



ROANOKE COUNTY, VIRGINIA

Municipal Separate Storm Sewer System (MS4) Annual Report Year Five

October 1, 2013

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Submitted to the Virginia Department of Environmental Quality in
compliance with Permit No. VAR040022.



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The City of Roanoke
The Town of Vinton
Roanoke Valley Resource Authority
Western Virginia Water Authority
Virginia Save Our Streams Foundation
Roanoke Valley Television Station
Virginia Department of Transportation

Signed Certification in Accordance with 4 VAC 50-60-370:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

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Executive Summary

Polluted stormwater runoff is a leading cause of impairment to nearly 40 percent of surveyed U.S. water bodies that do not meet water quality standards. Overland or via stormwater systems, polluted runoff is discharged into local water bodies. When left uncontrolled, this water pollution can result in the destruction of fish, wildlife, and aquatic life habitats; a loss of aesthetic value; and threats to public health due to contaminated food, drinking water supplies, and recreational waterways.

The County of Roanoke is committed to continuing in the development, implementation, and enforcement of a Municipal Separate Storm Sewer System (MS4) Program that is designed to reduce the discharge of pollutants from the regulated MS4 in compliance with its permit. The focus of this program is to protect water quality, and to improve waters into which the regulated small MS4 discharges. This program is also designed to satisfy the appropriate water quality requirements of the Clean Water Act, Virginia Stormwater Management Act, and associated regulations.

The County of Roanoke developed and implemented a comprehensive plan to meet the conditions of the MS4 permit. The plan is outlined in six minimum control measures (MCMs): Public Education and Outreach on Stormwater Impacts, Public Involvement and Participation, Illicit Discharge Detection and Elimination, Construction Site Stormwater Runoff Control, Post Construction Stormwater Management in New Development and Redevelopment, and Pollution Prevention and Good Housekeeping for Municipal Operations. Within each MCM, there are numerous best management practices (BMPs) being implemented by the County of Roanoke. This report is the fifth annual report for this MS4 permit.

Strong regional cooperation has been pursued in the MCM areas of Public Education and Outreach on Stormwater Impacts, Public Involvement and Participation. The County intends to continue to participate in regional efforts to educate the public in coordination with the City of Roanoke, the Town of Vinton, the Virginia Department of Transportation, and other regional organizations such as the Upper Roanoke River Roundtable and the Clean Valley Council. Regional cooperation and discussion will not only be economically sound, but also instrumental in the consistent and continual education of the citizens of Roanoke County and beyond.

The Minimum Control Measures and associated BMPs for this reporting period (July 1, 2012 – June 30, 2013) are described in the following document.

The header banner features a light green background with several icons: a dog's head, a trash can, a water tap, and a recycling symbol. Below the icons, the text "Clean Up After Your Pet!" is written in a light green, sans-serif font. The banner is flanked by images of trees and a stream.

MCM 1: Public Education and Outreach on Stormwater Impacts

This minimum control measure is intended to implement a public education program to distribute educational materials to the community and conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies. These measures outline the steps that the public can take to reduce pollutants in stormwater runoff. The programs which the County has developed to meet these educational and outreach goals are listed below:

BMP 1-1: Educational Programs Review

Update and distribute a comprehensive review of existing stormwater educational programs available to Roanoke County and the Roanoke Valley area.

BMP 1-2: Roanoke County Stormwater Informational Mailer

Develop and distribute a Roanoke County Stormwater Informational Mailer to County residents.

BMP 1-3: Stream Monitoring and Education

Provide stream monitoring and informational stream seminars for County residents.

BMP 1-4: Stormwater Education Program

Develop and maintain a stormwater quality education program for County school age children.

BMP 1-5: Stormwater Public Awareness Program

Develop a Stormwater Public Awareness Program that includes the distribution of stormwater merchandise, public service announcements, and other educational media.

BMP 1-6: Roanoke County Stormwater Webpage

Maintain and expand a Roanoke County Stormwater webpage that informs the public about water quality, community-based outreach and local projects.

BMP 1-7: Business Education Program

Develop and maintain a stormwater quality education program for specific commercial businesses within the County.

Included with this document is a detailed description of the objective and measurable goals of each BMP, the strategies to ensure consistency with local TMDLs, the status of the County's compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program. The TMDL compliance is broken down by impairment type: i.e. coli and fecal coliform (EC/FC), sediment (SED), or PCBs.

BMP 1-1: Educational Programs Review

Goal:

The goal of this BMP is to update and distribute a list of current publications, educational programs, websites, videos, maps, and training opportunities that directly address stormwater issues such as stormwater management, stormwater quality, floodplain management, pollution prevention, conservation practices and riparian habitat protection.

