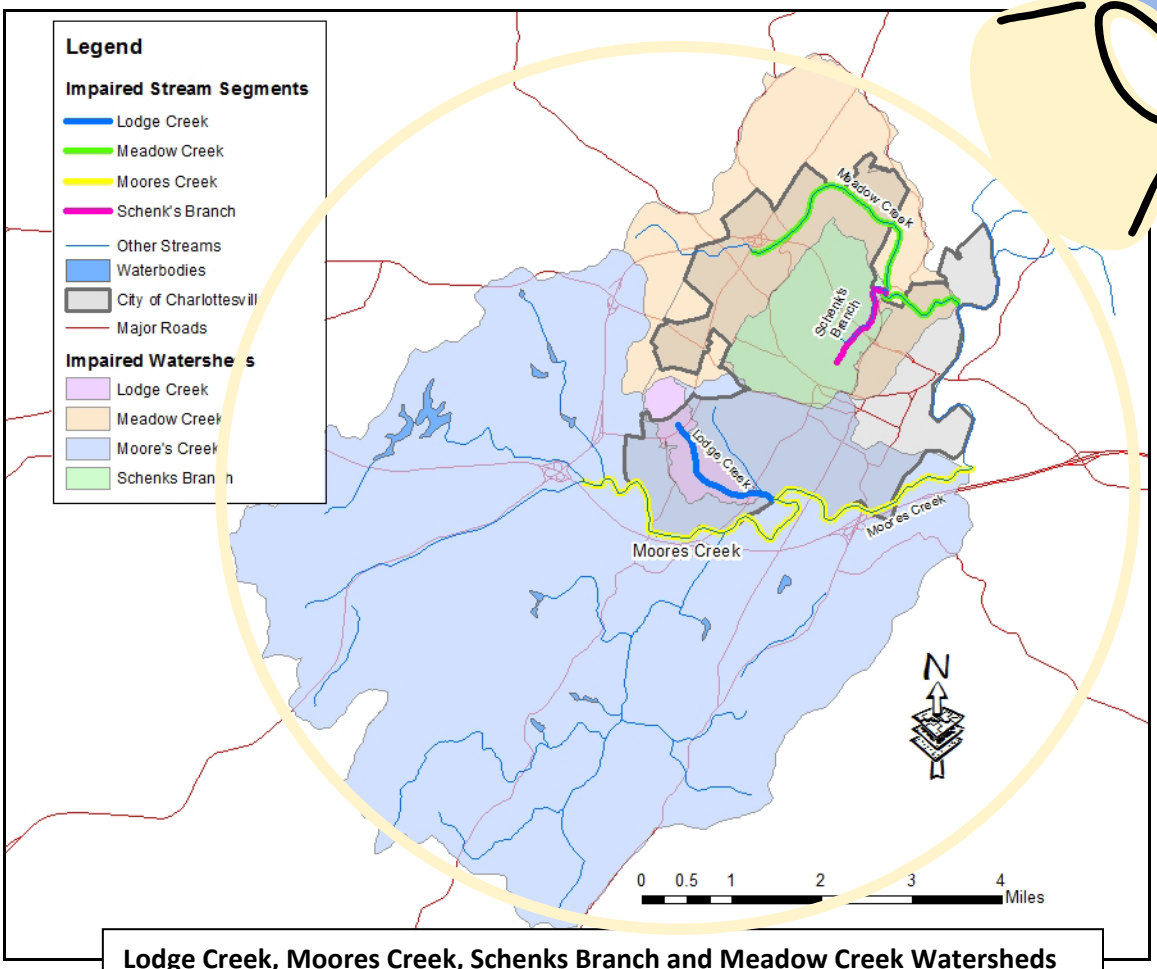
SPOTLIGHT ON LOCAL STREAMS:

Summary Report on Lodge Creek, Moores Creek, Schenks Branch and Meadow Creek



Lodge Creek, Moores Creek, Schenks Branch and Meadow Creek Watersheds

The Virginia Department of Environmental Quality (VADEQ) monitors the Commonwealth's streams and rivers (*there are **52,232 miles** of them!*) for five uses: fishing, swimming, wildlife, aquatic life (benthic), and drinking. When streams fail to meet standards based on these uses, they are declared to be "impaired", or not fully supportive of their beneficial uses, and placed on Virginia's impaired waters list. Based on routine water quality monitoring, four streams in Charlottesville and Albemarle County have been added to the list of waterways in Virginia that do not meet water quality standards. VADEQ reports this list to the USEPA every other year in the "*305(b)/303(d) Water Quality Assessment Integrated Report*" as required by the federal **Clean Water Act** of 1972. Moores Creek and its tributary, Lodge Creek, were originally listed as impaired on Virginia's in 2008 and 2006, respectively, due to violations of the general aquatic life standard. Meadow Creek and its tributary, Schenks Branch, were originally listed as

Are we being singled out?
No. In Virginia, 68% of assessed streams are considered "impaired".

impaired in the same reports in 2006 and 2008, respectively, also due to violations of the general aquatic life standard. A **Total Maximum Daily Load** must be prepared for streams that do not meet water quality standard and are listed as impaired.

