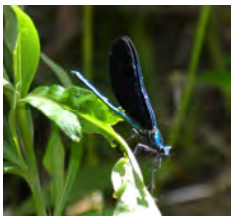
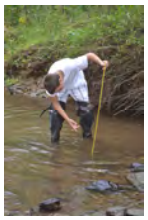
The Trail to Water Quality Project
Water Quality Management Plan

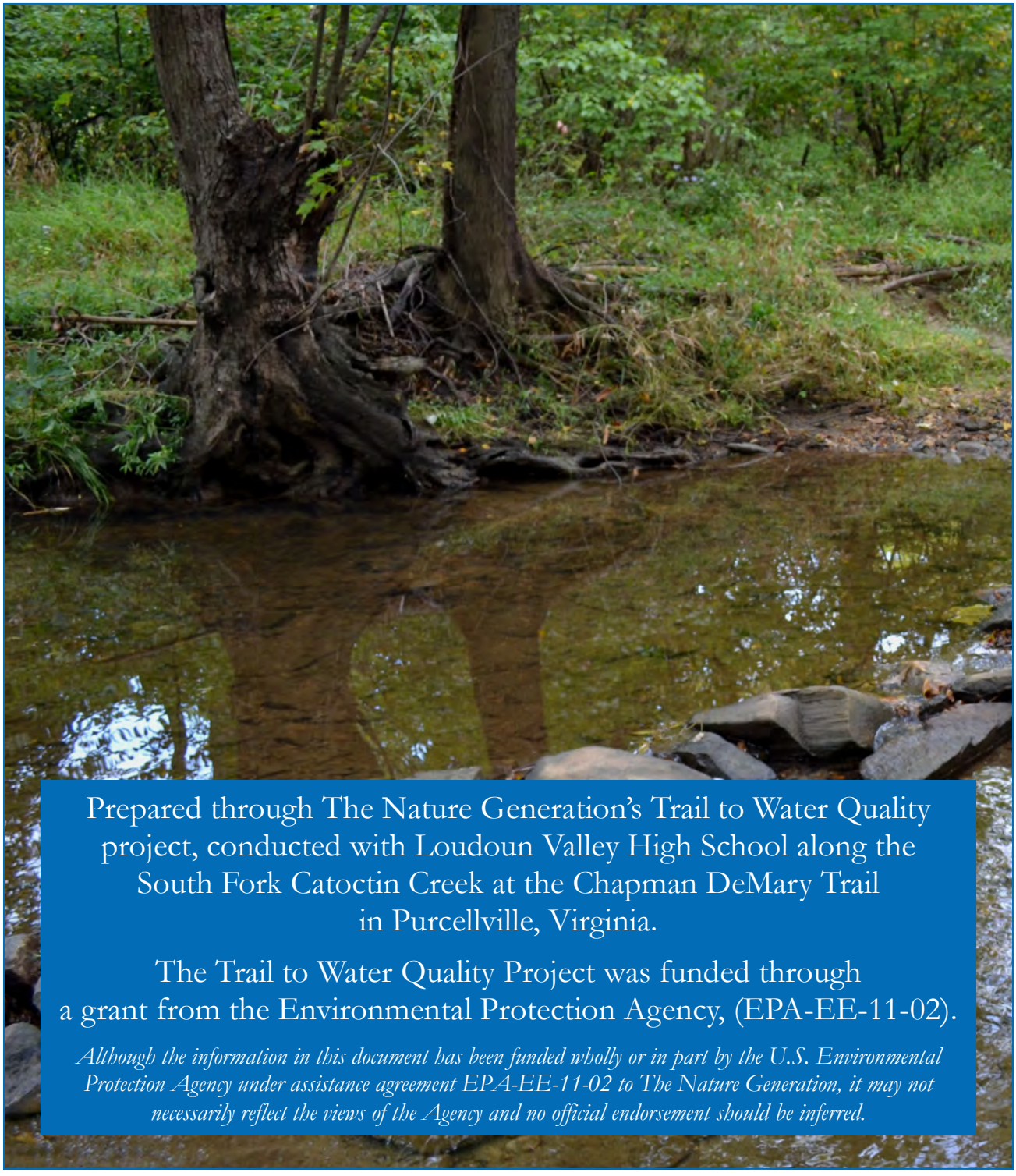
March 2013

The Trail to Water Quality Project was funded through a grant from the Environmental Protection Agency (EPA-EE-11-02).

THE Nature GENERATION
Inspiring environmental stewards



Prepared through The Nature Generation's Trail to Water Quality project, conducted with Loudoun Valley High School along the South Fork Catoctin Creek at the Chapman DeMary Trail in Purcellville, Virginia.

The Trail to Water Quality Project was funded through a grant from the Environmental Protection Agency, (EPA-EE-11-02).

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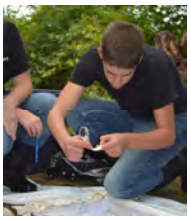
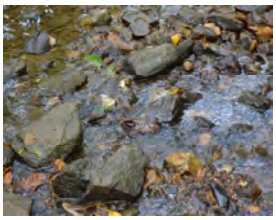

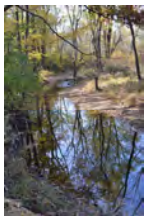

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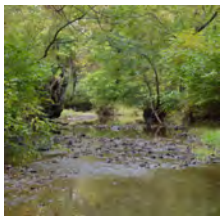
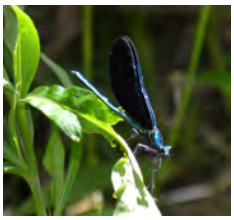
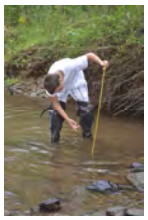
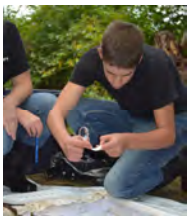
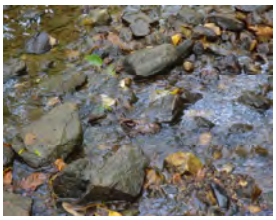


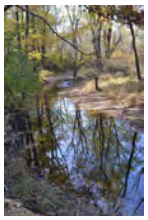





Macroinvertebrate testing

South Fork Catoctin Creek along the Chapman DeMary Trail



Executive Summary

The Trail to Water Quality Plan is part of the overarching Trail to Water Quality Project managed by The Nature Generation, or NatGen, a non-profit organization dedicated to inspiring environmental stewards. The Trail to Water Quality Project was funded through a grant from the Environmental Protection Agency (EPA-EE-11-02). NatGen worked closely with Loudoun Valley High School (LVHS) to implement the project which was designed to teach students the science of water quality through hands-on testing and evaluation so they could prepare a watershed management plan, educate others about water quality, and engage residents and other students in ways to improve water quality so that the important work these students have initiated will be sustained.

This plan is one of several products of the 15-month long project that were researched, written, and prepared by the three lead LVHS students enrolled in the Environmental Science classes. The plan describes water quality testing conducted by the project's lead students, trends in water quality along the South Fork Catoctin Creek, information about the local watershed, and recommendations for future monitoring and stewardship efforts to help improve water quality.

Purpose

The goal of this plan is to provide information about water quality along the South Fork Catoctin Creek and to serve as a starting point for future generations of LVHS students to continue the important work of monitoring and improving the health of this creek which runs along the Chapman DeMary Trail. With the leadership of these students, the hope is to encourage other schools and residents of the Town of Purcellville to get involved in these efforts.

Summary of Findings

The tests conducted through the Trail to Water Quality Project indicate that there has been improvement in water quality. The macroinvertebrate testing conducted shows that the South Fork Catoctin Creek is in a "gray" zone, meaning it is between acceptable and unacceptable ecological condition. This is an improvement from when stream monitoring conducted by other organizations first began in the 1990s. Sampling conducted for E. coli indicated that the health of the creek has improved, but results fluctuate greatly. Additionally, sampling for nitrates and turbidity conducted through the project, which will be used as a baseline for future testing, indicated tat the creek is in good condition. Testing by other organizations show that the South Fork Catoctin Creek is under stress.

Moving forward, the goals for the future are to reduce litter, restore and maintain riparian buffer zones, reduce contaminated runoff, and improve water quality. Strategies to reach those goals are addressed in this report, along with additional recommendations to continue future stream monitoring and expand partnerships. Timelines for annual, seasonal, and as needed activities are also provided.

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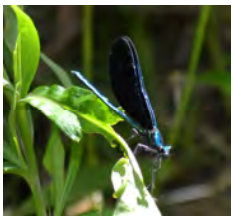
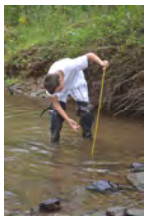




Acknowledgements

Trail to Water Quality Project Supporters

In addition to funding from the EPA, and support from NatGen, Loudoun Valley High School, the Piedmont Environmental Council, and the Town of Purcellville, which are the four primary Chapman DeMary Trail partners, several others have provided their support, expertise, and time for the Trail to Water Quality Project, including:

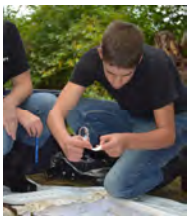
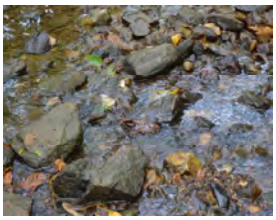
- Ashley Arayas, Environmental Consultant with PPC
- John DeMary, naturalist and retired LVHS teacher
- Mark Evans, Senior Environmental Scientist, TetraTech
- Scott Sandberg, Water Resources Engineer with Loudoun County Government and volunteer with Loudoun Wildlife Conservancy, a member organization with Loudoun Watershed Watch
- David Ward, Water Resources Engineer with Loudoun County Government and volunteer with Loudoun Wildlife Conservancy, a member organization with Loudoun Watershed Watch
- Keep Loudoun Beautiful
- Loudoun County Public Schools
- Loudoun Environmental Stewardship Alliance
- Loudoun Watershed Watch
- Loudoun Wildlife Conservancy
- NatGen Board Members, including:
    - Craig Cheney
    - Tony Diecidue
    - Caitlin Dudek
    - Hope Herron
    - Mark Johnson
    - Linda Manning
    - Nathan Smith
    - Peter Trick, NatGen Board Chair
    - Mike Wanta

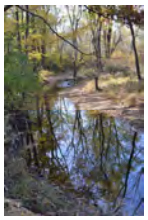

Water quality experts and NatGen board members helping with water testing.

A Special Note from The Nature Generation

The Nature Generation (NatGen) would like to recognize the three Loudoun Valley High School (LVHS) students who were the leads for the Trail to Water Quality Project: Kelsey Bledsoe, Johnathan Conner, and Laura Jeu. This plan, and many other aspects of this project, is their work.

NatGen would also like to recognize LVHS teacher, Liam McGranaghan, for his leadership on the project and for encouraging and guiding his students. NatGen extends their appreciation to LVHS Principal, Susan Ross, for her constant support.



Background

Overview

The Chapman DeMary Trail was created to inspire non-traditional learning while discovering the joy of nature. The EPA awarded a grant to The Nature Generation or NatGen (formerly the Newton Marasco Foundation) for the Trail to Water Quality Project. This project was intended to teach students the science of water quality through hands-on testing and evaluation to create their own watershed management plan for the portion of the South Fork Catoctin Creek that runs through the Chapman DeMary Trail. The trail is located in what is considered to be the last stand of old growth forest in the Town of Purcellville. Through the Trail to Water Quality Project, the lead students were able to engage and teach other students and area residents about the value of improving the health of the creek, which is part of the Chesapeake Bay Watershed. The goal was to positively impact our local watersheds by implementing a specific community response of engagement inspired by student leaders.

History

The Nature Generation and Loudoun Valley High School

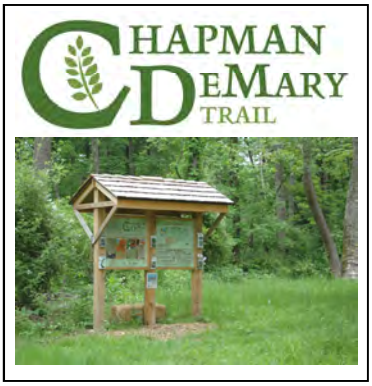
Since 2004, NatGen and LVHS have partnered to give students real-life educational experiences in outdoor environments. NatGen has worked with LVHS to install a variety of outdoor classrooms; support LVHS field trips related to vernal pools and the Meaningful Chesapeake Bay Experience defined by the Chesapeake Bay Program as "an investigative or experimental project that engages students in thinking critically about the Bay watershed;" bring in speakers about wetlands, water, energy, and other environmental topics; and sponsor a variety of environmental art contests. One of the most significant accomplishments in environmental education and stewardship for NatGen and LVHS has been the establishment of the Chapman DeMary Trail. The trail is part of sustainable education partnership among NatGen, LVHS, the Piedmont Environmental Council (PEC), and the Town of Purcellville.

LVHS students on an amphibian field trip supported by NatGen.

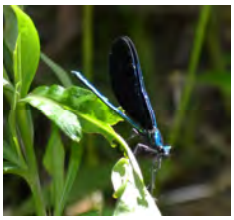
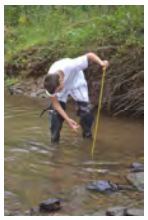
The Chapman DeMary Trail

Creation

Students from LVHS's environmental classes often learn in unconventional ways. John DeMary, now retired from teaching at LVHS, encouraged students to go beyond the classroom instruction, experience nature, and learn how they can protect it. Mr. DeMary and his students shared a vision to protect a tract of land near their school and turn it into an outdoor classroom. Mr. DeMary's students presented this vision to Purcellville's Town Council and community leaders. In the audience was the owner of the land, John Chapman, whose son was one of Mr. DeMary's students. The students' presentation led to Mr. Chapman's decision to generously donate this 10-acre area, considered to be the last stand of old forest growth





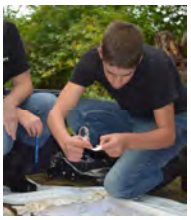
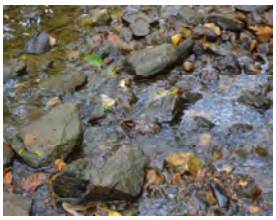

in the Town of Purcellville, for the purposes outlined by the students. Working with NatGen, PEC, and the Town of Purcellville, LVHS was able to achieve their goals to protect the area and use it an outdoor classroom, and the trail, which runs along the South Fork Catoctin Creek, was dubbed the Chapman DeMary Trail. It officially opened on October 30, 2009.

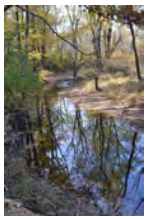
This area, still owned by Mr. Chapman, is now protected through a conservation easement held by the Town of Purcellville. Mr. DeMary's fellow teacher, Liam McGranaghan, worked by his side to help protect the area and turn it into an outdoor classroom. Because of his dedication and the work he continues to do on his own and with his students on the trail, NatGen created a special award in his name: the McGranaghan Stewardship Award. These two teachers and their students turned the area into what is now an amazing nature trail that students and residents can use for education and recreation. Mr. McGranaghan and his students continue their work as stewards of the trail today, and participate in project such as the Trail to Water Quality.