Measurable Goals:

Roanoke County has created and maintained this educational programs review in the form of a stormwater programs database. The database documents educational programs, brochures, pamphlets, videos, maps, and training opportunities related to stormwater quality, stormwater management, floodplain management, pollution prevention, conservation practices and riparian habitat. The database is accessible through Roanoke County's website. The address of the webpage where the educational programs list can be found is: <http://www.roanokecountyva.gov/index.aspx?NID=332>

The new Roanoke County Website can no longer report on the number of times a pdf or word document is accessed, so the viewing statistics for this permit year is unknown. A list of items in this database can be found on the attached compact disk under file titled **BMP 1-1 Educational Programs Database.pdf**.

TMDL Consistency:

Many of the sources available on our webpage provide extensive educational material concerning the damage that livestock and pet waste can do to our waterways. For example, links are provided to the National Agriculture Library where information can be gathered regarding the research of impacts of agriculture on water quality. (EC/FC)

Many of the sources available on our webpage also provide extensive educational material concerning the damage that sediment can do to our waterways. For example, links are provided to websites that educate citizens on how water can be protected from non-point source pollution. Best management practices are described in non-technical terminology for any age to understand. (SED)

Evaluation and Modification:

The number of times that the database has been viewed illustrates whether the website is an effective format to distribute the information concerning educational programs. At this time, we cannot track specific number of views of this material; however, the website statistics that are available are contained in BMP 1-6. These statistics indicate that the site is being visited. With the new permit cycle beginning in July 1, 2013, we anticipate major modifications to this BMP.

Year	Viewing Statistics
2008 - 2009 (YEAR ONE)	793
2009 - 2010 (YEAR TWO)	160
2010 - 2011 (YEAR THREE)	302
2011 - 2012 (YEAR FOUR)	UNKNOWN
2012 – 2013 (YEAR FIVE)	UNKNOWN

BMP 1-2: Roanoke County Stormwater Informational Mailer

Goal:

The goal of this BMP is to create a stormwater informational mailer on an annual basis which will educate residents of the County of Roanoke about local stormwater issues. The mailer will be designed as a regional document and will touch on the County's Stormwater Program, general stormwater quality education, updates on local impaired water bodies, and TMDLs. The mailer will be based on the unique issues and concerns for the Roanoke River Watershed.

Measurable Goals:

For Year Five, Roanoke County developed a summer informational mailer that was sent out to all residents in June 2013. This mailer discussed the Upper Roanoke River TMDL Implementation Plan, being prepared by DEQ, and upcoming water quality related volunteer opportunities.

This informational mailer was sent to approximately **60,000** residences. Multiple phone calls to the County were generated by this mailer; unfortunately the County does not have the capability to track the number and source of incoming phone calls at this time. A copy of this informational mailer can be found on the attached compact disk under the file titled **BMP 1-2 Stormwater Informational Mailer.pdf**.

TMDL Consistency:

This mailer discusses the benefits of the Implementation Plan in the overall clean-up process. (EC/FC & SED)

Evaluation and Modification:

The number of emails, phone calls, and website hits shows that the mailer is an effective format to distribute stormwater information. With the new Permit requirements, we will be reviewing this BMP for possible expansion. The County's goal continues to be to perform effective outreach to its citizens.

Year	Distribution Statistics
2008 - 2009 (YEAR ONE)	Aprox. 50,000
2009 - 2010 (YEAR TWO)	Aprox. 50,000
2010 - 2011 (YEAR THREE)	Aprox. 50,000
2011 – 2012 (YEAR FOUR)	Aprox. 60,000
2012 – 2013 (YEAR FIVE)	APPROX. 60,000

BMP 1-3: Stream Monitoring and Education

Goal:

In cooperation with the local Virginia Save Our Streams chapter, stream monitoring and informational stream seminars will be provided for Roanoke County residents. The goal of this BMP is to educate citizens on the field procedures that have been established to determine water quality, in addition to motivating citizens to monitor waterways in their neighborhood and enhance grass roots cooperation to promote the importance of stream monitoring within the County. These seminars and monitoring sessions will provide some field exposure to aquatic habitats, update citizens on local, state, and federal water quality regulations, and keep citizens updated on local stream health.



Measurable Goals:

During this annual period Roanoke County, in cooperation with Save Our Streams and Clean Valley Council, provided **five** informational stream seminars and **six** local stream monitoring sessions. The five indoor stream school seminars and six stream monitoring sessions targeted both adults and school age kids between 7th and 10th grade and had a total of **571** in attendance. The stream monitoring events performed by Save Our Streams evaluated **5** stream segments with **18** citizens participating. A report showing each segment that was monitored and the score each reach received can be found on the attached compact disk under the file titled **BMP 1-3 Stream Monitoring and Education Statistics.pdf**.