Total Maximum Daily Load

A TMDL is a pollution budget for a stream, which sets a maximum amount of a pollutant that can be released into a stream but still allows the stream to maintain water quality standards. It is also the process of improvement that Virginia uses to make streams healthier and cleaner. This report is part of the TMDL studies for these streams.

What is the general aquatic life water quality standard? What does benthic mean?
The basis of a stream's food chain is found in the community of the aquatic organisms that live at the bottom of the stream, known as benthic (or bottom-dwelling) macroinvertebrates (organisms without backbones that can be seen with the naked eye). These bugs are important because they are a key food source for other organisms, they play an important role in the cycling of nutrients, and they are good indicators of pollutants. The aquatic life water quality standard states that all state waters should support a healthy and diverse community of invertebrates and fish. Based on VADEQ's and StreamWatch biological monitoring results, it was concluded that segments of Lodge Creek, Moores Creek, Schenks Branch and Meadow Creek were not meeting this standard. Here are a few examples of benthic macroinvertebrates (all images courtesy of Bob Hendricks).

From Left to Right: Dragonfly larvae, Stonefly nymph, caddisfly larvae, flathead mayfly larvae.

Why don't these streams support a healthy aquatic community? After reviewing various types of data and examining possible stressors in the aquatic habitat, VADEQ and its Technical Advisory Committee identified the primary stressor on the aquatic community in each stream to be **sediment**. **Sediment** is soil that has been washed off the land during rain storms and soil that is scoured from the stream banks by fast moving water. Development has changed the way rainwater moves over land and through stream channels. **Impervious surfaces** have a negative impact on water quality because these surfaces, like **pavement, rooftops and sidewalks**, do not allow precipitation to slowly infiltrate into the soil.

Stormwater conveyance in a parking lot. **(Credit: VADEQ)**

How does pavement hurt streams? Instead of naturally allowing rainwater to infiltrate into the soil, impervious surfaces quickly move it into conveyance structures, like storm drains or storm sewers, or directly into streams and rivers. This is known as **stormwater runoff** and impacts streams in a multitude of ways. Stormwater is a problem because it washes pollutants like **sediment** from construction sites, oil from vehicles, nutrients from fertilized yards, and bacteria from pet waste into streams and rivers. Also, stormwater increases the flow in streams after a precipitation event, which can result in scouring of sediment from exposed streambanks, and often adds to the problem. **Stormwater runoff** – how it travels and what it carries– is affected by the landscape, or land use of the watershed. For example, when it rains in a forested area, the rain is slowed by the leaves of the trees and it infiltrates into the ground quickly. The landscape for these four watersheds is summarized by general categories in the below table. Urban land uses dominate the Lodge Creek, Schenks Branch, and Meadow Creek watersheds, ranging between 83% and 96%, while forest is the dominant land use in Moores Creek (61%).

Land Use Group	Lodge Creek	Moores Creek **	Schenks Branch	Meadow Creek **
	Area in acres			
Cropland	0.0	70.9	0.0	7.3
Pasture/Hay	0.0	989.0	0.0	44.6
Urban Pervious	274.3	5,669.2	867.6	2,321.5
Urban Impervious	146.7	1,655.1	485.0	1,365.4
Forest	50.4	13,244.0	53.7	661.6
Water	0.0	232.4	1.9	19.0
Total	471.4	21,860.5	1,408.1	4,401.4
** Moores Creek excludes Lodge Creek; Meadow Creek excludes Schenks Branch				
Land Uses in these watersheds are from the 2009 Rivanna and Vicinity Land Use/Land Cover Map and the 2009 National Agricultural Statistics Service.				