As stewards of the trail, LVHS students have cleaned hundreds of pounds of trash from the area, marked the trail path with woodchips, planted native species, built and installed foot bridges, and created a variety of educational signs and materials so anyone who uses the trail can learn more about this remarkable area. With support and guidance from NatGen and other trail partners and supporters, LVHS students continue to improve and maintain it today, while other schools and residents enjoy the beauty of the area and take advantage of the many educational opportunities it offers. This amazing trail—inspired and maintained by students—relies on student leadership as it grows.

Above: LVHS students spread mulch to mark the path of the Chapman DeMary Trail.

Right: LVHS student Laura Jeu teaches about nonpoint source water pollution.



Chapman DeMary Trail Partners

The Chapman DeMary Trail is part of a sustainable education partnership among The Nature Generation (formerly the Newton Marasco Foundation), Loudoun Valley High School, the Piedmont Environmental Council, and the Town of Purcellville.

The Nature Generation

The Nature Generation, or NatGen, is a non-profit organization dedicated to inspiring environmental stewards. This organization has two main programs: Read Green and Teach Green. The Chapman DeMary Trail is part of the Teach Green program, and designed to get students and others outside to learn about and take care of our environment. NatGen was instrumental in helping secure the conservation easement for the trail, and continues efforts to support and promote the trail through expert-led nature hikes, field kits for schools, and equipment so LVHS students can fulfill their role as stewards of the area. NatGen has worked with students to develop educational signage and materials available at the trail so anyone can learn more about this habitat. To fund many of these efforts, NatGen has secured a number of grants and has also established the Friends of the Trail program.

Loudoun Valley High School (LVHS)

LVHS teaches Environmental Explorations classes that educate and engage students in issues about our environment. Students from these classes have been involved in the establishment of the trail, and have been leaders in the Trail to Water Quality Project. Other classes, including Graphic Arts, have also been involved in the trail by designing educational materials and signage.

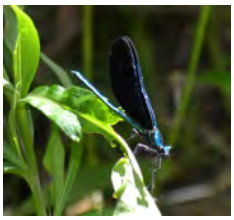
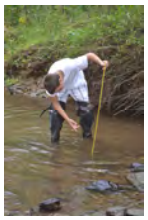
The Piedmont Environmental Council (PEC)

PEC is a nonprofit organization that works with the citizens of their nine-county region, including Loudoun County, to "conserve land, create high-quality communities, strengthen rural economies, celebrate historic resources, protect air and water quality, build smart transportation networks, promote sustainable energy choices, restore wildlife habitat, and improve people's access to nature." PEC has secured grant funding to help make improvements and provide educational information for the Chapman DeMary Trail and worked with students in their efforts to help protect the area.

The Town of Purcellville

The Town of Purcellville is an award-winning town of nearly 8,000 residents located in Loudoun County, approximately 30 miles west of Washington, DC. It has been honored for its green initiatives, most recently with the prestigious Siemens Sustainability Award for Small Communities. The Town holds the conservation easement for the Chapman DeMary Trail. They funded the trail head sign, promoted and participated in trail events, provided mulch for the trail path, and continue to support the trail in many ways.




History of the Property

For about 200 years, the area where the Chapman DeMary Trail is now had been a farm. When the construction of Route 7 divided the property, the family sold it. The individual who purchased it later sold it to John Chapman. It is Mr. Chapman who donated the area to be used as an outdoor classroom, and while he still owns the property, it is protected through a conservation easement held by the Town of Purcellville.

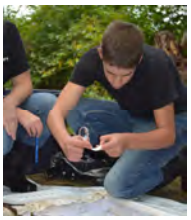
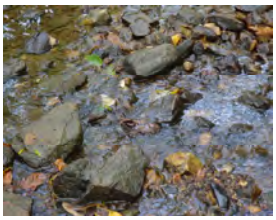
Trail to Water Quality Project

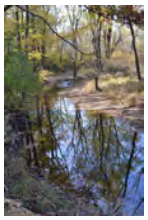
Summary

NatGen's Trail to Water Quality Project was funded through a grant from the EPA. Working with several water quality experts, Loudoun Valley High School Environmental Explorations classes, and Loudoun County Public Schools, NatGen initiated the project in January 2012. The project and concepts about water quality were introduced to students through presentations coordinated by NatGen. Soon after, students began conducting water quality testing at the South Fork Catoctin Creek with guidance from local experts. The tests were performed from June through November 2012, with two benthic macroinvertebrate studies, three nitrate tests, two Escherichia coli (E. coli) tests, and four tests for turbidity conducted in total over the six month period. These tests were selected because similar tests had been conducted by other organizations, providing the opportunity to see trends in water quality, and the ease of conducting these particular tests.

Water testing along the South Fork Catoctin Creek.

The project was designed to give these students hands-on experiences in testing water quality, conducting research about water testing performed by other organizations and governmental agencies, considering the causes of water quality issues, educating and engaging other students and residents in helping understand and improve water quality issues, and creating a plan for future generations of students and residents to help guide efforts in monitoring and improving water quality. Through this project, NatGen also coordinated with Loudoun County Public Schools to provide teachers with training and resources to teach about water testing, as well as to provide equipment for any Loudoun County Public School to check out and use for water testing, conducted outreach to Purcellville residents, established educational information for all trail visitors, and provided equipment for Loudoun Valley High School Environmental Explorations classes to use for future water quality testing efforts.



Trail to Water Quality, Water Testing Timeline

Under the guidance and support of local experts, LVHS students conducted the water quality testing below in 2012:

- June 3—Macroinvertebrates, Turbidity
- September 26—Macroinverbrate, Nitrates, Turbidity
- October 23—Nitrates, Turbidity, E. Coli
- November 28--Nitrates, Turbidity, E. Coli

Trail to Water Quality Events

In addition to the water testing conducted by LVHS students throughout 2012, the events below were held to encourage area residents, teachers, and students to learn about water quality and ways to improve it.

March 2012 Clean-up Day

On March 25, 2012, more than 30 volunteers picked up and removed litter from the Chapman DeMary Trail. Volunteers included local school students, scout troops, area residents, as well as the Blue Ridge District Supervisor of the Loudoun County Board of Supervisors. The volunteers collected over 12 bags of trash, tires, and rusted metal and recycled 7.2 pounds of plastic, 25.6 pounds of glass, and 4.4 pounds of aluminum. Volunteers also marked portions of the trail with wood chips.

June 2012 Community Test Day for Macroinvertebrates

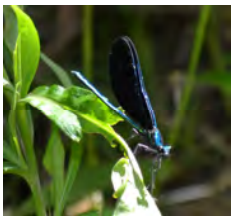
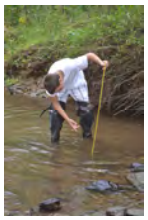
On June 3, 2012, The Nature Generation organized a community-wide testing event to evaluate the status of macroinvertebrates in the Catoctin Creek. Nearly sixty people, including Loudoun County Public School teachers, gathered on the Chapman DeMary Trail to identify and count benthic macroinvertebrates and to use turbidity tubes to test for suspended solid levels. Former and current environmental teachers, water quality experts, and local students oversaw the testing with assistance from local volunteers. Four separate teams collected and counted macroinvertebrates at different sites along the stream.

Bethnic macroinvertebrate testing conducted during the project.

October 2012 Family Stream Day

On October 13, 2012, the annual Family Stream Day was held at the Chapman DeMary Trail. Co-sponsored by the Loudoun Watershed Watch and the Loudoun Environmental Stewardship Alliance, of which NatGen is a member, the event featured 11 organizations which offered fun, hands-on activities about water and water quality for children and their families. The lead students for the Trail to Water Quality Project worked with NatGen to plan and promote NatGen's Trail to



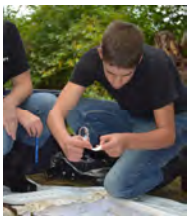
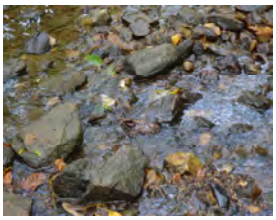



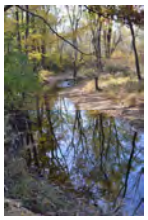

Water Quality table. The students also created a fact sheet, designed and led an activity for children to learn about nonpoint source water pollution, and created a display about nonpoint source water pollution, and staffed the table during the event

Project WET Training for Loudoun County Public School Teachers
NatGen worked with the Loudoun County Public School (LCPS) science curriculum staff to plan Project WET training, open to any interested LCPS teacher.




Events held over the course of the project to clean up, test the water, and educate others about water pollution.



Watershed Characteristics

The EPA defines a watershed as "the land area that drains to a single body of water such as a stream, lake, wetland or aquifer (an underground layer of water)." Information from the EPA goes on to state that "The actions of people who live in a watershed affect the health of the waters that run through it. Rainfall and snowmelt wash chemicals, fertilizers, sediment, and other pollutants from the land into water bodies."

The South Fork Catoctin Creek, which runs along the Chapman DeMary Trail, is within the Middle Potomac-Catoctin Watershed. This watershed is part of the larger Chesapeake Bay Watershed, which covers 64,000 square miles and is home to more than 17 million people. About 150 major rivers and streams are part of the Chesapeake Bay Watershed.

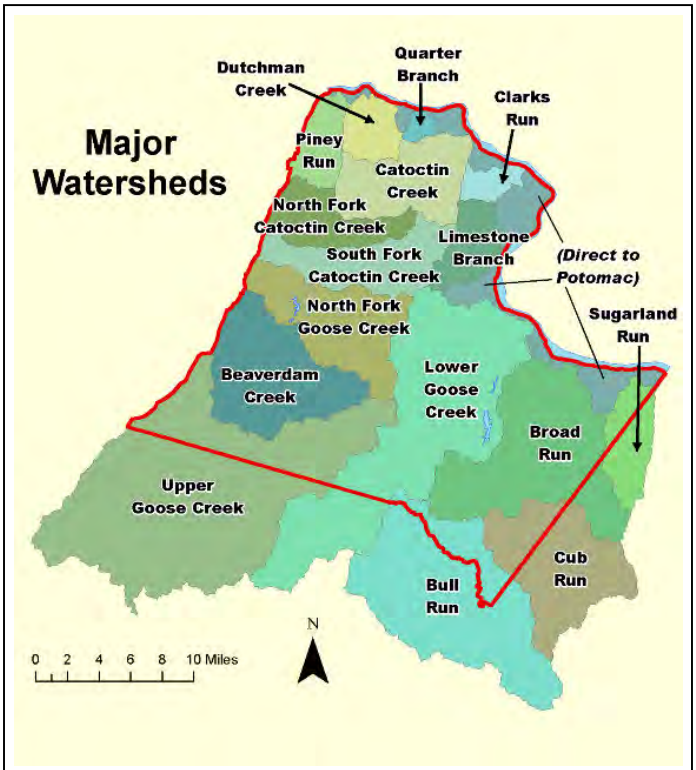


Figure 1: Major Watersheds in Loudoun County
Source: http://www.loudoun.gov/index.aspx?NID=1512

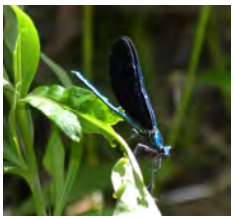
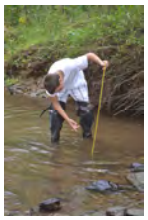
Geography

The Town of Purcellville and surrounding areas lie in a valley created by the Blue Ridge Mountains. The segment of the South Fork Catoctin Creek watershed within the city limits is in a low lying area near business Route 7. A broad riparian buffer zone protects a large portion of the stream from runoff from Hirst Road, but there is less of a buffer provided by forest growth between the stream and the neighborhoods stemming from Hatcher Avenue. South Fork Catoctin Creek, a rocky bottomed stream, converges with North Fork Catoctin Creek a few miles north of Waterford, Virginia (about 10 miles from Purcellville) to form the Catoctin Creek, which flows to the Potomac River, a tributary to the Chesapeake Bay.

Geology

South Fork Catoctin Creek is located in western Loudoun County, which is separated from Eastern Loudoun County by the Bull Run Fault. The western portion of the county lies on the Blue Ridge Province. In western Loudoun, the soil is underlain by metamorphic rocks and tends to be more permeable than the rest of the county, allowing a higher level of interaction between groundwater and surface water.




Soils

In the area surrounding the Chapman DeMary Trail, the following soil types exist in some capacity: Purcellville soil, Tankerville soil, Middleburg soil, Codorus silt loam, Hatboro loam, Mongle silt loam, and Purcellville silt loam. The area next to the Catoctin Creek is dominated by Codorus silt loam and Hatboro loam. Both Codorus and Hatboro flood easily as water does not drain well in these soil types. Codorus is found along the western half of the stretch of Catoctin Creek located between 21st Street and Hatcher Avenue whereas Hatboro is found along the eastern half. Codorus can be cultivated if well drained and protected from flooding, but Hatboro is not recommended for cultivation as it contains too much sand. A report on the soil along the Chapman DeMary Trail was obtained from the Department of Agriculture.

Topography

Located North of Purcellville, Virginia, within the county of Loudoun, the South Fork of the Catoctin Creek rises on the slopes of the Blue Ridge Mountains west of Purcellville and flows eastward toward Waterford, Virginia. It then flows northward to become Catoctin Creek after its confluence with the North Fork, which rises on the Blue Ridge Mountains west of Hillsboro, Virginia. The Catoctin Creek then flows into the Potomac River and the Chesapeake Bay. Impervious surfaces and agricultural fields are located throughout the watershed area. Milltown Creek, the primary tributary to the Catoctin Creek, originates on the eastern slope of Short Hill Mountain and flows eastward to join with the main stem of the Catoctin Creek. Steep rocky buffs are present from Taylorstown, Virginia to Point of Rocks.

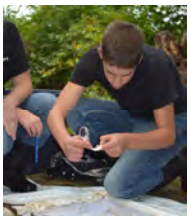
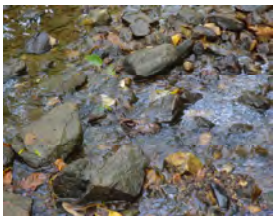
Habitat

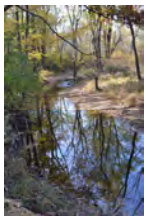
Many plants and animals rely on the land surrounding the Chapman DeMary trail for survival. As the last true expanse of old forest growth in Purcellville, the area provides a habitat for many animals that otherwise could not survive. This area provides necessary and unique resources for many native animals and preserves the land as a natural habitat in the midst of an expanding industrial and residential area.