TMDL Consistency:

This activity allows citizens to have an understanding of the many factors that can affect the life in a stream. The effects of pet waste, stream bank erosion and agricultural runoff are discussed during the monitoring sessions as important impacts to water health. (EC/FC and SED)

Evaluation and Modification:

The number of seminars, monitoring events, and participating citizens show that the stream monitoring and education BMP is an effective method to educate citizens and enhance the grass-roots monitoring effort throughout the County. The County's goal is to continue to provide stream seminars and monitoring sessions to continue to educate citizens and encourage cooperation in regional water quality health.

Year	Streams Monitored	Attendance
2008 - 2009 (YEAR ONE)	52	491
2009 - 2010 (YEAR TWO)	24	775
2010 - 2011 (YEAR THREE)	28	735
2011 - 2012 (YEAR FOUR)	13	592
2012 - 2013 (YEAR FIVE)	5	589

BMP 1-4: Stormwater Education Program

Goal:

Roanoke County will develop a stormwater educational program for Roanoke County school age children. Educators will develop and provide programs addressing stormwater and related water quality issues. Different programs will target appropriate grade levels and will be SOL appropriate.

Measurable Goals:

For this annual period, Roanoke County in conjunction with Clean Valley Council has continued to provide the stormwater education program to school age children. Twenty seven education programs were held in County schools and reached **3,897** students between first grade and 12th grade. The Stormwater Education Program descriptions and program statistics for each educational event can be found on the attached compact disk under the file titled **BMP 1-4 Stormwater Education Program Statistics.pdf**.



TMDL Consistency:

Several of the educational programs that are presented to Roanoke County Schools target sources of bacteria such as, "Reeling in Runoff" (EC/FC). Several of these school programs also target potential sources of sediment such as, "Why Watersheds?", "Drains to Rivers", and "Soil: Who Needs It?"(SED)

Evaluation and Modification:

The number of school programs and participating students show that the stormwater educational programs are an effective method to address stormwater and related water quality issues in the school system. The County will continue to provide these programs and continue to target appropriate grade levels and be SOL applicable. The specific educational programs will continue to be evaluated and new programs may be incorporated into the group of programs to address new issues that impact the community.

Year	Programs Given	Students Reached
2008 - 2009 (YEAR ONE)	20	4,011
2009 - 2010 (YEAR TWO)	31	6,871
2010 - 2011 (YEAR THREE)	34	8,815
2011 - 2012 (YEAR FOUR)	21	4,407
2012 - 2013 (YEAR FIVE)	27	3,897

BMP 1-5: Stormwater Public Awareness Program

Goal:

Roanoke County will maintain a Stormwater Public Awareness Program that includes the distribution of stormwater merchandise, public service announcements, and other high visibility educational media to utilize social mass marketing methods to bring stormwater quality issues to the attention of the citizens of Roanoke County.

Measurable Goals:

In this annual period, Roanoke County distributed book bag tags, bookmarks, books, erasers, lanyards, litter bags, pencils, rulers, stickers, handouts, and t-shirts, all promoting the importance of water quality to the citizens of Roanoke County. In addition, Clean Valley Council completed **five segments** on local news stations regarding stormwater runoff and associated pollutants on behalf of Roanoke County.

In total, Roanoke County gave out **1,420** pieces of merchandise to the citizens of the County. The types and amounts of merchandise provided by the County can be found on the attached compact disk under the file titled **BMP 1-5 Stormwater Public Awareness Program Statistics.pdf**.



TMDL Consistency:

Roanoke County and our educational partners give out thousands of pieces of merchandise that have reminder slogans on them to be aware of day to day items such as picking up after their pets and filling bare spots in their yards to prevent erosion. (EC/FC & SED)

Evaluation and Modification:

Roanoke County continues to successfully distribute a variety of media bringing stormwater quality issues to the attention of the public through merchandise and informational sessions. The County finds this BMP to be effective and intends to continue to distribute stormwater merchandise through a variety of media sources to continue to meet the goals of this permit.