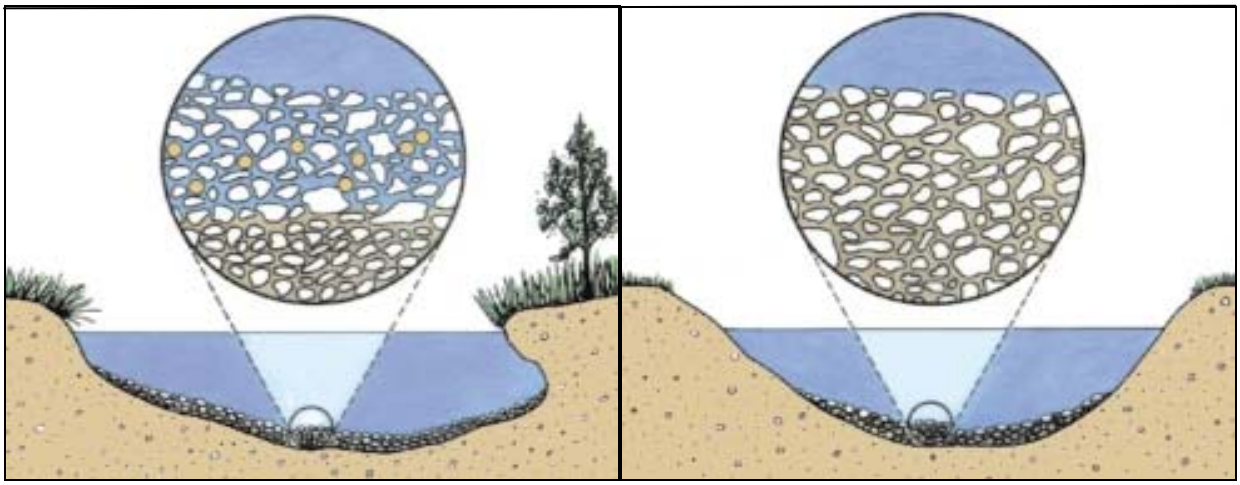
Sources of sediment are typically divided into two categories - **point** and **nonpoint sources**. The sediment in the watersheds for the four impaired streams involved in this project comes primarily from nonpoint source pollution including urban land, agricultural land, and stream channel erosion. Impervious urban areas (roads, parking lots, roof tops) collect atmospheric dust and dirt which are

__NONPOINT__ Sources of pollution are those from diffuse areas with no single point of entry to a waterway (streets, sidewalks).
__POINT__ Sources of pollution are from a definitive point or outfall (a pipe from a factory).

then washed off during storms. Development activity (building roads, houses and other buildings) can contribute sediment to waterways if proper controls are not in place. Agricultural lands, such as cropland and pasture/hay areas, often contribute excessive sediment loads through basic erosion of areas with reduced vegetative coverage. Point sources in these four watersheds are limited. One such source is the Moores Creek Wastewater Treatment Plant which discharges, according to its permit limits, a minor amount of sediment.

Point Source vs. Non-point Source (Credit: VADEQ – Jeffries and Harrigan)

Why is too much sediment in a stream system a problem? Aquatic organisms need space in between rocks and gravels on the stream bottom in order to make their homes, move, and capture prey. With too much sediment, the niches in between the rocks are filled in, it's difficult to travel, and food sources are eliminated. Below is an illustration of a healthy stream bed versus one with extra sediment.

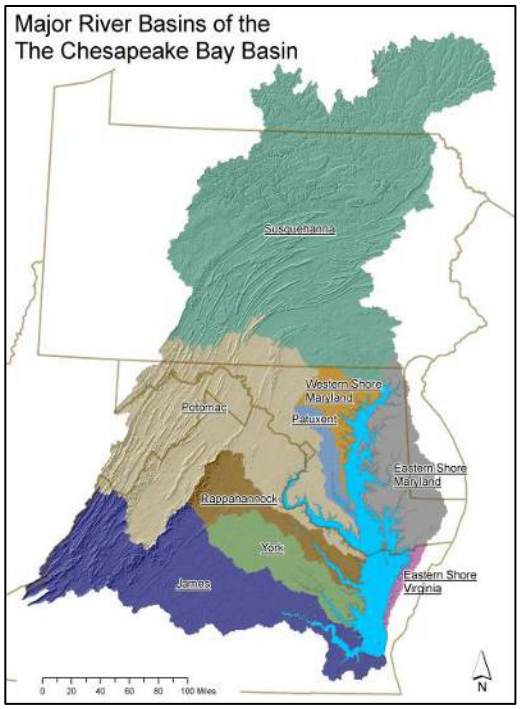


What is being done? ***(And what, really, is a TMDL?)*** VADEQ and its local and state agency partners have been working together since 2010 to determine sources of the sediment, suggest reductions, and recommend next steps in the process known as the **Total Maximum Daily Load (TMDL)** process. In these **TMDL** studies for Lodge Creek, Moores Creek, Meadow Creek and Schenks Branch, a watershed-based approach was used to relate both land-based and in-stream sources of pollutants to water quality problems. In order to develop a **TMDL**, background pollutant concentrations, point source contributions, and non-point source contributions are considered. Through the

WHAT IS A WATERSHED? It's an area of land that drains to a common point or body of water.

