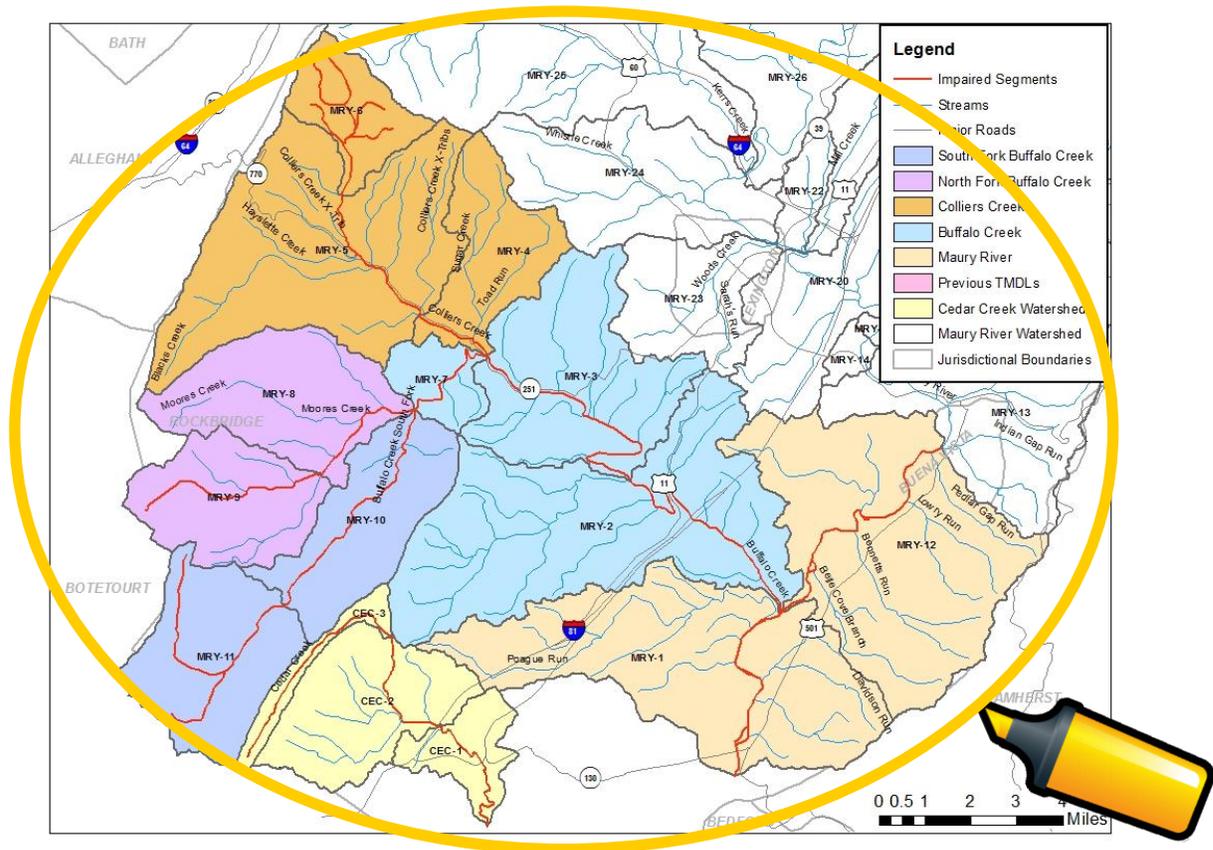


HIGHLIGHTING LOCAL STREAMS:

Water Quality Studies on the Maury River Watershed



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. VADEQ reports this list to the USEPA every other year as required by the federal **Clean Water Act** of 1972. Based on routine water quality monitoring, several streams in Southern

Rockbridge County have been added to Virginia's list of waterways that do not meet water quality standards. **Colliers Creek, North Fork and South Fork and the mainstem Buffalo Creek, the Maury River and Cedar Creek** were listed as

"impaired" in 2006, 2008 and 2010 due to violations of the recreational use standard (too much *E. Coli* bacteria). A **Total Maximum Daily Load** must be prepared for streams that do not meet water quality standards and are listed as "impaired".

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

TOTAL MAXIMUM DAILY LOAD

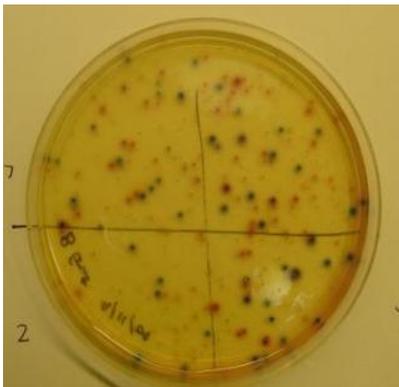
A **TMDL** is a pollution budget for a stream, which sets a maximum amount of a pollutant that can enter a stream but still allow the stream to maintain water quality standards. It is also the process of improvement that Virginia uses to make streams healthier and cleaner. This report is part of the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

What is the recreational use standard?