Plants

The riparian buffer zone surrounding the trail is characterized by moderately thick underbrush and old forest growth. The heavy tree cover keeps the forest floor and stream water at a cooler temperature than the surrounding area. The vegetation filters pollutants from runoff into the stream. Several common plants include Skunk Cabbage, Wood Nettle, and Virginia creeper. Springtime brings a flurry of seasonal wildflowers, such as Jack-in-the-Pulpit, New England Aster, and Star of Bethlehem. Among the trees towering above the trail, Black Walnut, Red Maple, Red Oak, Tulip Poplar, and American

Jack-in-the-Pulpit along the Chapman DeMary Trail



Beech stand predominantly tall, with large summer leaves to filter the sunlight from the brush below. Spicebush, sassafras, and other shrubs provide food and shelter along the forest floor.

Animals

Many animals take shelter in the underbrush around the trail. White-Tailed Deer often tread along the path. Garter snakes, black rat snakes, and northern water snakes slither through the woods and in the brush. Often, box turtles and painted turtles can be found directly on the path. Small rodents, as well as raccoons, squirrels, rabbits, foxes, and opossums also make their homes in the area.

Birds

In the South Fork Catoctin Creek floodplain, Spicebushes grow amply, providing food for migratory birds. This area is a major migration corridor for birds including Eastern Bluebirds and Yellow Rump Warblers. The rich soil of the floodplains allows many types of insects and other small organisms to flourish, which attracts birds. The large rodent population appeals to raptors. Common birds in the floodplain include Red-Shouldered Hawks, Carolina Chickadees, Downy Woodpeckers, Pileated Woodpeckers, and Barred Owls. There is also a nesting pair of Great Horned Owls along the trail.

Great Horned Owls along the Chapman DeMary Trail.

Amphibians

The rocky creek bed and sloping banks provide habitats for numerous amphibians. Frogs and toads, like the green frog, bullfrog, American toad, and gray tree frog can be found in trees and on the banks. Sometimes, a few immature salamanders can be seen squirming through muddy puddles in springtime.

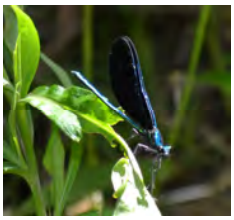
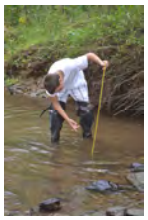
Butterflies

Butterflies find food and shelter in a student maintained butterfly waystation. Native plants, including milkweed, goldenrod, asters, and butterfly bush, create a habitat for butterflies like the eastern tiger swallowtail, the red admiral, and the monarch.

Watershed Population

As of the 2010 United States Census, there were 7,727 people living in Purcellville. Because of the mbiguity of the exact area of the watershed, finding exact numbers is difficult. The South Fork Catoctin Creek is part of the Cheasapeake Bay Watershed, which, according to the Chesapeake Bay Foundation, http://www.cbf.org/about-the-bay/maps "covers 64,000 square miles in six states and



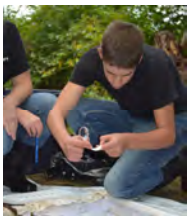
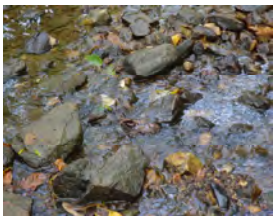



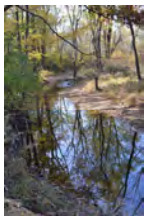

the District of Columbia." The Chesapeake Bay Program, http://www.chesapeakebay.net/indicators/indicator/chesapeake_bay_watershed_population, states that as of 2011, 17.5 million people were estimated to live in the bay watershed, up from 17.4 million in 2010. Experts predict that the watershed's population will increase to more than 20 million by 2030."

Watershed Land Uses

The primary land uses within the Catoctin Creek watershed, which drains about 100 square miles, are agriculture and forest. Agriculture can have an impact on the water in a variety of ways, such as creating demands on water supplies; causing pollution through runoff and seepage of fertilizer, herbicides, and pesticides; and/or animal waste. Fecal pollution from livestock, especially beef cattle, is a serious concern; according to the Virginia Department of Environmental Quality, 70% of the wastes from cattle that have stream access will be deposited into that stream. Additionally, suburban development in the southern part of watershed is changing the land at the headwaters of the Catoctin Creek, according to the *State of the Streams, Loudoun County: 2005, A Water Quality Assessment*. In urban and suburban areas, impervious surfaces, such as roadways, driveways, rooftops, and parking lots, in these areas impact the health of streams and water quality because these surfaces increase the quantity of runoff water from rainstorms. Runoff water from rain and stormwater picks up pollutants such as oil, trash, sediment, fecal matter, fertilizers, and pesticides and carries them into our streams, harming aquatic life and our environment. Towns that have more impervious surfaces cause large volumes of stormwater to discharge into South Fork Catoctin Creek. Activities upstream affect the water quality by adding pollutants that are not easily traced. These pollutants can cause algal blooms, decrease dissolved oxygen, and hinder organism growth. Organism populations that cannot easily adapt to change will most likely decrease.


South Fork Catoctin Creek and animal tracks in the sand.



Water Quality Analysis

Water Quality Sampling Background

Through the Trail to Water Quality Project, the LVHS students tested the following:

Benthic Macroinvertebrates: Stream bottom dwellers known as benthic macroinvertebrates are aquatic species for which the count can serve as an indicator of the health of a particular area. Certain species cannot survive in polluted water and when found in high numbers, can indicate a healthy waterway. Other species are able to thrive in polluted water, and when found in high numbers can indicate a polluted waterway.

Nitrates: Nitrates are a form of nitrogen. While they are essential plant nutrients, when there is too much, it can cause significant problems with water quality. When there is an excess of nitrates, along with phosphorous, it can contribute to algae blooms in the water body, which may lead to decreases in oxygen for aquatic organisms. This impacts the entire food chain, and may also increase turbidity. Nitrate sources include runoff from lawns and croplands that are fertilized, wastewater treatment plants, and more.

Turbidity: Turbidity is a measure of water clarity. It shows how much suspended material, such as soil particles, algae, plankton, and microbes, in the water decreases the passage of light through the water. A higher turbidity reduces photosynthesis and the production of dissolved oxygen. Additionally, higher turbidity causes water temperatures increase because the particles suspended in the water absorb more heat which reduces the concentration of dissolved oxygen. High turbidity is associated with changes in the macroinvertebrate populations because many species cannot tolerate high levels of turbidity. These changes in macroinvertebrate populations lead to changes in the fish populations that feed on them. Additionally, fish cannot tolerate high levels of turbidity. Sources of turbidity include soil erosion, waste discharge, urban runoff, eroding stream banks and excessive algal growth.

Escherichia Coli (E. coli): Animal and human waste, known in water quality testing as fecal coliform, is found in many waterways. The bacteria Escherichia coli is a type of coliform that can cause dangerous illnesses. Escherichia coli enters waterways through numerous pathways: faulty septic systems, sewer malfunctions, grazing land runoff, and storm drains. Animals that directly enter waterways also contaminate the water.

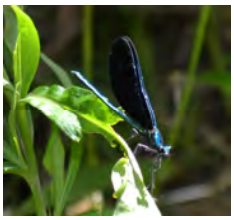
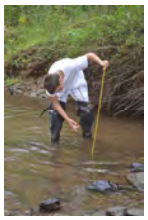
Water Quality Sampling Methodologies

Through the Trail to Water Quality Project, LVHS students used the protocols described below to conduct their sampling.

Benthic Macroinvertebrates

All sampling was conducted using the guidelines set forth by Virginia Save Our Streams. Under the Save Our Streams scoring, unacceptable ecological conditions are those which have a Multimetric score




between 0 and 7, ecological conditions that cannot be determined (gray zones) have a Multimetric score of 8, and acceptable ecological conditions are given a Multimetric score from 9 to 12. The Multimetric score is determined by counting the individual organisms based on the categories, and continuing through a series of calculations that result in a final Multimetrix Index Score that indicated whether the site is in acceptable or unacceptable ecological condition. Sampling sites for benthic macroinvertebrates were selected along the entire length of the portion of the South Fork Catoctin Creek that runs along the Chapman DeMary Trail, providing sampling results that are representative of the overall water quality along the trail.

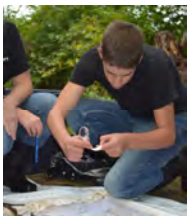
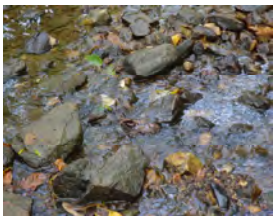
Nitrates

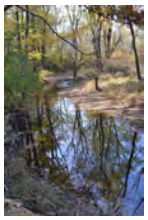
To measure nitrates on the South Fork Catoctin Creek, the LaMotte Nitrate/Nitrogen Test Kit was used, following the instructions provided in the kit. This kit consists of a 2-tablet reagent system that measures nitrate nitrogen from 0 to 15 parts per million, or ppm, (0 to 66 ppm as nitrate). To conduct the test, water from the South Fork Catoctin Creek was collected in a test tube. A nitrate tablet was added to the water and mixed until the tablet had disintegrated. A second nitrate tablet was then added and again, the water was shaken until the second tablet had dissolved. After 5 minutes, the test tube was inserted into an Octa-Slide viewer to match the color of the water to one on the scale. All water samples were taken from the stream near the mid-point of the Chapman DeMary Trail.

Turbidity

The Carolina Turbidity Tubes were used to conduct all tests. Using the tubes, the transparency of the water was measured. The turbidity tube is a clear, 120-cm tube featuring a side scale with both centimeter and Nephelometric Turbidity Unit (NTU) markings, plus a 45-mm secchi-disk design at the bottom of the tube. Water level within the tube is controlled using the drain tube and clamp at the base. Turbidity was tested by filling the tube with water from the South Fork Catoctin Creek, draining the tube until the testers could clearly view the secchi-disk design at the base. In the event that visibility exceeded the length of the tube, exact measurements could not be recorded. Nephelometric Turbidity Units (NTUs) are a way to measure turbidity in water by analyzing light scattered through a water sample. Test water samples were taken from various locations of the creek along the Chapman DeMary Trail.

LVHS lead students with some water testing equipment. Pictured clockwise from the top: Kelsey Bledsoe, Laura Jeu, and Johnathan Conner.



Escherichia Coli (E. coli)

All sampling for E. coli was conducted using materials from and following the instructions of Micrology Laboratories, LLC for the Coliscan Water Monitoing Kit. Per the instructions, 5mL of water from the South Fork Catoctin Creek was added to the Coliscan medium, poured into an Easygel petri dish, and then incubated using Loudoun Valley High School's incubator. The results were recorded based on the number of visible colony forming units (cfu) per 100 milliliter (mL) sample. Water samples were taken from various locations of the South Fork Catoctin Creek along the eastern portion of the Chapman DeMary Trail. The Virginia Water Quality Standard for E. coli indicates that the maximum safe amount is 235 colony forming units per 100mL for recreational use, such as swimming, and for drinking water, the limit is zero.

Summary of Existing Data

During the writing of this plan, several reports were reviewed. Information from these reports that was relevant to the plan is summarized below.

Virginia Department of Environmental Quality 2004 Water Quality Assessment Summary of Findings for Loudoun County

Using data from samples taken between 1998 and 2002, Virginia Department of Environmental Quality (DEQ) developed a Total Maximum Daily Load (TMDL) for South Fork Catoctin Creek. A TMDL is the maximum amount of a given pollutant that a waterbody can contain without exceeding the state water quality standard for that pollutant. Additionally, a new benthic impairment was identified for the stream, meaning that the water quality could not adequately support benthic organism populations. This impairment was added to the existing fecal coliform impairment of the stream. The major sources of pollution identified in the TMDL were livestock in the stream, residential runoff and pollutants, and inadequate riparian buffers.

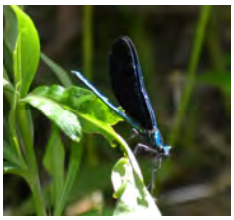
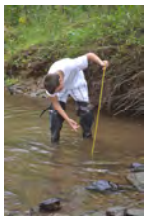
State of the Streams: Loudoun County 2005

According to a 2005 water quality assessment conducted by Loudoun Watershed Watch and Loudoun Wildlife Conservancy, South Fork Catoctin Creek was classified as 'impaired" by the presence of fecal coliform. The assessment also showed that the stream did not support a healthy benthic macroinvertebrate community. The chemical quality of the water was reported to be 'good.' Bacteria quality was 'impaired.' The assessment reported that the primary sources of pollution were inadequate riparian buffers, contaminated runoff, and direct pollution.

Loudoun County Stream Assessment: Results Report 2009

In a 2009 stream assessment conducted by Loudoun County, samples were taken from six test sites along South Fork Catoctin Creek. South Fork Catoctin Creek was classified as being under 'stress' based on the mean stream health using Virginia Stream Condition Index. The habitats surrounding South Fork Catoctin Creek were a mix of 'suboptimal' and 'optimal'; the streambed habitat was 70% 'optimal' and 30% 'suboptimal.' While both the riparian width and bank erosion were not under severe



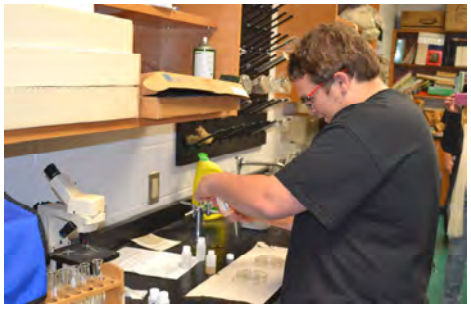




stress, they presented the two largest concerns to the stream's health. The test site directly along the Chapman DeMary Trail (SFCC-216-T-2009) had a benthic score that indicted severe stress and a suboptimal habitat score.

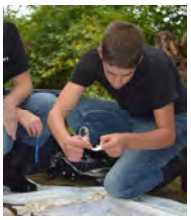
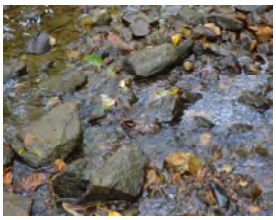
2011 Water Resources Monitoring Data Summary

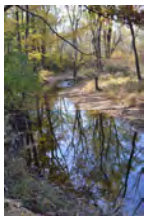
In a summary developed by Loudoun County, South Fork Catoctin Creek was found to have benthic impairments in the Purcellville area of the watershed and was not able to support all aquatic life due to pollution. (Published 2012)






Lead students, Laura Jeu, Kelsey Bledsoe, and Johnathan Conner, conducting tests for nitrate, turbidity, and E. coli.



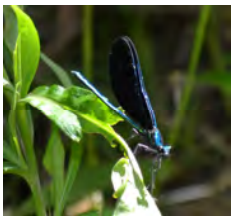
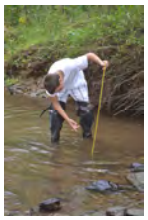
Results of Water Quality Sampling Conducted by LVHS

The results of testing conducted by LVHS students for the Trail to Water Quality Project are below. These results indicate that over the course of our testing, the water quality remained fairly stable. No significantly higher or lower results were found.