TMDL process, states are able to identify water-quality based controls to reduce pollution and meet water quality standards.

How do the local stream TMDLs relate to the Chesapeake Bay TMDL? These local TMDLs are based on monitoring of local stream and have been developed to identify the sediment reductions needed in order for these streams to support a healthy and diverse population of aquatic life. The Chesapeake Bay TMDL was developed using monitoring data collected within the Chesapeake Bay watershed which consists of six states and the District of Columbia. It has been developed to identify the nitrogen, phosphorous and sediment reductions needed to restore the water quality in the Chesapeake Bay. The Chesapeake Bay itself is downstream from the Charlottesville and Albemarle County's local streams and their watersheds. As such, these local watersheds are components of the larger watershed that drains into the Chesapeake Bay, meaning that whatever enters local streams eventually enters the Chesapeake Bay. Conversely, any pollutant reductions to local streams also reduce pollutant loading to the Bay. While these TMDL studies for Lodge Creek, Moores Creek, Schenks Branch and Meadow Creek are focused on how to reduce sediment entering these streams, the measures taken to reduce sediment will also result in reductions of both nitrogen and phosphorus transported to the streams. Therefore, all best management practices and pollutant reductions from these local TMDLs also contribute to the reductions needed to meet Chesapeake Bay cleanup goals.



Whatever we do to clean up our local streams will also help downstream.

So, what reductions are recommended? The table below summarizes the reductions that need to be made from the average amount of sediment that currently comes into the streams from each watershed, the target amount of sediment and the percent reduction that this calls for.

NOTE: One dump truck load = about 20 tons of sediment.

That's 160 dump truck loads moving down Moores Creek every year!

	Lodge Creek	Moores Creek	Schenks Branch	Meadow Creek
Avg. Yearly Load	**177.4 tons/yr**	**3,202.5 tons/yr**	**577.3 tons/yr**	**1,587.8 tons/yr**
Target Yearly Load	**152.6 tons/yr**	**2,696.3 tons/yr**	**500.2 tons/yr**	**1346.1 tons/yr**
% Reduction	**14.0%**	**15.8%**	**13.4%**	**15.2%**

Where do these reductions come from? There are many reasons to decrease the amount of sediment coming into streams and rivers. Not only will the aquatic habitat which is the foundation of a stream's food chain be restored, but water treatment and stormwater

management costs can be reduced. When more soil is kept on the land, the soil is able to maintain its fertility and productivity. The recommended reductions can be accomplished by installing stormwater management practices to prevent sediment from getting into the streams. Techniques that target the land uses that contribute the most sediment will be most effective. With that in mind, the below table summarizes the three land uses that contribute the most sediment in each of the four watersheds.

Lodge Creek, Moores Creek, Schenks Branch, Meadow Creek Land Uses	Examples of this Land Use
Impervious surfaces	**Parking lots, roads, roofs, sidewalks**
Pervious surfaces	**Lawns, parks, fields, grassed areas**
Construction	**Building lots, exposed topsoil**

What's next? The goal of the **TMDL** program is to establish a three-step path that will lead to attainment of water quality standards. The first step in the process is to develop **TMDLs** that will result in meeting water quality standards, which is a federal mandate under the Clean Water Act. This report represents the culmination of that effort for the benthic impairments in Lodge Creek, Moores Creek, Schenks Branch, and Meadow Creek. The second step, mandated by Virginia law, is to develop a **TMDL Implementation Plan**. The final step is to implement this plan and to monitor stream water quality to determine if water quality standards are being attained. Implementation of these **TMDLs** will contribute to on-going water quality improvement efforts in these four watersheds. Ongoing restoration efforts include the Meadow Creek Stream Restoration project which is being coordinated with a Rivanna Water and Sewer Authority project to upgrade a Sanitary Sewer Interceptor along the stream; existing stormwater management programs in Albemarle County, the City of Charlottesville, the University of Virginia, and along VDOT properties; incorporation of urban infiltration practices, such as the **rain garden at Greanleaf Park** and retrofitting green roofs on existing municipal buildings, such as the Charlottesville City Hall and the Police Building. In addition, efforts will be made to learn from, and coordinate with, other existing TMDLs for bacteria and sediment in the Rivanna River Basin and the Moores Creek Bacteria TMDL Implementation Plan.

Greanleaf Park Rain Garden
(Credit: City of Charlottesville)

Want more information or to be involved in the next step? Contact **Kristel Riddervold**, Environmental Administrator for Charlottesville, at riddervold@charlottesville.org. Contact **Greg Harper**, Water Resources Manager for Albemarle County, at gharper@albemarle.org. Also, check out these links to find out more information on the TMDL Program, local stream improvement efforts, and community organizations that are already working in your area!

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