The code of Virginia states that all of Virginia's waterways are designated for several different uses, including "recreation... e.g. swimming and boating" (9VAC 25-260-10). These activities involve contact with the water – people getting their feet, hands,, and heads wet. People are naturally attracted to bodies of water -- whether to wade, fish, swim or paddle, and streams should be **safe** places to enjoy Virginia's great outdoors.

Why do we care about bacteria? Why is too much bacteria a problem?

VADEQ is charged with ensuring that Virginia's waterways are **safe** places to play and swim. This implies a low risk of contracting a gastro-intestinal illness from in the stream water. VADEQ monitors a strain of bacteria in the fecal coliform family to ensure that streams are **safe** for people to enjoy. This strain is known as *Escherichia coli* or *E. coli*. VADEQ visits streams all over the Commonwealth on a regular basis to take water samples and measure the concentration of bacteria colonies. The higher the concentration of bacteria in the water, the higher the likelihood of ingesting *E. coli*, and the greater the risk of illness. Virginia's water quality standard is set so that a stream's samples should not exceed an *E. coli* concentration of 235 colonies per 100 mL of stream water more than 10.5% of the time.



Each of the purple-blue dots on the slide to the left is an *E. coli* colony – a cluster of bacteria growing all together. When bacteria grow, the molecules of bacteria grow on top of each other, eventually becoming visible to the naked eye. The reddish colonies at left are fecal coliform colonies, which is the family of bacteria that *E. coli* belongs to. Many people relate *E. coli* to food poisoning, but it can also be ingested from water sources with similar disastrous consequences. (Photo Credit: Sandy Greene, HSWCD)

Where is the bacteria coming from? Sources of pollution are typically divided into two categories - **point** and **nonpoint sources**. The bacteria in the Maury watershed comes primarily from **nonpoint source** pollution including agricultural and residential lands.

What is a watershed?
A watershed is the area of land that drains to a stream.

Crop and haylands' runoff often contributes bacteria to streams if proper controls are not in place. In addition, cattle may directly deposit bacteria into streams adjoining pasture.

Residential lands contribute bacteria from improperly functioning septic systems, and from straight pipes (pipes that take sewage directly from the house to the stream with no treatment in between). Other nonpoint sources, including pets and wildlife, were also determined to have an influence on bacteria levels. Permitted point sources in these watersheds are few, but are accounted for at the maximum level allowed in their discharge.

How do people use the land in these areas? The land in the Maury watershed is predominately forested. In fact, when considering the entirety of the land that drains to the Maury River, almost three quarters of the land is forested. Cedar Creek is similarly predominately forest, with about 74% of its watershed in forest.

	Forest	Pasture/Hay	Crop	Residential
Maury River	73%	20%	0.5%	6%
Cedar Creek	74%	18%	1%	7%

What is the general aquatic life water quality standard? What does benthic mean?

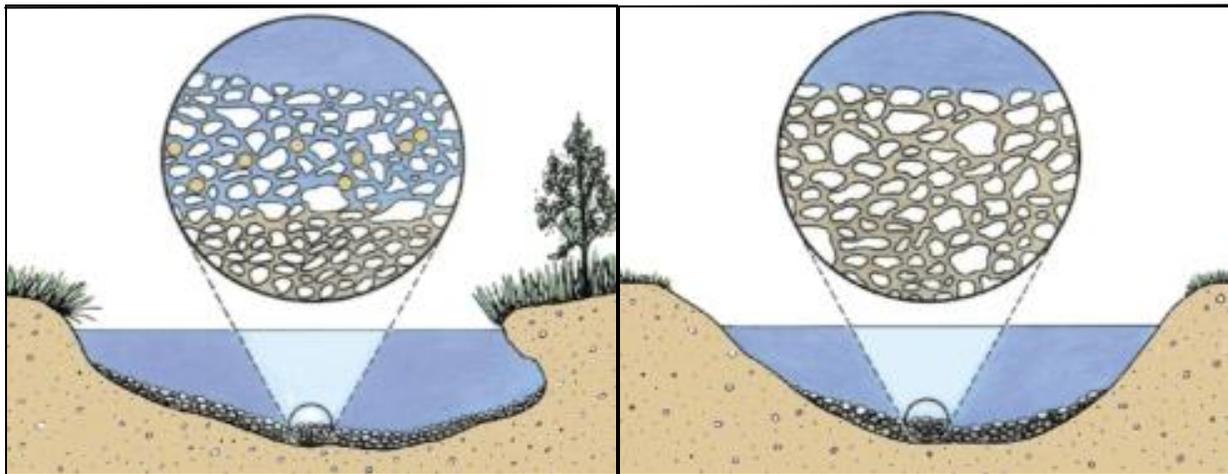
The basis of a stream's food chain is found in the community of the aquatic organisms that live at the bottom of the stream, known as benthic (or bottom-dwelling) macroinvertebrates (organisms without backbones that can be seen with the naked eye). These bugs are important because they are a key food 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 biological monitoring results, it was concluded that Colliers Creek was 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, the primary stressor on the aquatic community in Colliers Creek was determined 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.