Date:	Test:		Results:	
June 3, 2012	Macroinvertebrates (three stations)	Station 1	Multimetric score of 8	
		Station 2	Multimetric score of 10	
		Station 3	Multimetric score of 8	
	Turbidity (four tests)	Test 1	120 cm	<10
		Test 2	112 cm	<10
		Test 3	104 cm	<10
		Test 4	100 cm	<10
September 26, 2012	Macroinvertebrates (four stations)	Station 1	Multimetric score of 10	
		Station 2	Multimetric score of 7	
		Station 3	Multimetric score of 11	
		Station 4	Multimetric score of 11	
	Nitrates		2 ppm	
	Turbidity		Visibility exceeded length of tube	<10 NTU
October 23, 2012	Nitrates		2 ppm	
	Turbidity		Visibility exceeded length of tube	<10 NTU
	Escherichia coli		No colonies found	
November 28, 2012	Nitrates		1 ppm	
	Turbidity		Visibility exceeded length of tube	<10 NTU
	Escherichia coli		8 colonies per 100 mL	

Table 1: Results of Water Quality Sampling Conducted by LVHS




Trends from New and Existing Data

Below are tables and graphs that show results and trends from the sampling conducted by LVHS through the Trail to Water Quality Project and results of testing conducted or reported by other organizations when available, including results reported by Loudoun Wildlife Conservancy (LWC) through Virginia Save Our Streams and by the Virginia Department of Environmental Quality (DEQ).

Benthic Macroinvertebrates

Collection Dates		LWC*	LVHS
2008	May 24	7	
	August 16	10	
	November 15	8	
2009	May 10	9	
	July 11	8	
2010	April 11	8	
	July 14	9	
	October 17	7	
2012	April 7	11	
	June 3	8	
	September 26	9	
	June 3		8
	June 3		10
	June 3		8
	September 26		10
	September 26		7
	September 26		11
	September 26		11

Table 2: Benthic Macroinvertebrate Test Results and Trends

*Almost all of the data collected and reported by LWC (Loudoun Wildlife Conservancy) in the table and chart on these pages is from Phillips Farm at South Fork Catoctin Creek near Waterford, Virginia. Land use in this area is similar to the South Fork Catoctin Creek along the Chapman DeMary Trail in Purcellville, Virginia.

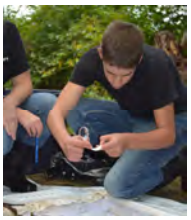
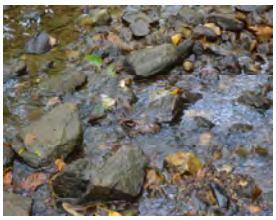
What the Scores Mean

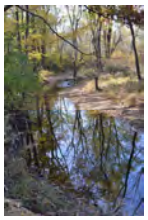
9 to 12
Acceptable ecologic condition

8
Ecological conditions cannot be determined at this time (Gray Zone)

0 to 7
Unacceptable ecological condition

LVHS student holding a crayfish.



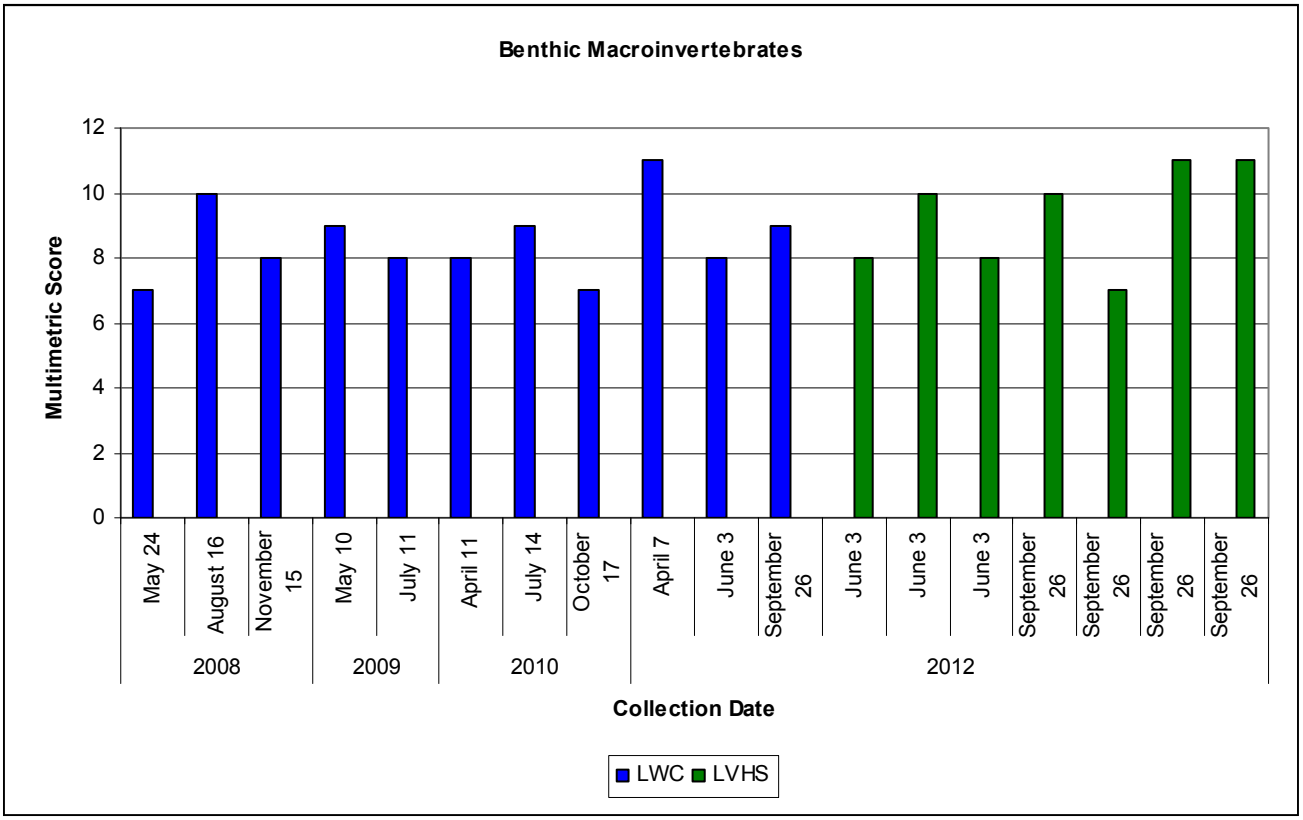


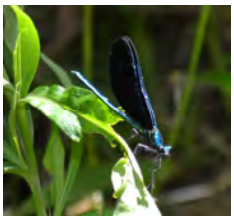
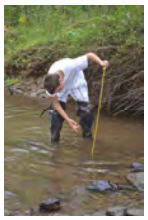
Figure 2: Benthic Macroinvertebrate Test Results and Trends

Summary

The macroinvertebrate count has remained near the "gray zone." These results indicate that the pollutants in the stream are creating a ecological conditions that are between acceptable and unacceptable. Populations of macroinvertebrates and other organisms could be affected negatively by the pollutants. The creek should continue to be monitored regularly.

Tray of benthic macroinvertebrates.




Nitrate

Collection Date	LVHS
September 26, 2012	2 ppm
October 23, 2012	2 ppm
November 28, 2012	1 ppm

Table 3: Nitrate Test Results and Trends

Tests used through the Trail to Water Quality Project measured nitrate nitrogen from 0 to 15 parts per million, or ppm (0 to 66 ppm as nitrate).

LVHS student, Kelsey Bledsoe working with John DeMary.

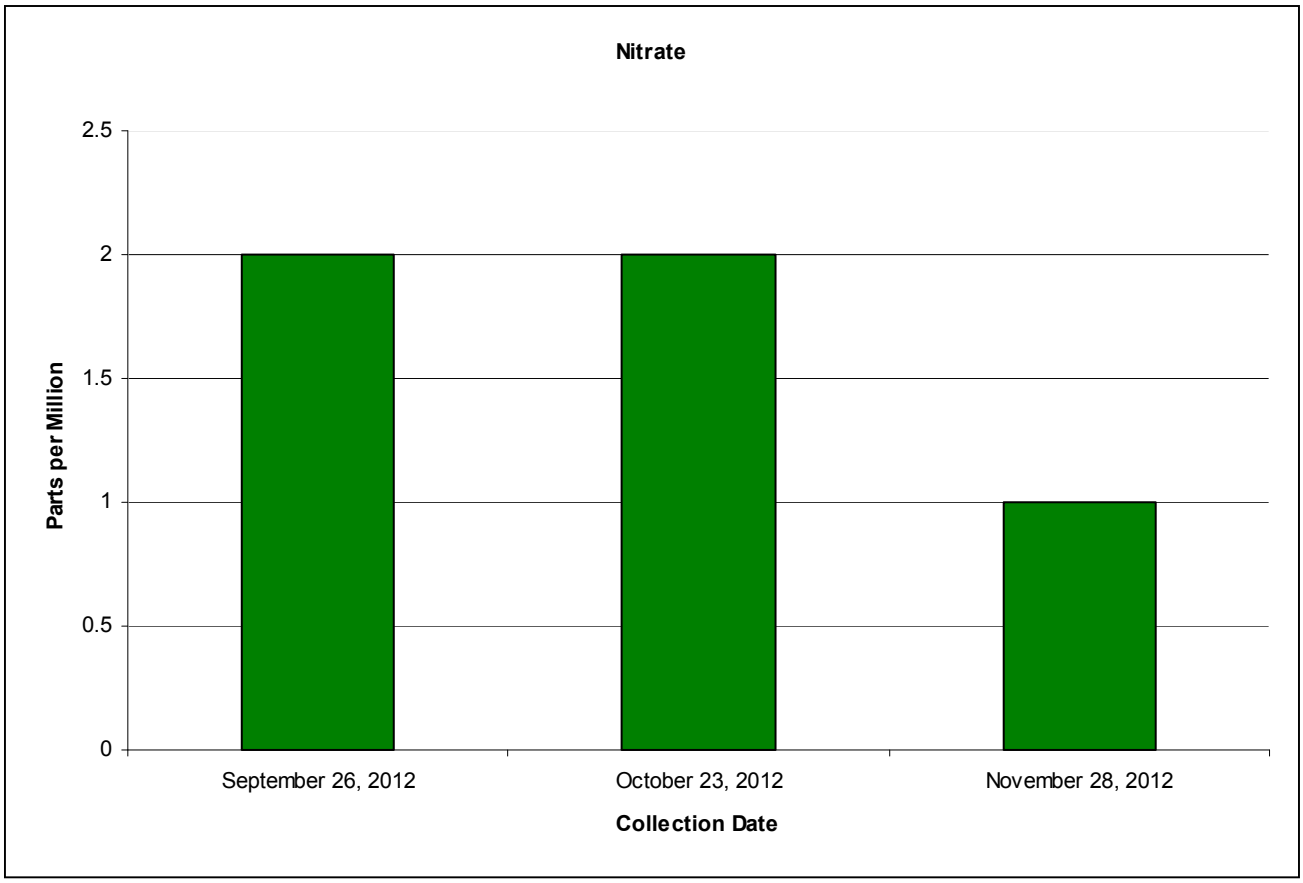
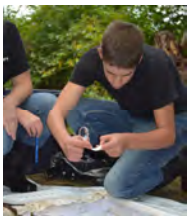
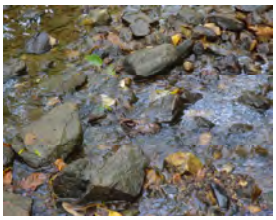
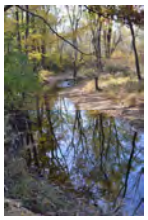


Figure 3: Nitrate Test Results and Trends



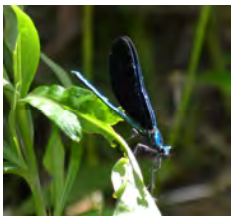
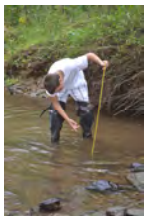
Summary

Through the Trail to Water Quality Project, LVHS students established a baseline of data for nitrates in the South Fork Catoctin Creek. In the three-month period that nitrate levels were tested there was a slight decrease. Using the scale in the kit, the results indicate low levels of nitrates in the water, which is a positive indicator of good water quality. Nitrate levels should continue to be monitored and trends tracked, using this data as a baseline.

Retired LVHS teacher John DeMary with lead student Laura Jeu checking nitrate levels from the South Fork Catoctin Creek.

Lead students Laura Jeu and Kelsey Bledsoe conducting a nitrate test.




Turbidity

Collection Date		Centimeters/NTU
2012	June 3, test 1	120 cm (< 10 NTU)
	June 3, test 2	112 cm (< 10 NTU)
	June 3, test 3	104 cm (< 10 NTU)
	June 3, test 4	100 cm (< 10 NTU)
2012	September 26	120 cm (< 10 NTU)
2012	October 23	120 cm (< 10 NTU)
2012	November 28	120 cm (< 10 NTU)

NTU stands for Nephelometric Turbidity Unit. The turbidity tube used has a scale with markings for centimeters and for NTUs.