Year	Media Distributed	Media Sources
2008 - 2009 (YEAR ONE)	2,811	STUDENT MERCHANDISE, TELEVISION SPOTS,
2009 - 2010 (YEAR TWO)	5,244	STUDENT MERCHANDISE, PRESENTATIONS, WATERSHED MAPS
2010 - 2011 (YEAR THREE)	5,081	STUDENT MERCHANDISE, WATER BOTTLES, BMP MAINTENANCE GUIDES
2011-2012 (YEAR FOUR)	3,802	STUDENT MERCHANDISE, T-SHIRTS, BMP MAINTENANCE GUIDES
2012-2013 (YEAR FIVE)	1,420	STUDENT MERCHANDISE, T-SHIRTS, BMP MAINTENANCE GUIDES

BMP 1-6: Roanoke County Stormwater Webpage

Goal:

Roanoke County will maintain and monitor the Roanoke County Stormwater webpage, where citizens can continue to get information concerning the County's Stormwater Management Program, ordinances, design guidelines, general information, contact information, pollution prevention information, educational programs and links to other organizations and sites. The website will also inform the citizens about on-going community based projects such as: storm-drain stenciling, streams monitoring, and other educational programs.

Measurable Goals:

This 17 page website is devoted to stormwater management, water quality, floodplain management and local water quality issues and information.

These webpages continue to inform the citizens about the current issues of this region while giving phone, email, and web information to contact a stormwater professional for further information. There were a total of **2,699 visits, with 6,448**



page views to the stormwater website between July 1, 2012 and June 30, 2013. The number of visitors to each webpage for this fifth year of this permit has been monitored and can be found on the attached compact disk under the file titled **BMP 1-6 Stormwater Webpage Statistics.pdf**.

TMDL Consistency:

The website highlights a page discussing "Non-point Source Pollution". This page illustrates how agriculture and straight pipes can contribute to the overall pollution problem. (EC/FC) This page also illustrates how a citizen can prevent non-point source pollution through planting riparian buffers along creeks. (SED)

Evaluation and Modification:

For the next permit cycle, the County plans on continuing to look at the pages that are least viewed and utilize this information to determine if the content of some of the pages needs to be changed.

Year	Webpage Views	Most Popular (MP) and Least Popular Page (LP)
2008 - 2009 (YEAR ONE)	21,035	(MP): STORMWATER MANAGEMENT HOMEPAGE (LP) : STORMWATER PROGRAMS DATABASE
2009 - 2010 (YEAR TWO)	6,084	(MP): STORMWATER MANAGEMENT HOMEPAGE (LP) : STORMWATER PROGRAMS DATABASE
2010 - 2011 (YEAR THREE)	7,529	(MP): STORMWATER MANAGEMENT HOMEPAGE (LP) : STORMWATER PROGRAMS RESOURCES
2011 - 2012 (YEAR FOUR)	4,131	(MP): STORMWATER VOLUNTEERING OPPORTUNITIES (LP) : PROPERTY PROTECTION
2012 - 2013 (YEAR FIVE)	6,448	(MP): STORMWATER VOLUNTEERING OPPORTUNITIES (LP) : PROPERTY PROTECTION

BMP 1-7: Business Education Program

Goal:

The goal of this program is to develop a stormwater quality education program for specific commercial businesses within the County of Roanoke. This BMP will provide information to these businesses in an effort to increase business owner awareness of the impact of discharges into the County's storm sewer system. These education programs are directed toward groups of commercial, industrial, and institutional organizations that are most likely to have significant impacts to local stormwater quality. Target businesses will be chosen so that the awareness message can be specific and most effective.

Measurable Goals:

For Year Five, the businesses in our target group were car washes, auto detailing shops, and other businesses that might wash vehicles as a part of their business (such as used car lots). These businesses can have an adverse impact on local water quality through direct discharges of wash waters. Post cards were developed with Clean Valley Council in English and Spanish. Unfortunately, due to staffing limitations, the post cards could not be completed and mailed during this permit period. We intend to send these post cards out before the end of the 2013 calendar year.



TMDL Consistency:

The program targets local businesses that may have uncontrolled discharges from vehicle washing operations. These operations would increase sediment discharges. Therefore, these postcards would address the TMDL for sediment (SED).

Evaluation and Modification:

This program can be an effective means to educate businesses. Additional resources need to be applied to this BMP for proper implementation. This BMP will be reassessed and strengthened in accordance with the new permit requirements.

Annual Period	Type of Educational Material	Target Group	Number of Businesses
2008 - 2009 (YEAR ONE)	Stormwater Facility Information Brochure	Commercial Businesses Owning a Stormwater BMP	16
2009 - 2010 (YEAR TWO)	Improving Water Quality by Smart Landscaping Letter	Local Landscaping Companies	86
2010 - 2011 (YEAR THREE)	Stormwater Best Management Practices for Restaurants Pamphlet	Restaurants	78
2011 - 2012 (YEAR FOUR)	Pet Waste Pick Up Pamphlet	Veterinarians and Kennels	32
2012 - 2013 (YEAR FIVE)	Vehicle Washing Post Card*	Businesses that may wash vehicles	0

*Literature developed, but not mailed out.