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, state agency partners and the local Maury River watershed community have been working together to determine sources of bacteria and sediment, suggest reductions, and recommend next steps in the process known as the **Total Maximum Daily Load (TMDL)** process. In these **TMDL** studies for **Colliers Creek, North Fork and South Fork and the mainstem Buffalo Creek, the Maury River and Cedar Creek**, a watershed-based approach was used to relate both land-based and in-stream sources of pollutants to water quality problems. Local community participation has been key to the development of this TMDL. Local residents, farmers, paddlers and representatives from interested organizations volunteered their time to attend meetings and review data as part of the **Technical Advisory Committee (TAC)**. Their involvement was necessary to create an accurate and reliable picture of the watershed and its land uses. The TAC considered and gave feedback on such information as: background pollutant concentrations, point source contributions, and non-point source contributions. Through the **TMDL** process and the local expertise of **TACs**, We are able to identify water-quality based controls to reduce pollution and meet water quality standards.

So, what reductions are recommended?

When looking at the sources of bacteria in the Maury River Watershed, straight pipes are of primary concern because of their risk to human health. In Virginia, we would like to eliminate all discharges of raw sewage to waterways, including straight pipes and failing septic systems. In addition, reducing direct deposits to the streams from cattle is recommended to make a large difference to bacteria levels. These “direct” sources of bacteria contain many colonies of E. Coli and in times of hot weather, bacteria can even reproduce in the open air. By comparison, bacteria deposited on the ground and then carried to the stream by runoff does not live as long because it is exposed to the elements. Taking care of the “direct” sources first is an efficient and effective way of reducing bacteria. The **TAC** was able to provide information on likely sources of bacteria in the Maury River watershed and review all reduction options.

Where do these reductions come from?

There are many reasons to decrease the amount of bacteria coming into streams and rivers. Not only will a **safe** recreation environment be restored, but the streams will be cleaner for other uses, including supplying water to livestock and irrigating crops. The recommended reductions can be accomplished by installing practices to prevent **bacteria and sediment** from getting into the streams. Techniques that target the land uses that contribute the most bacteria will be most effective. With that in mind, the following reductions are recommended by the **TAC** to return the streams that have excess bacteria to a **safe** condition in the Maury River Watershed:

Stream	Livestock Direct Deposit	Pasture & Hay	Cropland	Straight Pipes & Failing Septics
Colliers Creek Bacteria	70%	50%	10%	100%
North Fork Buffalo Bacteria	35%	35%	10%	100%
South Fork Buffalo Bacteria	99%	50%	10%	100%
Buffalo Creek Bacteria	50%	50%	10%	100%
Maury River Bacteria	99%	30%	10%	100%
Cedar Creek Bacteria	99%	50%	10%	100%

In order to bring the aquatic population back to a healthy condition, some reductions of sediment need to be made in the Colliers Creek watershed. Overall, the TAC recommends a reduction of 24% in sediment, which would allow the habitat to be improved enough for the aquatic organisms to return to a diverse and abundant state.

Stream	Channel Erosion	Pasture/Hay Land	Developed Land	OVERALL
Colliers Creek Sediment	32%	32%	10%	24%

What’s next? Where do we go from here?

The goal of the **TMDL** program is to establish a three-step path that will lead to local streams and rivers returning to a safe and healthy state and again meeting water quality standards. The first step in the process is to develop **TMDLs** that will identify pollutant



reductions that result in streams achieving water quality standards, which is a federal requirement. This report represents the culmination of that effort for the excess bacteria issues in the Maury River watershed and sediment in the Colliers Creek watershed. The second step, mandated by Virginia law, is to develop a **TMDL Implementation Plan –**

or **“Clean-up Plan”**. The final step is to put this **“Clean-up Plan”** into place!

Implementation of these **TMDLs** will contribute to on-going water quality improvement efforts in these watersheds. There are lots of actions that landowners can do to clean-up **Colliers Creek, North Fork and South Fork and the mainstem Buffalo Creek, the Maury River and Cedar Creek**, including:

- **Fixing malfunctioning septic systems and straight pipes**
- **Considering pasture rotation and tree plantings**
- **Providing alternative water supplies while fencing cattle out of streams**

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

Want more information? Want to make a difference to your local stream? Contact **Natural Bridge Soil and Water Conservation District and the **USDA Natural Resources Conservation Service** for more information on available cost-share programs at (540) 463-7124 or <http://www.naturalbridgeswcd.com>.**