Table 4: Turbidity Test Results and Trends

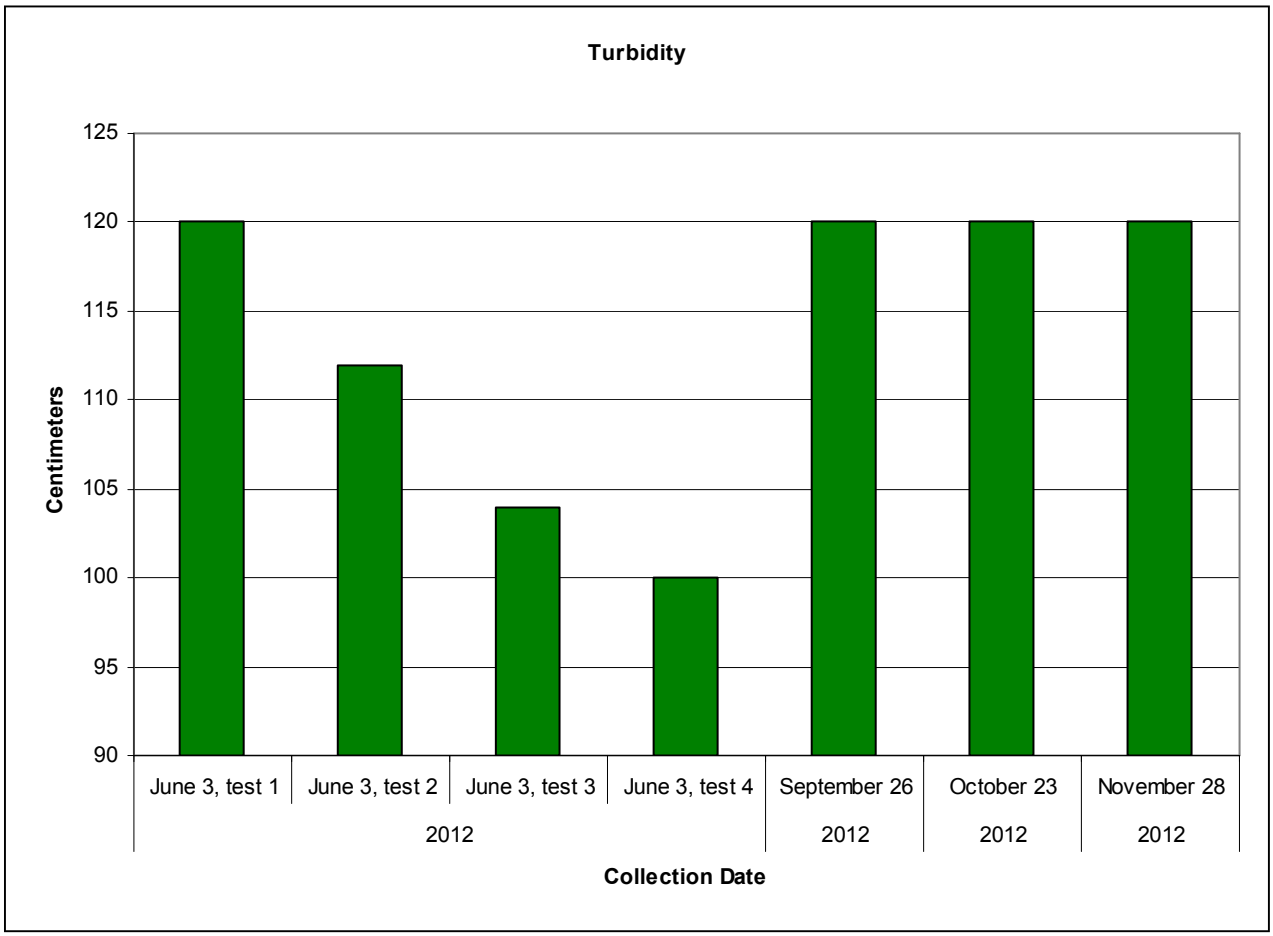
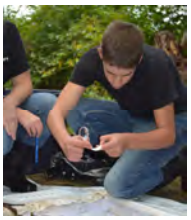
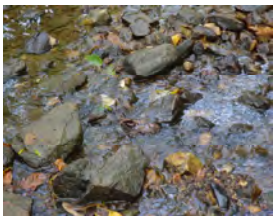
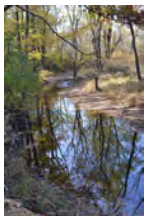


Figure 4: Turbidity Test Results and Trends



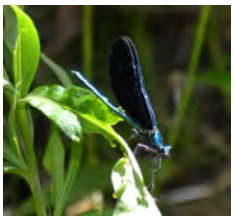
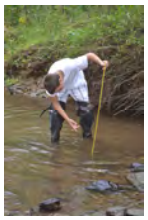
Summary

Nephelometric Turbidity Units (NTUs) are a way to measure turbidity in water by analyzing light scattered through a water sample. A high number of NTUs indicates that there is a large amount of suspended solids in the water, which is a negative indicator for water quality. Tests conducted through the Trail to Water Quality Project show a low number of NTUs, with <10, which is an indication of good water quality. The water levels were measured in centimeters and NTUs. These results will be used as a baseline for future testing.

Turbidity testing conducted through the project.





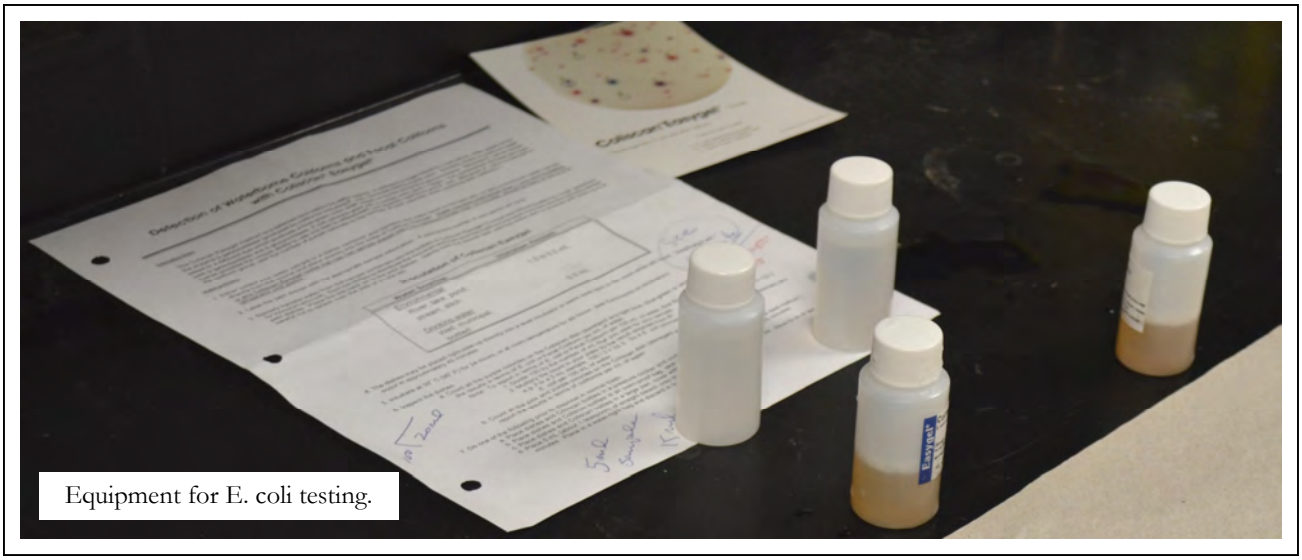

Escherichia Coli

Year	Date	DEQ	LVHS
1999	July 15	68	
	September 15	3819	
	November 16	68	
	December 1	68	
2000	January 11	187	
	February 10	68	
	March 2	68	
	April 25	2205	
	May 30	129	
	June 19	68	
	July 17	513	
	August 28	3819	
2006	October 18	668	
	October 18	1400	
	November 20	52	
	November 20	25	
2012	October 23		0
	November 28		8

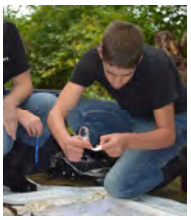
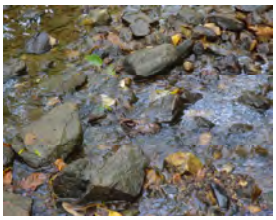
Table 5: E. coli Test Results and Trends

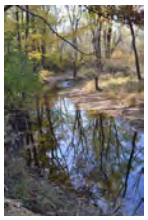
LVHS teacher Liam McGranaghan guiding student on E. coli test.

The Virginia Department of Environmental Quality's (DEQ) Water Quality Standard for E. coli indicates that the maximum safe amount is 235 colony forming units per 100mL for recreational use, such as swimming, and for drinking water, the limit is zero.



Equipment for E. coli testing.



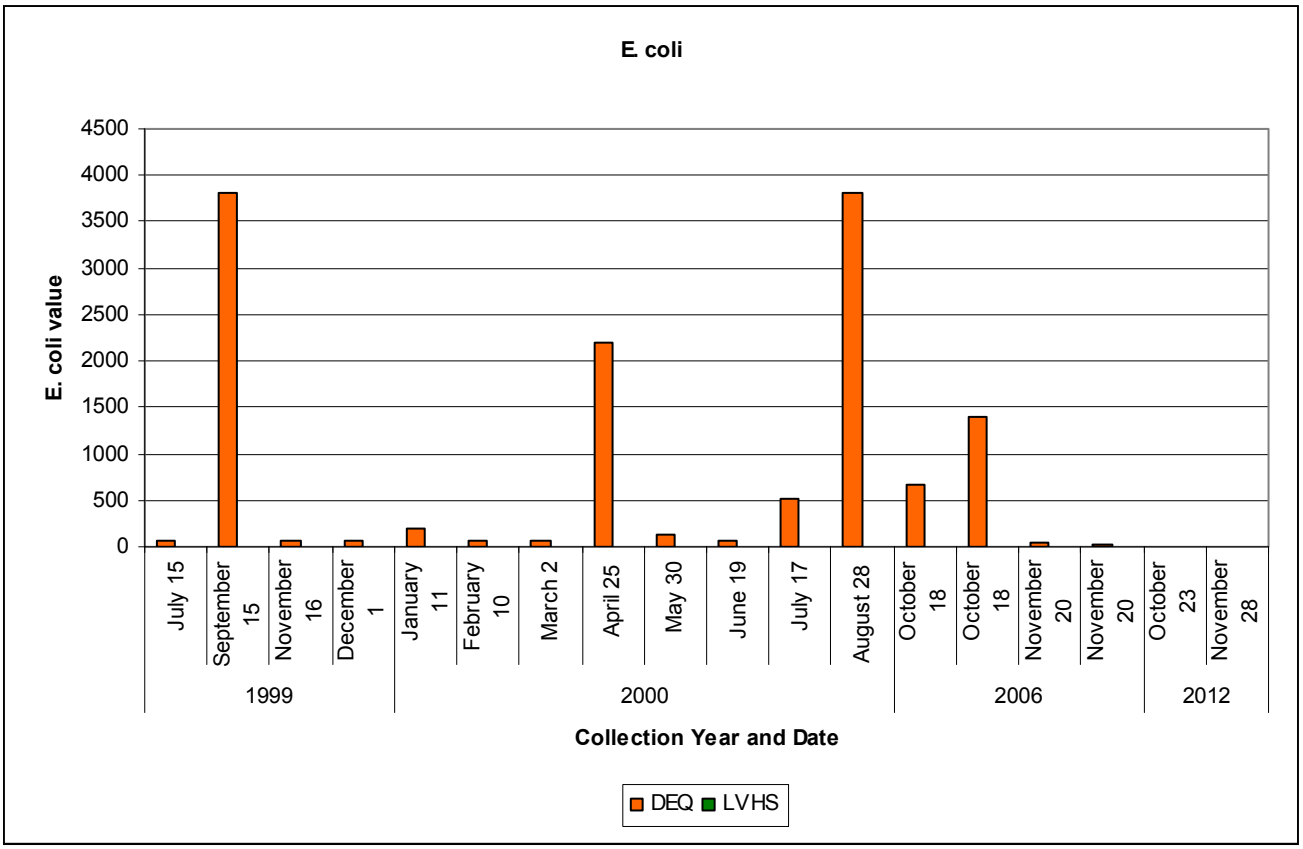


Figure 5: E. coli Test Results and Trends

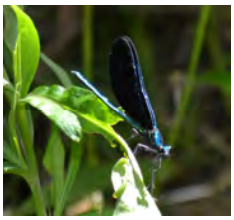
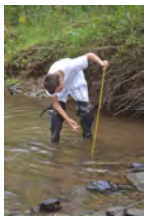
Summary

Results show that E. coli levels fluctuate. The Virginia Department of Environmental Quality (DEQ) has conducted E. coli tests along the South Fork Catoctin Creek since 1977, though the results shown here are from 1999. DEQ's water quality standard for recreational use, such as swimming, is 235 colony forming units/100 mL; the limit for drinking water is zero. It is critical that E. coli continue to be monitored closely and efforts continue to be taken to help reduce levels. It is unclear as to why results from tests conducted by LVHS were significantly lower than those from DEQ, but may be related to factors such as time of year and procedures used.

Based on results of water quality testing conducted by LVHS students through the Trail to Water Quality Project, and analysis of data from other sources, a variety of recommendations are proposed in the next section to help continue improving water quality in the South Fork Catoctin Creek.

Incubator used for E. coli testing.




Benthic macroinvertebrate testing.




Save Our Streams Multimetric Index

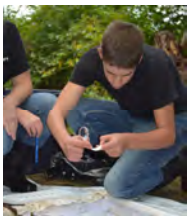
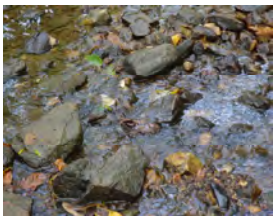
Write your metric value from the previous page in the 2nd column (Your Metric Value). Determine whether each metric should get a score of 2,1, or 0 – depending upon the range of your metric value. Put a check in the appropriate box for your metric value under 2,1, or 0. Count the total number of 2's 1's and 0's. Follow the multiplication at the bottom of the chart to determine your Save Our Streams Multimetric Index score and determine whether the site has acceptable or unacceptable ecological condition.

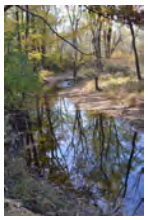
Metric Number	Metric Organism	Your Metric Value	2	1	0
1	% Mayflies + Stoneflies + Most Caddisflies	11%	Greater than 32.2	16.1 - 32.2	Less than 16.1 O
2	% Common Netspinners	37%	Less than 19.7	19.7 - 34.5	Greater than 34.5 O
3	% Lunged Snails	0	Less than 0.3 2	0.3 - 1.5	Greater than 1.5
4	% Beetles	42%	Greater than 6.4 2	3.2 - 6.4	Less than 3.2
5	% Tolerant	7%	Less than 46.7 2	46.7 - 61.5	Greater than 61.5
6	% Non-Insects	5%	Less than 5.4 2	5.4 - 20.8	Greater than 20.8
			Total # of 2s: 4	Total # of 1s: O	Total # of 0s: 2
	Subtotals:		Multiply by 2: 8	Multiply by 1: O	Multiply by 0: O

Now add the 3 subtotals to get the Save Our Streams Multimetric Index score: 8

_____Acceptable ecological condition (9 to 12)
X Ecological conditions cannot be determined at this time (Gray Zone) (8)
_____Unacceptable ecological condition (0 to 7)

Please send data sheets to your regional coordinator or VA SOS, P.O. Box 8297, Richmond, Va 23226. If you have any questions about the modified method or this particular collection, please call 804-615-5036 or e-mail stacey@vasos.org



Watershed Management Recommendations

Water Quality Improvement

The goals and strategies for improving water quality are proposed below.

Goal #1 – Reduce Litter

Strategies

- Conduct at least two clean-up days a year
- Install trash and recycling receptacles
- LVHS students will pick up trash during classes (with teacher supervision/instruction)
- Coordinate with local scout troops to remove litter
- Educate the public about waste removal and how to "Leave No Trace"
- Provide information about proper disposal of pet waste
- Provide information about nonpoint source water pollution and methods of reducing it

Clean-Up Day at the Chapman DeMary Trail.