MCM 2: Public Involvement and Participation

This minimum control measure is intended to implement a program that helps to inform and educate County residents about the Roanoke County Stormwater Program. Support from the citizens is critical for the success of a stormwater plan. To garner this support, the County has coordinated several programs to engage the citizen's interest in stormwater quality. The BMPs that have been established to complete this measure are listed below:

BMP 2-1: Storm Drain Stenciling Program

Coordinate a storm drain stenciling program designed to engage group involvement and educate people about the consequences of dumping waste into the storm drain system.

BMP 2-2: Stormwater Public Event

Conduct a public event to bring attention to current stormwater issues and allow feedback from citizens on the condition of the County's stormwater program, from a citizen's point of view.

BMP 2-3: Stormwater Management Citizens Advisory Committee

Conduct a stormwater management program citizens' advisory committee to provide an approachable environment where ideas and concerns regarding the County's stormwater program may be shared and discussed. A member of the County's stormwater management team must be present.

BMP 2-4: Annual Report Posted on Stormwater Website for Citizens to View

Continue to post Roanoke County's Stormwater Discharge permit and annual report on the County's website for citizens to download and read.

Included with this document is a detailed description of the objective and measurable goals of each BMP, the strategies to ensure consistency with local TMDLs, the status of the County's compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program. The TMDL compliance is broken down by impairment type: e. coli and fecal coliform (EC/FC) or sediment (SED).

BMP 2-1: Storm Drain Stenciling Program

Goal:

The goal of this program is to coordinate a storm drain stenciling program with local schools, neighborhoods, businesses, and other groups, to stencil messages on storm drains that educate people about the consequences of dumping waste into the storm drain system.

Measurable Goals:

In the fifth year of this permit cycle, the County hosted three storm drain stenciling events. A total of five persons participated, with 80 storm drain inlets being stenciled.

TMDL Consistency:

The storm drain stenciling program is an outreach method to inform and remind citizens that what goes into the storm drain goes directly to local creeks and streams. Roanoke County believes that when citizens understand that the storm drains are not treated by the sanitary sewer, they will be less likely to allow their pet waste or other non-stormwater waste to enter the storm drain through the road-side inlets. (EC/FC)

Evaluation and Modification:

The County finds this BMP to be an effective method of information distribution and outreach. The County proposes to continue to coordinate a storm drain stenciling program that will stencil storm drains within the County while at the same time expanding the areas being stenciled so that the education and outreach value is enhanced.



Year	Storm Drains Stenciled	Attendance
2008 - 2009 (YEAR ONE)	-	26
2009 - 2010 (YEAR TWO)	65	59
2010 - 2011 (YEAR THREE)	34	14
2011 - 2012 (YEAR FOUR)	232	109
2012 - 2013 (YEAR FIVE)	80	5

BMP 2-2: Stormwater Public Event

Goal:

At least once a year, Roanoke County will hold a public event to address stormwater issues, the County's progress towards stormwater quality improvements and to receive input from the public on the County's Stormwater management program.

Measurable Goals:

Roanoke County was active in 14 events throughout Year Five that involved 7,156 persons from throughout the region. During these events, Roanoke County staff and/or Clean Valley Council staff, under contract with Roanoke County addressed questions and comments about stormwater and water quality. Information highlighted at the booths included the benefits of stream buffers, the differences between storm and sanitary sewers, and the importance of pet waste pick up and disposal.



A complete list of events and attendance can be found on the attached compact disk under the file titled **BMP 2-2 Stormwater Public Events Statistics.pdf**

TMDL Consistency:

At least once a year, the County is involved in one or more public events that celebrate our commitment to regional water quality. Pet waste and soil erosion are common issues discussed at each of these events since they are key regional water quality issues. (EC/FC & SED)

Evaluation and Modification:

Based upon the attendance at these public events, Roanoke County finds this BMP to be an effective method of allowing the citizens to address issues and allowing the County to receive input from the public. Modifications to this BMP will be considered in light of the new permit requirements.

