 are already highlighted.

6. On page 30, it sounds as if TSS monitoring is necessary to evaluate the alternate drawdown scenarios effectively. Would this be conducted by DEQ?

It has been clarified on page 30 that, based on the availability of funding, additional TSS monitoring could be conducted by DEQ. Partner organizations have also been identified for this effort should assistance be needed.

7. Also on page 30, last sentence, RACC can also be a monitoring partner.

RACC has been added as a monitoring partner.

Technical Document - RACC has been added as a monitoring partner in Section 8.2.

Regarding your general comments about the overall management of Lake Merriweather and the health of the Little Calfpasture River, DEQ is hopeful that the spirit of engagement and cooperation that was shown during the development of this plan will continue into implementation. We believe that the collaborative planning process that we just completed fostered some degree of buy in from all parties, which we hope will translate into action down the road.

Thank you again for your dedication to your community and the natural resources that it treasures. Your engagement in the development of this plan has been greatly valued, both by DEQ, and by others in the conservation community.

Very best,

Nesha McRae, VA DEQ, Valley Regional Office