Goal #2 – Restore and Maintain Riparian Buffer Zones

Strategies

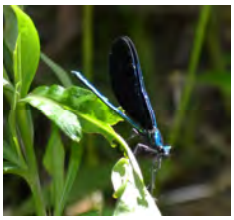
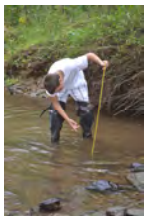
- Expand vegetation upstream of the trail
- Establish a continuous trail to the Potomac River
- Plant native species in areas where vegetation has been removed or harmed
- Remove invasive and nonnative species to restore the natural filtration system
- Educate the public about degradation of riparian buffer zones and how to help restore riparian buffers and reduce erosion

Goal #3 – Reduce Contaminated Runoff

Strategies

- Educate the public about nonpoint source water pollution and methods of reducing it
- Encourage residents to use fewer fertilizers or pesticides, or to use natural alternatives
- Encourage residents to check vehicles for leaks and to properly dispose of used motor oil and antifreeze
- Encourage waste reduction and proper litter disposal




- Encourage recycling and reusing
- Encourage the proper disposal of pet waste

Goal #4 – Improve Water Quality

Strategies

- Continue water monitoring efforts by LVHS students, local citizens, local organizations, and the local government
- Establish an official water monitoring stream through the Loudoun Wildlife Conservancy to test the water of South Fork Catoctin Creek in its entirety
- Make the results of tests known to the public
- Educate residents about proper waste disposal
- Educate residents about nonpoint source water pollution and methods of reducing it

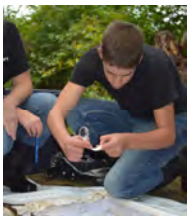
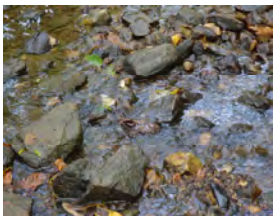
Overgrowth of algae in the South Fork Catoctin Creek; the result of contaminated runoff.

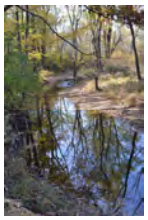
Future Stream Monitoring

Hopefully, this plan can be used as both a resource and as a set of instructions. For residents of Loudoun County, this plan details the health of one waterway and how each stream and river affects each citizen. The plan can be used to understand and implement processes for water monitoring. For citizens of other watersheds, it could be used as a manual to monitor waterways.

For this plan to be relevant to those goals, stream monitoring must continue. The writers of this plan request that various organizations or groups conduct further testing and complete and record the results of the tests on the following chart at least once a year to ensure that the chemical and biological stream indicators are recorded. It is further requested asked these organizations and groups conduct the testing using the same or similar protocols as those used in this analysis, unless the State of Virginia indicates a preference for an alternative. The requested methods are as follows:

- Benthic Macroinvertebrates: Virginia Save Our Streams Modified Method (Appendix A)
- Nitrates: LaMotte (or similar company) nitrate testing kit producing results in parts per million (PPM)
- Escherichia Coli: Micrology Laboratories (or similar company) Coliscan Water Monitoring Kit for E. coli testing producing results in colonies per 100 mL; an incubator is required
- Turbidity: Carolina Turbidity tubes

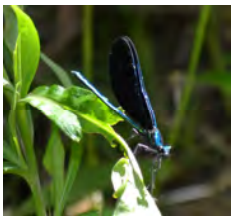
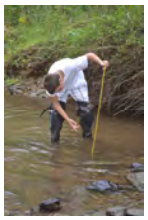


Data Collection Sheet for Monitoring the South Fork Catoctin Creek along the Chapman DeMary Trail in Purcellville, Virginia

Test:	Results:	Comments/Unusual results
Benthic Macroinvertebrates	Multimetric score of ____	
Nitrates	____ ppm	
Escherichia Coli	____ colonies per 100 mL	
Turbidity	____ NTU	

Table 6: Data Collection Sheet for Monitoring the South Fork Catoctin Creek along the Chapman DeMary Trail in Purcellville, Virginia




Future Partners

In addition to continuing to coordinate and work with the existing Chapman DeMary Trail partners, NatGen, PEC, and the Town of Purcellville, Loudoun Valley High School environmental studies students must actively pursue assistance from various groups including, but not limited to, Loudoun Wildlife Conservancy and Loudoun Watershed Watch.

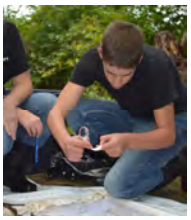
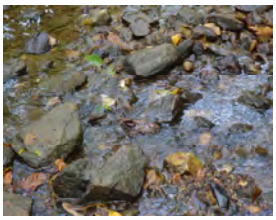
Loudoun Wildlife Conservancy, a non-profit organization that relies on volunteers, offers many resources and knowledgeable experts on water quality and habitat restoration. Their volunteers also present an enthusiastic group of workers who contribute to water testing and restoration.

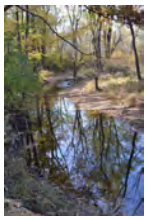
Loudoun Watershed Watch is a group dedicated to monitoring stream health. They seek to restore the health of the county's watersheds and protect them from future degradation. Their qualified stream monitors can expertly educate LVHS students about water testing and stream rehabilitation.

To work more closely with the Town of Purcellville, with which the school interacts in many ways each year and which is a vital sponsor of the trail, students must continue to seek the advice and support from the Town Council and environmental committees on issues that affect the Town.

Right: Lead students Kelsey Bledsoe and Laura Jeu talking with the Vice Mayor of Purcellville, Joan Lehr.

Left: Two boys on the Chapman DeMary Trail during on tf the events held during the project.



Timelines

Below are timelines for events to help improve water quality on the South Fork Catoctin Creek annually, seasonally, and as necessary.

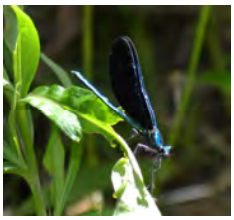
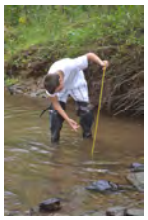
Annual Events

The following events should occur at least once a year to sustain the stream and watershed health.

Event	Description
Meeting between LVHS and Town of Purcellville	To maintain a productive relationship with the Town of Purcellville, a meeting between the students and Town Council is necessary and should occur at least yearly. Recommended topics include the following: • Recent test results • Watershed health • Requests for assistance from the town • Summaries of recent school environmental events benefitting the town
Litter evaluation and reduction strategies	While many local organizations hold clean-up days, LVHS students should research local litter impacts visually, and develop a written plan to reduce this source of pollution. They should then plan events to remove litter (see Seasonal Events).
Riparian buffer zone analysis	Students should evaluate the erosion along South Fork Catoctin Creek, as well as test the turbidity of the water under various conditions. If the riparian buffer is deemed to be inadequate, measures must be taken to restore the vegetation (see As Needed Events).
Water testing	Using the guidelines given in the Protocols section and data chart in the Future Stream Monitoring section, a group will test the stream and log the data with LVHS' environmental program.
Scholastic outreach event	LVHS students enrolled in Advanced Placement Environmental Science and/or Environmental Explorations will hold an annual event in coordination with local schools and scout troops to explain the importance of water testing and pollution reduction.
Wetland evaluation and restoration	The area of the trail classified as 'wetland' should be evaluated and repaired if necessary. The reparations should be supervised and led by a qualified wetlands expert.

Table 7: Timeline of Recommended Annual Events




Seasonal Events

Season	Event	Description
Winter		
Spring	Clean-up Day	Students should organize an event to remove litter from the trail and promote the event to encourage local participation.
Summer		
Autumn	Clean-up Day	Students should organize an event to remove litter from the trail and promote the event to encourage local participation.

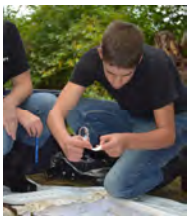
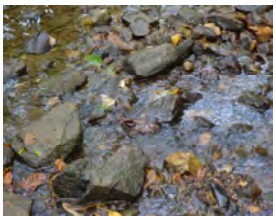
Table 8: Timeline of Recommended Seasonal Events

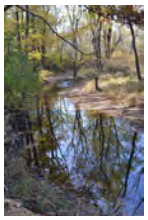
As Needed Events

The following events should be conducted when necessary.

Event	Conditions Triggering Event	Description
Inclement weather restoration	A natural disaster requiring that the trail or stream be restored.	LVHS will organize a group of volunteers to remove any new debris from the trail and determine which new natural changes hold a potentially negative outcome for the watershed.
Riparian buffer zone restoration	Excessive erosion and/or excessive turbidity present in the stream.	Under the instruction of watershed experts, volunteers will plant new vegetation to restore the watershed's filtration capacities.

Table 9: Timeline of As Needed Events

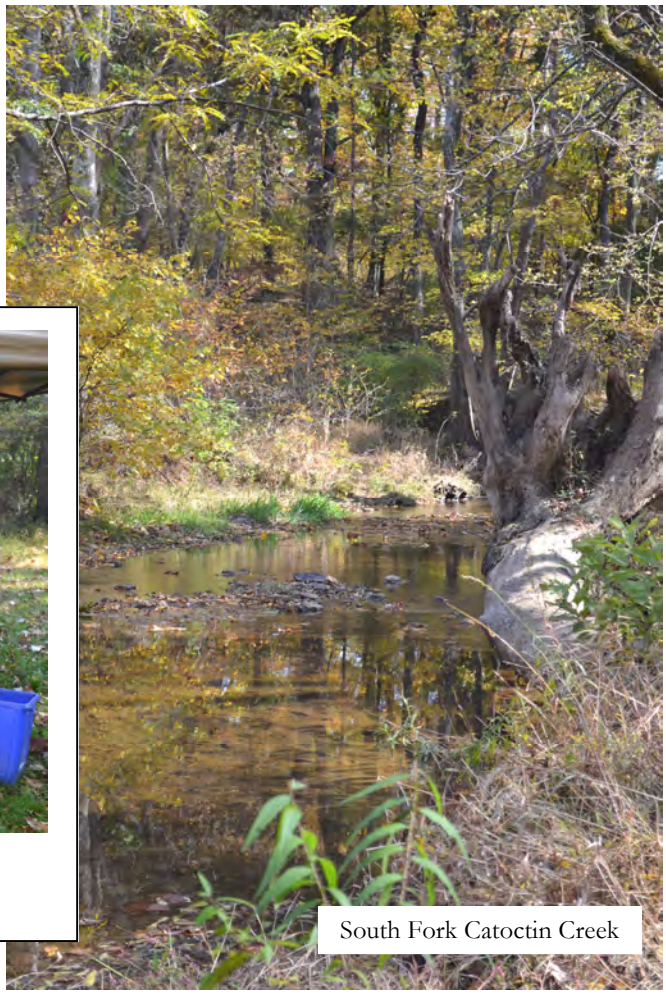






Conclusions

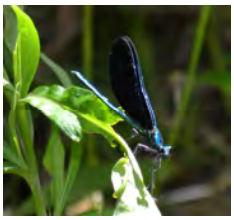
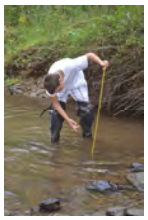
The results from sampling through the Trail to Water Quality Project are mixed, with positive indicators, marginal indicators, and one with a great deal of fluctuation. Previous tests indicate that the South Fork Catoctin Creek is stressed. Together, these results underscore the importance of continued citizen monitoring, of continued efforts to educate residents about sources of pollution and steps they can take to reduce it, and of getting involved in efforts on the Chapman DeMary Trail to keep it and the South Fork Catoctin Creek clean. Should conditions deteriorate, it is critical that restoration actions be taken.

The Trail to Water Quality Project has allowed many students, volunteers, and local citizens to explore the ease of testing and maintaining water quality. Hopefully, this type of testing can be spread to other schools and be used as indicators of water health. The Trail to Water Quality Watershed Management Plan represents hours of testing, interpretation, and summarizing conducted by students from Loudoun Valley High School. It is designed to be a resource for schools, residents, and organizations to aide them in understanding, analyzing, and appreciating the South Fork Catoctin Creek, our watershed, and the steps we can all take to continue to improve the health of our waterways.

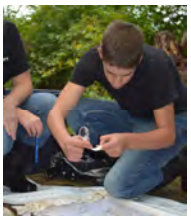
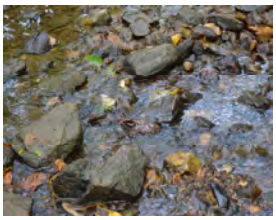


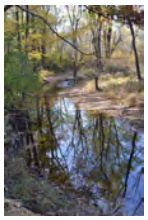
Above, from left to right: LVHS Lead students Kelsey Bledsoe, Laura Jeu, and Johnathan Conner.




South Fork Catoctin Creek



References and Resources

References

Below is a list of references used for the Trail to Water Quality, Water Quality Management Plan, by section.

Background

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Watershed Characteristics

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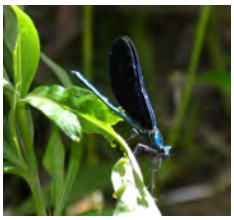
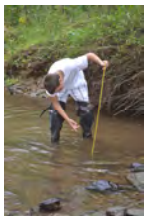




Resources

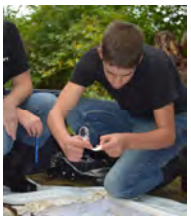
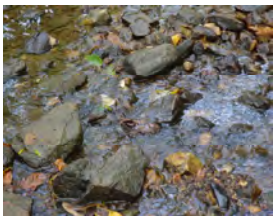
Below is a list of some of the many resources available about water quality, specifically for the Catoctin Creek, water testing results, and actions to help improve water quality from several local, state, and federal sources.