Year	Public Event(s)	Attendance
2008 - 2009 (YEAR ONE)	Fall Waterways Cleanup 2008, Public Meeting, Volunteer Planting Day, Better Living Expo 2009, Garst Mill Park Celebration 2009	1,102
2009 - 2010 (YEAR TWO)	Earth Summit 2009, Fall Waterways Clean-up 2009, Better Living Expo 2010	687
2010 - 2011 (YEAR THREE)	Fall Waterways Clean-Up 2010, AECF Green Living and Energy Expo 2010	2,892
2011 - 2012 (YEAR FOUR)	See list in file titled BMP 2-2 Stormwater Public Events Statistics.pdf on Compact Disk	7,156
2012 - 2013 (YEAR FIVE)	See list in file titled BMP 2-2 Stormwater Public Events Statistics.pdf on Compact Disk	5,850

BMP 2-3: Stormwater Management Citizens Advisory Committee

Goal:

The goal of this program is to establish a regional group of citizens that meet with local stormwater management officials to review ordinances, TMDLs, local projects, informational materials and educational components of each localities' Stormwater Management program (Roanoke County, Roanoke City, and the Town of Vinton). This group will also provide an approachable environment where ideas and concerns regarding the County's stormwater program may be shared and discussed.



Measurable Goals:

Roanoke County held four citizens advisory committee meetings this year, on August 29, 2012, November 28, 2012, February 27, 2013, and May 29, 2013.

The **August 29th meeting** was held at Garst Mill Park. Clean Valley Council staff conducted a Stream School program for the committee.

The **November 28th** meeting was held at a local restaurant (Metamorphosis). There was a discussion concerning a car wash post card being developed and changes in the MS4 permit. There was also a presentation given by Mr. Craig Coker, principal of Coker Composting and Consulting, on the use of compost for erosion control.

The **February 27th** meeting was held at the Town of Vinton Municipal Building. A discussion was held concerning the desired role of the committee in relation to the new MS4 permit requirements.

The **May 29th** meeting was held at Virginia Western Community College. The committee received an overview of upcoming stormwater activities and Mr. Kip Foster, VDEQ, briefly described the Upper Roanoke River TMDL Implementation Plan process and status. The committee was broken into 4 smaller groups to work on brainstorming ideas for committee actions/activities.

The minutes for each meeting can be found on the attached compact disk under the file titled **BMP 2-3 Stormwater Management Citizen Advisory Committee.pdf**

TMDL Consistency:

During each of these citizens' advisory committee meetings, topics are chosen that target specific issues that educate our committee members on local issues such as excess bacteria in our waterways and ways to prevent and minimize the sediment loss to our streams. (EC/FC & SED)

Evaluation and Modification:

Roanoke County proposes to continue this citizens' advisory committee. Based on the attendance, the citizens find this committee to be an effective method of allowing them to address issues and speak to the County. The County will continue to meet with the committee. The meetings will be on a quarterly basis and will meet three to four times a year.

Date	Topic	Attendance
8/29/2012	Stream School, Biological Assessment of Mudlick Creek	17
11/28/2012	Compost for Erosion Control	20
2/27/2013	The Committee role with the new MS4 Permit	15*
5/29/2013	Brainstorming Committee Activities/Actions	15

*Approximate attendance, no minutes were kept for this meeting.

BMP 2-4: Annual Report Posted on Stormwater Website for Citizens to View

Goal:

The goal of this program is to post the Roanoke County's Municipal Separate Storm Sewer (MS-4) Program on the website where citizens may view and comment on it. This form of public viewing will allow citizens of Roanoke County to become knowledgeable about the goals of the program and have information with which to comment on existing issues and influence changes in future programs. Each annual report will be posted on the website to keep citizens current on annual evaluations of program effectiveness and proposed changes.

Measurable Goals:

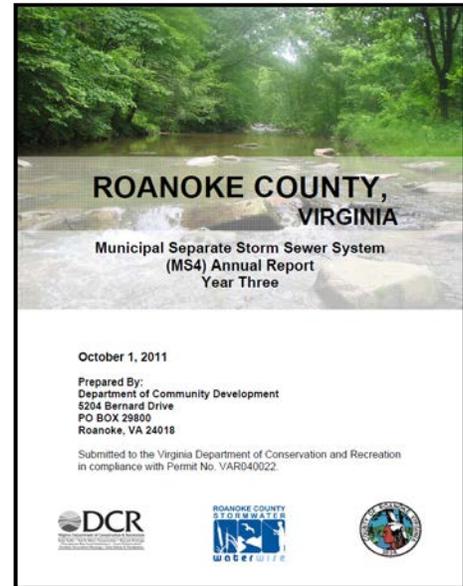
The general registration statement was posted to the Roanoke County Stormwater website on December 3, 2008. This will continue to be available on the website. The fourth year annual report was posted to the website on November 28, 2012. Roanoke County has also made the Stormwater Program Plan and Year One through Year Five annual reports available in hard copy in the Department of Community Development office. No comments were received from the citizens regarding the Program Plan.