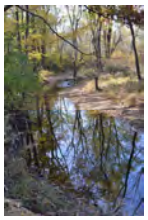
Local Organizations

- Loudoun Watershed Watch
  http://loudounwatershedwatch.org/
- Loudoun Wildlife Conservancy
  http://www.loudounwildlife.org/
- Loudoun Soil and Water
  http://www.loudounsoilandwater.com/
- Loudoun Watershed Watch: Water Quality Report Card of Catoctin Creek
  http://www.loudounwatershedwatch.org/catoctin/pdf/Brochure-Water%20Quality-Print.pdf
- Loudoun Watershed Watch: Catoctin Creek Watershed Project
  http://www.loudounwatershedwatch.org/catoctin/monitor.html
- Loudoun Wildlife Conservancy: Stream Monitoring
  http://www.loudounwildlife.org/Stream_Monitoring.htm
- Loudoun Watershed Watch and Loudoun Wildlife Conservancy, State of Streams Loudoun County: 2005
  http://www.loudounwatershedwatch.org/pdf/2005_State_of_Streams.pdf

Loudoun County Government

- Loudoun County Water and Hydrology
  http://www.loudoun.gov/index.aspx?NID=1363
- Loudoun County Water Resources Monitoring Program
  http://www.loudoun.gov/index.aspx?NID=1511
- Loudoun County Water Resources Monitoring Program/Current and Recent Hydrological Conditions
  http://www.loudoun.gov/index.aspx?nid=1523
- Loudoun Stream Assessment
  http://www.loudoun.gov/index.aspx?nid=1538
- Loudoun Stream Assessment Mapping (local stream conditions)
  http://www.loudoun.gov/index.aspx?NID=1537
- Loudoun Stream Assessment Reports
  http://www.loudoun.gov/index.aspx?NID=1535
- An Overview of Local (not Chesapeake Bay) TMDLs in Loudoun County, from Monitoring to Assessment to Implementation
  http://www.loudoun.gov/DocumentCenter/View/78008



- Loudoun County Stream Assessment Results Report, 2009 http://www.loudoun.gov/documents/14/1128/1173/Stream%20Assessment%20%20Results%20Report.PDF
- 2009, Loudoun County 2009 Stream Assessment Report, on South Fork of the Catoctin Creek http://www.loudounwatershed.org/stream_assessment/gis/report/SFCC-215-T-2009.pdf
- 2009 Water Resources Monitoring Data Summary, Loudoun County, Virginia http://va-loudouncounty.civicplus.com/documents/14/1128/1173/2009-Water-Resources-Monitoring_report.PDF
- Loudoun County Stream Assessment: Review of Previous Stream Biological and Habitat Assessments in Loudoun County, dated 2009 http://www.loudoun.gov/documents/14/1128/1173/Stream%20Assessment%20%20Review%20of%20Previous%20Assessments.PDF
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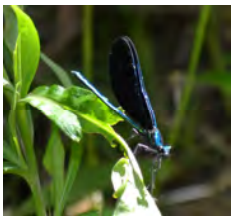
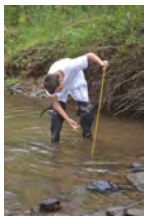
- Loudoun County, Department of General Services: Stormwater Education and Outreach http://www.loudoun.gov/index.aspx?NID=2094
- Loudoun County, Department of General Services: Stormwater Education and Outreach, Residents Guide for a Cleaner Environment http://www.loudoun.gov/documents/30/Residents%20Guide%20for%20a%20Cleaner%20Environment_201208010855035110.pdf
- Loudoun County, Department of General Services: Stormwater Education and Outreach, Automotive Care Guide http://www.loudoun.gov/documents/30/AutomotiveCareBrochure_201210030916197592.pdf
- Loudoun County, Department of General Services: Stormwater Education and Outreach, Lawn Care Guide http://www.loudoun.gov/documents/30/Lawn%20Care%20Guide_201208010855289806.pdf
- Loudoun County, Department of General Services: Stormwater Education and Outreach, Scoop the Poop http://www.loudoun.gov/documents/30/Pet%20Waste_201208010853441178.pdf

Commonwealth of Virginia

- Virginia Department of Environmental Quality Water Program http://www.deq.state.va.us/Programs/Water.aspx
- Virginia Department of Environmental Quality, Draft 2012 305(b)/303(d) Water Quality Assessment Integrated Report http://www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2012305b303dIntegratedReport.aspx

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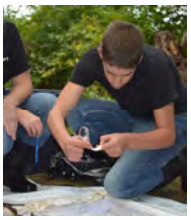
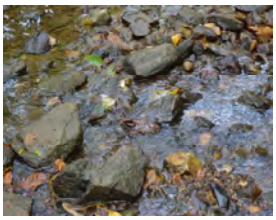
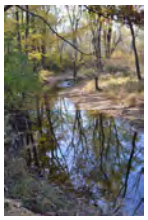
- Virginia Department of Environmental Quality, 2010 List of Category 5 Impaired Waters http://www.deq.state.va.us/Portals/0/DEQ/Water/WaterQualityAssessments/IntegratedReport/2010/ir10_Pt3_Ch3.3a_Category5_List.pdf
- Virginia Department of Environmental Quality, 2010 List of Impaired Waters Needing Clean Up Plans http://www.deq.state.va.us/Portals/0/DEQ/Water/WaterQualityAssessments/IntegratedReport/2010/Appendices/ir10_AppendixA_Category5_Factsheets_PotShen.pdf
- Catoctin Creek Water Quality Implementation Plan (Fecal Coliform TMDLs) on behalf of The Commonwealth of Virginia: Department of Conservation and Recreation and Department of Environmental Quality, 2004 http://www.deq.virginia.gov/Portals/0/DEQ/Water/TMDL/ImplementationPlans/catoctip.pdf
- Virginia Department of Environmental Quality, Monitoring Efforts in the Catoctin Creek Watershed, 2003 – 2008 (2009 Report) http://www.loudounwatershedwatch.org/catoctin/pdf/Catoctin_Creek_Mtg_72709_DEQ.pdf
- Virginia Save Our Streams on Macroinvertebrates http://vasos.wrayesian.com/form_submissions/list?url[action]=list

Federal Government

Environmental Protection Agency

- EPA STORET (The STORET (short for STOrage and RETrieval) Data Warehouse is a repository for water quality, biological, and physical data and is used by state environmental agencies, EPA and other federal agencies, universities, private citizens, and many others. Take a minute to browse around our site or click on the water drop to retrieve monitoring data!) http://www.epa.gov/storet/
- Environmental Protection Agency (EPA), Water http://water.epa.gov/
- EPA, Water, Rivers and Streams http://water.epa.gov/type/rsl/
- EPA, What's Up with Our Nation's Waters? http://water.epa.gov/learn/resources/nationswaters_index.cfm
- EPA in Virginia http://www.epa.gov/aboutepa/states/va.html
- EPA, Surf Your Watershed http://cfpub.epa.gov/surf/locate/index.cfm

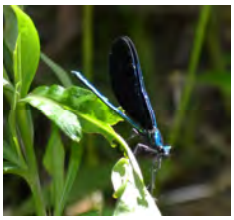
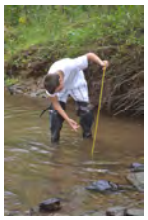


United States Geological Survey

- USGS, Office of Water Quality
  http://water.usgs.gov/owq/
- USGS, Real Time Data, Water Quality
  http://waterdata.usgs.gov/nwis/current/?type=quality
- USGS, Real Time Water Data (temperature, pH, nitrate, turbidity, etc.)
  http://waterwatch.usgs.gov/wqwatch/
- USGS, Historical Data
  http://waterdata.usgs.gov/nwis/dv/?referred_module=qw
- USGS, Annual Water Data Report Mapper—Water Years 2006 to 2012
  http://wdr.water.usgs.gov/adrgmap/index.html

South Fork Catoctin Creek

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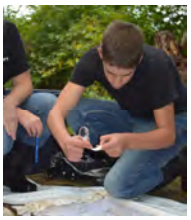
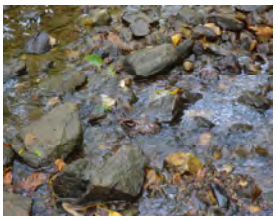
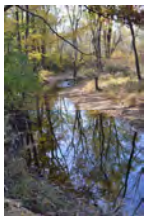



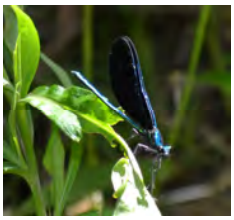
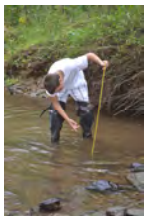


Appendices

Appendix A: Virginia Save Our Streams Data Chart and Protocols
Appendix B: Nonpoint Source Water Pollution Factsheet

South Fork Catoctin Creek

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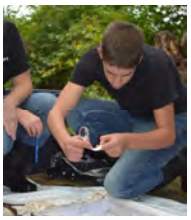
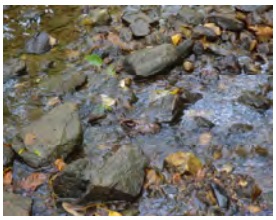
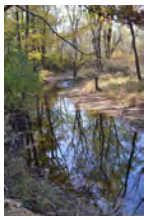





Appendix A: Virginia Save Our Streams Data Chart and Protocols (7 pages)

These sheets on the following pages are available to download at:
http://www.vasos.org/images/stories/docs/vasosfieldsheetsmodifiedmethodapril2007.pdf

Monitors checklist for the Va. SOS modified method

1) Choose a site (riffle) that is accessible (public property or with landowner permission) and that has the stream water bubbling over cobblestone sized rocks (3"-10" at the widest part of the particle). We strongly encourage monitors to avoid DEQ monitoring sites and the mixing zone of permitted wastewater discharges.

2) Use a Va. SOS seine net. This mesh is important for quality assurance purposes.

3) Approach the riffle from downstream (so as not to disturb potential collection areas) and position the net just below a spot with maximum bubbling action and a predominant number of cobbles. (approx. 45 degree angle) The net should be spread as widely as possible and set to allow a direct flow of water into the center of the net.

4) The monitor that will do the rubbing should take some cobbles from OUTSIDE the area to be sampled and rub them underwater (and outside of the "net zone")before gently laying them on the bottom of the net to anchor the net to the stream bottom.

5) The person holding the net will then time the other monitor to allow the rubbing of rocks for twenty seconds immediately upstream of the net. The final five seconds will be announced and for that time the "rubber" will scratch the stream bottom with their fingers or a garden cultivator type tool to collect any organism that live in the substrate.

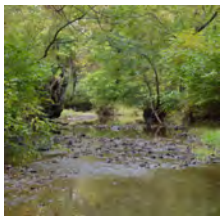
6) Rub the "anchor" stones to remove any critters that may have attached themselves and with a forward and scooping motion remove the net from the stream. Examine the net for any organisms that are not macroinvertabrates (minnows or salamanders) and return them to the stream.

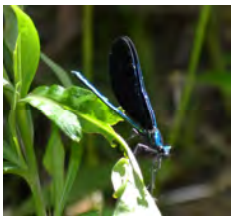
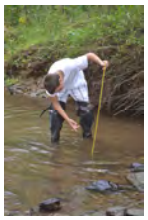
7) Take the net to the streamside and place it on a sheet that will allow for identification of any organisms that may pass through the mesh. Use ice cube trays and dishes to pick ALL organisms. Examine both sides of the net and the sheet beneath to obtain a rigorous count of all aquatic macroinvertabrates that were caught.

8) Repeat this procedure until a composite of all nets yields a total of organisms in excess of 200. Remember to thoroughly pick each net and add the total to the previous total. The time devoted to rubbing can be modified according to the judgment of the monitors but can not exceed 90 seconds per "dip". Also, no more than 4 "dips" can be made in pursuit of exceeding 200 organisms. If the monitors fail to find 200 organisms in 4 "dips" the calculation shall be made with the total that is obtained. Special note of this fact should be made in reporting the data.

9) With the individual counts of the organisms according to the categories as listed on the Va. SOS identification sheet and the total of all categories, calculate the six percentages (metrics) and combine them into one index value using the Va. SOS field calculation sheets. Be sure to report your results to Va. SOS ASAP.

Do this four times a year (every 3 months). Thank you for being a Va. SOS monitor!!!




SAFETY

Four things to remember when monitoring your stream…

1. Always remember to wash your hands after getting into any stream. The VA SOS method can not detect bacteriological pollution.
2. Glass may be hidden in the bottom of the stream - watch out for it!
3. If you do get a cut or scrape while in the stream, use peroxide to clean the wound. Again, bacteriological pollution...
4. Always sample in pairs!

POLLUTION

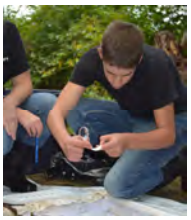
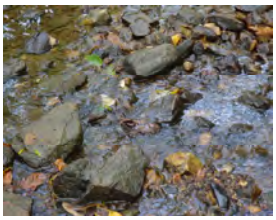
Sources of Pollution

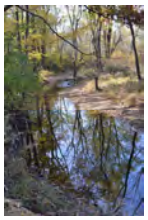
When people talk about water, they talk about *point source pollution* and *nonpoint source pollution*

1. Point source pollution comes from a specific source: a pipe, a ditch, a container. It has a beginning point and an end point. Here's an easy way to remember, you can point to the pipe that's causing the problem.
2. Nonpoint source pollution comes from many scattered sources. It occurs when water (runoff) moves across and under the ground (think rain storm). The runoff picks up natural and man-made pollutants as its moves across the land. Then the runoff deposits the pollutants at the bottom of the watershed, into streams, rivers, lakes, estuaries, and even underground aquifers. Can you point to the problem? You might be able to point to different sources - but you can't tell if, when, or how the source is getting into the waterbody.

Types of Pollution

1. Toxic pollution, like DDT or other chemicals that cause organisms to die and can threaten human health. Toxic pollution can come from pipes or barrels (point source), but it can also come from runoff (nonpoint source).
2. Sediment pollution can clog our waterways, ruin habitat and clog the gills of organisms in the stream. Lack of vegetative cover and impervious surfaces both have an impact on sedimentation.
3. Nutrient pollution can cause plant life in a stream to overgrow; depleting oxygen and sometimes causing the temperature of the stream to get too high. Nutrients can come from fertilizers used in lawns and gardens and animal waste or human waste (nonpoint source or point source).
4. Bacteria pollution can cause human health problems - usually gastrointestinal. Bacteria pollution comes from animal and human waste (nonpoint source or point source).



For Office Use Only
Name of Reviewer_____
Date Reviewed_____
Data sent to_____
VA SOS Data Entry Date _____

Virginia
Save Our Streams
Stream Quality Survey

The purpose of this form is to aid you in gathering and recording important data about the health of your stream. By keeping accurate and consistent records of your observations and data from your macroinvertebrate count, you can document changes in ecological condition. Refer to the Virginia Citizen Monitor's Methods Manual for instructions on how to collect and identify stream macroinvertebrates. *Please note, this method was designed and tested for conditions in the state of Virginia and may not be appropriate in other areas.*

Date_____

Stream_____ Station_____ # of participants_____

Group or individual_____

Name of certified* monitor_____

County_____ Latitude_____ Longitude_____

Location (please be specific) _____
_____

Average stream width _____ft Average stream depth _____in

Flow rate: High_____ Normal_____ Low_____ Negligible_____

Weather last 72 hours _____
_____

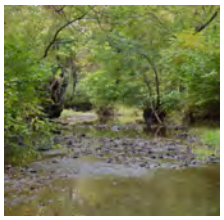
Water Temperature_____°F (Please specify if reporting temperature in Celsius)

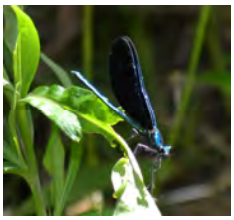
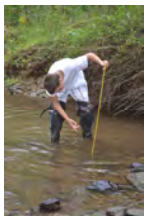
Collection Time:
Net 1:_____sec
Net 2:_____sec
Net 3:_____sec
Net 4:_____sec

Other comments:
_____
_____
_____
_____
_____
_____
_____

Please send data sheets to your regional coordinator or to VA SOS, P.O. Box 8297, Richmond, Va 23226. If you have any questions about the modified method or this particular collection, please call 804-615-5036 or e-mail stacey@vasos.org

* Your data is most useful when you pass your certification. Please contact VA SOS to schedule your certification!