TMDL Consistency:

Access to the MS-4 Program Plan and Annual Reports gives Roanoke County Citizens a hefty education about all of the local streams and rivers, their impairments, and any approved TMDLs. In addition, the Program Plan and Annual Report detail the efforts that the County is taking to address these issues. This will inform citizens on ways to get involved with current outreach programs in addition to minimizing any impact that they may have on local water quality. (EC/FC) & (SED)

Evaluation and Modification:

No modifications are planned for this BMP. Roanoke County believes that these locations for viewing are successful in allowing interested citizens to become more familiar with the stormwater program.



MCM 3: Illicit Discharge Detection and Elimination

The goal of this minimum control measure is to develop, implement, and enforce a program to detect and eliminate illicit discharges to the storm sewer system. The BMPs that have been established to complete this measure are listed below:

BMP 3-1: Storm Drain Map

A County-wide Storm Sewer Map in the GIS database has been prepared for all known locations of municipal storm sewer systems. The Roanoke County Storm Sewer Database will be maintained so that a map of all the public storm sewers in the County will be available to the public.

BMP 3-2: Illicit Discharge Ordinance

A Roanoke County Illicit Discharge Ordinance will be established which will include policy, procedures, reporting, and enforcement measures for illicit discharges.

BMP 3-3: Illicit Discharge Program

Roanoke County will design and enforce an illicit discharge program to target and inspect areas of high risk potential for illicit connections.

Included with this document is a detailed description of the objective and measurable goals of each BMP, the strategies to ensure consistency with local TMDLs, the status of the County's compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program. The TMDL compliance is broken down by impairment type: e. coli and fecal coliform (EC/FC) or sediment (SED).

BMP 3-1: Storm Drain Map

Goal:

The goal of this program is to develop, and keep updated, a storm drain map which identifies all of the municipal separate storm sewers within the County of Roanoke which discharge to a natural drainage way.

Measurable Goals:

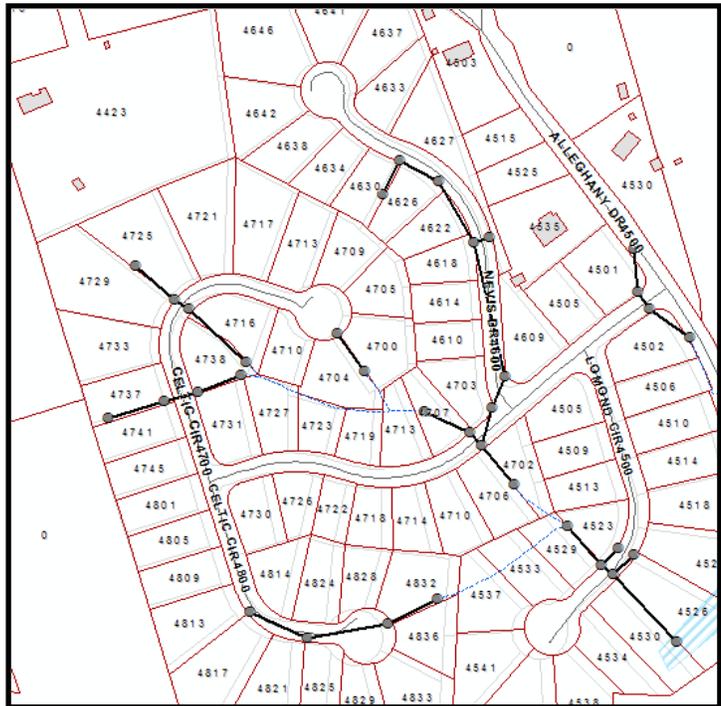
Roanoke County has continued this program by expanding and updating the storm sewer map of Roanoke County. In addition to locating any new storm sewer outfalls, the map has been updated to show the current outfalls and their associated Hydrologic Unit Code (HUC) of the waters that are being discharged to, the names and locations of all the impaired surface waters that receive discharges from these systems and the estimated acreage draining to the storm sewer outfall. This analysis has been completed for **96%** of the known outfalls within the County. A list of all outfalls analyzed thus far in Permit Years One through Five can be found on the attached compact disk under the file titled **BMP 3-1 Storm Drain Outfalls.pdf**.

TMDL Consistency:

An updated and accurate storm drain map which identifies all of the municipal separate storm sewers will greatly aid Roanoke County in the discovery of illicit connections and the locations where sediment may be entering the regulated MS4. (SED & EC/FC)

Evaluation and Modification:

No modifications are planned for this BMP. Roanoke County believes that the process of mapping storm drains is an appropriate method to aid in the enforcement, detection and elimination of illicit discharges to the storm sewer system.