Macroinvertebrate	Tally	Count
Worms		
Flat Worms		
Leeches		
Crayfish		
Sowbugs		
Scuds		
Stoneflies		
Mayflies		
Damselflies and Dragonflies		
Hellgrammites, Fishflies, and Alderflies		

Macroinvertebrate	Tally	Count
Common Netspinner		
Most Caddisfly		
Beetles		
Midges		
Blackflies		
Most True Fly		
Gilled Snail		
Lunged Snail		
Clams		
Other Subsurface Invertebrates		
TOTAL NUMBER		

EXAMPLE

Metric	Metric Organism Group	Number of metric		Total number		Percent
1	Mayflies + Stoneflies +	80	÷	204	X 100	**39.2%**
2	Common Netspinners	40	÷	204	X 100	**19.6%**
3	Lunged Snails	0	÷	204	X 100	**0%**
4	Beetles	9	÷	204	X 100	**4.4%**

METRIC 5 - % Tolerant

Taxon	Number
Worms	10
Flatworms	0
Leeches	0
Sowbugs	5
Scuds	0
Dragonflies and Damselflies	5
Midges	20
Black Flies	10
Lunged Snails	0
Clams	10
Total Tolerant	40
Total Tolerant divided by the total number of organisms in the sample	204
Multiply by 100 - **This is your Value**	29.4

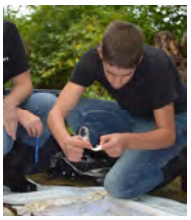
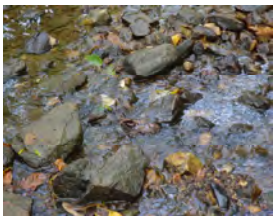
Metric 6 - % Non-Insects

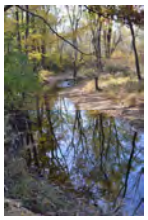
Taxon	Number
Worms	10
Flatworms	0
Leeches	0
Crayfish	5
Sowbugs	5
Scuds	0
Gilled Snails	10
Lunged Snails	0
Clams	10
Total Non-Insects	40
Total Non-Insects divided by the total number of organisms in the sample	204
Multiply by 100 - This is your Value	19.6

Metric Number	Metric Organism	Your Metric Value	2	1	0
1	% Mayflies + Stoneflies + Most	39.2	Greater than 32.2 X	16.1 - 32.2	Less than 16.1
2	% Common Netspinners	19.6	Less than 19.7 X	19.7 - 34.5	Greater than 34.5
3	% Lunged Snails	0	Less than 0.3 X	0.3 - 1.5	Greater than 1.5
4	% Beetles	4.4	Greater than 6.4	3.2 - 6.4 X	Less than 3.2
5	% Tolerant	29.4	Less than 46.7 X	46.7 - 61.5	Greater than 61.5
6	% Non-Insects	19.6	Less than 5.4	5.4 - 20.8 X	Greater than 20.8
	Subtotals:		Total # of 2s: 4	Total # of 1s: 2	Total # of 0s: 0
			Multiply by 2: 8	Multiply by 1: 2	Multiply by 0: 0

Now add the 3 subtotals to get the Save Our Streams Multimetric Index score: 10

_X_ Acceptable ecological condition (9 to 12)
_____ Ecological conditions cannot be determined at this time (Gray Zone) (8)
_____ Unacceptable ecological condition (0 to 7)



Individual Metrics

Metric Number	Metric Organism Group	Number of metric organism		Total number of organisms in the sample		Percent (This is your value for this metric)
1	Mayflies + Stoneflies + Most Caddisflies		÷		Multiply by 100	%
2	Common Netspinners		÷		Multiply by 100	%
3	Lunged Snails		÷		Multiply by 100	%
4	Beetles		÷		Multiply by 100	%

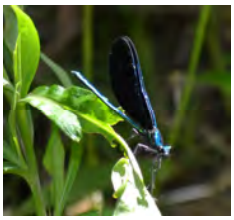
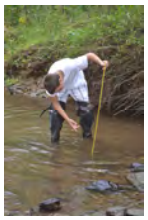
Metric 5 - % Tolerant

Taxon	Number
Worms	
Flatworms	
Leeches	
Sowbugs	
Scuds	
Dragonflies and Damselflies	
Midges	
Black Flies	
Lunged Snails	
Clams	
Total Tolerant	
Total Tolerant divided by the total number of organisms in the sample	
Multiply by 100 **This is your Value for Metric 5**	

Metric 6 - % Non-Insects

Taxon	Number
Worms	
Flatworms	
Leeches	
Crayfish	
Sowbugs	
Scuds	
Gilled Snails	
Lunged Snails	
Clams	
Total Non-Insects	
Total Non-Insects divided by the total number of organisms in the sample	
Multiply by 100 **This is your Value for this Metric 6**	




Save Our Streams Multimetric Index

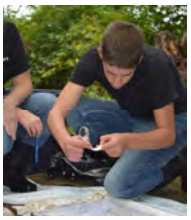
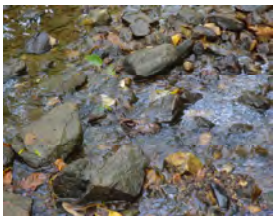
Write your metric value from the previous page in the 2nd column (Your Metric Value). Determine whether each metric should get a score of 2,1, or 0 – depending upon the range of your metric value. Put a check in the appropriate box for your metric value under 2,1, or 0. Count the total number of 2's, 1's, and 0's. Follow the multiplication at the bottom of the chart to determine your Save Our Streams Multimetric Index score and determine whether the site has acceptable or unacceptable ecological condition.

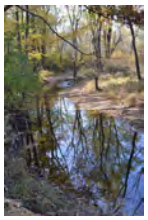
Metric Number	Metric Organism	Your Metric Value	2	1	0
1	% Mayflies + Stoneflies + Most Caddisflies		Greater than 32.2	16.1 – 32.2	Less than 16.1
2	% Common Netspinners		Less than 19.7	19.7 – 34.5	Greater than 34.5
3	% Lunged Snails		Less than 0.3	0.3 – 1.5	Greater than 1.5
4	% Beetles		Greater than 6.4	3.2 – 6.4	Less than 3.2
5	% Tolerant		Less than 46.7	46.7 – 61.5	Greater than 61.5
6	% Non-Insects		Less than 5.4	5.4 – 20.8	Greater than 20.8
			Total # of 2s:	Total # of 1s:	Total # of 0s:
		Subtotals:	Multiply by 2:	Multiply by 1:	Multiply by 0:

Now add the 3 subtotals to get the Save Our Streams Multimetric Index score:_____

_____Acceptable ecological condition (9 to 12)
_____ Ecological conditions cannot be determined at this time (Gray Zone) (8)
_____Unacceptable ecological condition (0 to 7)

Please send data sheets to your regional coordinator or VA SOS, P.O. Box 8297, Richmond, Va 23226. If you have any questions about the modified method or this particular collection, please call 804-615-5036 or e-mail stacev@vasos.org



Fish water quality indicators	**Barriers to fish movement**	**Surface water appearance**
scattered individuals scattered schools trout (pollution sensitive) bass (somewhat sensitive) catfish (pollution tolerant) carp (pollution tolerant)	beaver dams man-made dams waterfalls (>1ft.) other none	clear milky clear, tea colored black colored sheen (oily) foamy other _____ muddy gray
Stream bed deposit (bottom) gray orange/red yellow black brown silt sand other _____	**Odor**: none musky oil sewage other _____	**Stability of steam bed**: Bed sinks beneath your feet in: no spots a few spots many spots
Algae color: light green dark green brown coated matted on stream bed hairy	**Algae located**: everywhere in spots ____ % bed covered	**Stream Channel Shade**: >75% full 50%-74% high 25%-49% moderate 1%-24% slight none
Stream bank composition ____% trees ____% shrubs ____% grass ____% bare soil ____% rocks ____% other _____	**Stream bank erosion potential** >75% severe 50%-75% high 25%-49% moderate 1% - 24% slight none	**Riffle composition** (=100%) ___ % silt (mud) ___ % sand (1/64"-1/4" grains) ___ % gravel (1/4"-2" stones) ___ % cobbles (2"-10" stones) ___ % boulders (>10" stones)

Land uses in the watershed: Record all land uses observed in the watershed area upstream and surrounding your sampling site. Indicate whether the following land uses have a high (H), moderate (M), or slight (S) potential to impact the quality of your steam. (Leave the space blank if there is no impact or if the land use is not present in your watershed.) Refer to the SOS standard operating procedures to determine how to assess H, M, or S.

___ Oil & gas drilling ___ Housing developments ___ Forest ___ Logging ___ Urban uses (parking lots, highways, etc.	___ Sanitary landfill ___ Active construction ___ Mining (types) _____ ___ Cropland (types) _____	___ Trash dump ___ Fields ___ Livestock pasture ___ Other _____ _____ _____

Describe the amount of litter in and around the stream. Also describe the type of litter in and around the stream.

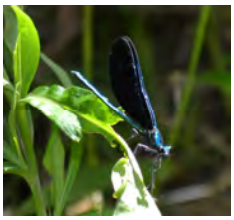
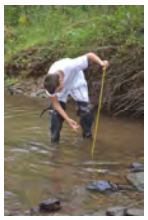
_____

_____

Comments: Indicate what you think are the current and potential threats to your stream's health. Feel free to attach additional pages or photographs to better describe the condition of your stream._____

_____




Appendix B: Nonpoint Source Water Pollution Fact Sheet (2 pages)

Help Us Clean the Stream!

Researched and written by Kelsey Bledsoe, Johnathan Conner, and Laura Jeu, Loudoun Valley High School students working on the Trail to Water Quality Project at the Chapman DeMary Trail with The Nature Generation.

Nonpoint source water pollution contaminates watersheds from many separate sources rather than from one specific source. It is a problem that can be corrected if we all play our part.

Nonpoint source water pollution occurs when rainwater carries pollutants and litter from farm fields, urban areas, construction sites, and residential areas into streams, rivers, oceans, lakes, and ponds, filling them with harmful chemicals, trash, sediment, and other pollutants. Eventually, the pollutants and litter can contaminate a body of water to the point that plants and animals may suffer or cannot survive.

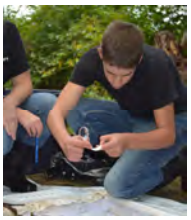
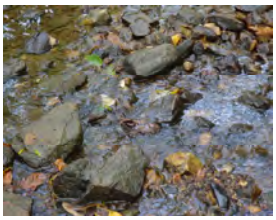
Nonpoint source pollutants include fertilizers, pesticides, insecticides, motor oil, antifreeze, toxic chemicals, sediment, salt, bacteria, nutrients, pet waste, and trash.

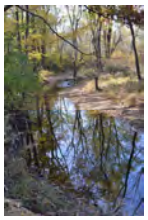
Here are some simple actions you can take to help reduce these pollutants and improve water quality:

More than 12,000 miles of streams and rivers in Virginia and most of the Chesapeake Bay remain polluted from dirty water running off streets, parking lots, lawns, and farms, from poorly treated wastewater, air pollution, and other sources.

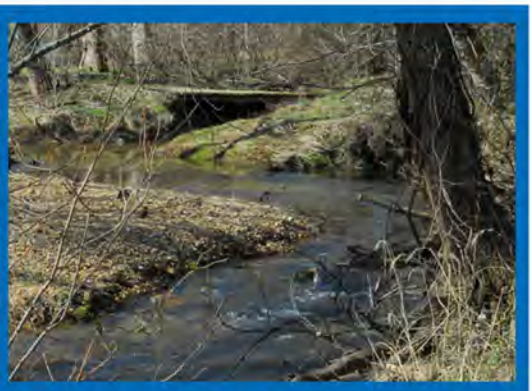
- Recycle, especially plastic bags which are a huge source of pollution in the streams and rivers that go to the Chesapeake Bay.
- Utilize reusable alternatives to plastics (bottles and shopping bags especially) to reduce waste.
- Use a natural fertilizer instead of a chemical-based fertilizer so harmful chemicals don't runoff into the stream. Ask your local nursery for recommendations.
- Check vehicles for leaks of motor oil, antifreeze, brake fluid, etc., and repair them so they don't runoff into our streams. If you find a leak, don't hose it into the street and don't pour anything into storm drains because it will eventually get into our waterways.
- Stop chemicals from running into storm drains.
- Properly dispose of household chemicals during local household hazardous waste collection days.
- Use dog waste bags to pick up after your pet instead of leaving it on the ground where it will eventually get into our streams. This waste carries harmful nutrients, bacteria, and parasites that can potentially cause infections and bacterial diseases in the people and animals that swim in the water.
- Keep farm animals out of creeks by using proper fencing.
- Protect creek banks from erosion by planting native grasses and shrubs.
- Respect the stream as a living thing and treat its inhabitants courteously.

The Chesapeake Bay, which receives water from the Catoctin Creek, contains a large dead zone, where not enough dissolved oxygen exists to sustain life. Dead zones are caused by chemical pollutants in the water that create algal blooms—an overgrowth of algae that blocks sunlight from under-water plants. Worse yet, when the algae eventually dies, the oxygen in the water is consumed by decomposing bacteria. The lack of oxygen makes it impossible for aquatic life to survive. Dead Zones are bad for the Bay's 3,600 plant and animal species, and for the people and local economics that depend on them.



We all have the ability to help restore the glorious Catoctin Creek and all local waters to clean, healthy condition. Together, through the simple acts of recycling, reducing, reusing, and finding safe alternatives to harmful chemicals, we can create a stream that will become a showcase that will champion the reduction of nonpoint source pollution for watersheds everywhere.

Water quality testing conducted in June 2012 through The Trail to Water Quality project with The Nature Generation, Loudoun Valley High School students, and local experts, showed that the portion of the Catoctin Creek along the Chapman DeMary Trail is in a "Gray Zone," meaning is it between acceptable and unacceptable ecologic condition. This is an improvement since the late 1990's when citizen monitoring started and found the creek to be in the unacceptable range. Let's keep working together to make it healthy!

Sources:

http://www.epa.gov/owow_keep/NPS/whatis.html
http://water.epa.gov/polwaste/nps/whatudo.cfm
http://www.epa.gov/nutrientpollution/effects/effects_algalblooms.html
http://adventures-in-climate-change.com/features/index.php/2011/08/18/dead-zone-imperils-chesapeake-bay/
http://www.cbf.org/page.aspx?pid=2525
http://www.chesapeakebay.net/blog/2011/03

THE Nature GENERATION
Inspiring environmental stewards

Learn more about The Nature Generation and the Chapman DeMary Trail at www.NatGen.org.

The Trail to Water Quality project, managed by The Nature Generation, is funded through an environmental grant from the Environmental Protection Agency's Region 3 Office.

Although the information in this document has been funded wholly or in part by the U.S. Environmental Protection Agency under assistance agreement EPA-EE-11-02 to The Nature Generation, it may not necessarily reflect the views of the Agency and no official endorsement should be inferred.

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