Year	New Mapped Structures	Stormwater Facilities	Outfalls Mapped	% of Outfalls Analyzed
2008 - 2009 (YEAR ONE)	21	461	235	25%
2009 - 2010 (YEAR TWO)	224	511	363	40%
2010 - 2011 (YEAR THREE)	97	595	415	47%
2011 - 2012 (YEAR FOUR)	1,428	627	463	55%
2012 - 2013 (YEAR FIVE)	1,428	716	788	96%

BMP 3-2: Illicit Discharge Ordinance

Goal:

The goal of this program is to detect and eliminate illicit discharges in to the Municipal Separate Storm Sewer System by developing and adopting regulations and an enforcement program to prevent illegal discharges into the storm drain system.

Measurable Goals:

Roanoke County has developed and evaluated the Illicit Discharge Ordinance and determined that it is in compliance with current state regulations of the Virginia Department of Conservation and Recreation. Suitable measures for effective enforcement are included in the Illicit Discharge Ordinance which can be found on the attached compact disk under the file titled **BMP 3-2 Illicit Discharge Ordinance.pdf**.

TMDL Consistency:

An Illicit Discharge Ordinance greatly aids in the enforcement of illicit discharges to the MS4 system. This legal method can aid the County in discontinuing existing connections and discouraging future illicit discharges to the system. (EC/FC)

Evaluation and Modification:

Due to changes in the Virginia Stormwater Law and Regulations, Roanoke County will be adopting a new Stormwater Management Ordinance. As a part of this effort, the Illicit Discharge ordinance language will also be reviewed and changes considered.



Year	Action	Modifications
2008 - 2009 (YEAR ONE)	Illicit Discharge Ordinance Reviewed	None
2009 - 2010 (YEAR TWO)	Illicit Discharge Ordinance Reviewed	None
2010 – 2011 (YEAR THREE)	Illicit Discharge Ordinance Reviewed	None
2011 - 2012 (YEAR FOUR)	Illicit Discharge Ordinance Reviewed	None
2012 - 2013 (YEAR FIVE)	Illicit Discharge Ordinance Reviewed	None*

*Modifications will be considered in the upcoming year.

BMP 3-3: Illicit Discharge Program

Goal:

The goal of this program is to develop, implement, and enforce a program to detect and eliminate illicit discharges, as defined in 4VAC50-60-10, into the regulated municipal separate storm sewer system. The Illicit Discharge Program will include the following components:

1. Procedures for locating priority areas likely to have illicit discharges.
2. Procedures for tracing the source of an illicit discharge.
3. Procedures for removing the source of the discharge.
4. Procedures for program evaluation and assessment.
5. Procedures for reporting discharges to the MS4.



Measurable Goals:

Roanoke County has developed procedures to detect, address, and report illicit discharges that enter the municipal separate storm sewer system. The Illicit Discharge Ordinance (BMP 3-2) includes procedures to address illicit discharges through the enforcement process. In Year One, Roanoke County determined the screening factors for high illicit discharge potential and in Year Two, the desktop determination was completed. In Year Three, Roanoke County began field screening and monitoring for illicit discharges. Due to several eliminated staff positions, no new field screening was completed in Year Four. In Year Five, Roanoke County completed the outfall field reconnaissance. Of the 258 outfalls originally identified for field reconnaissance, it was determined that 43 of them were not true outfalls, and 215 were observed in the field (47 in Year 3, and 168 in Year 5). The results of the field reconnaissance is included on the attached compact disc under the file titled **BMP 3-3 Outfall Field Reconnaissance Results.pdf**.

TMDL Consistency:

An Illicit Discharge Program will greatly aid in the location of illicit discharges to the MS-4. This method can give staff the methodology needed to screen, target and monitor the storm drain system in the efforts to discover existing illegal connections to the municipal storm drain system. (EC/FC)

Evaluation and Modification:

Roanoke County believes that the Illicit Discharge Program is a critical component in the detection and elimination of illicit discharges to the storm sewer system. Roanoke County will continue its field reconnaissance of outfalls.

Steps in Illicit Discharge Program	Schedule	Status
Determination of Screening Factors	YEAR 1	Complete
Desktop Determination of Illicit Discharge Potential	YEAR 2	Complete
Begin Field Screening and Indicator Monitoring	YEAR 3	19% Complete
Continue Field Screening and Indicator Monitoring	YEAR 4	19% Complete
Complete Field Screening and Indicator Monitoring	YEAR 5	100% Complete



MCM 4: Construction Site Stormwater Runoff Control

Roanoke County recognizes that construction sites can deposit significant amounts of silt and sediment in stormwater runoff due to the large areas of land disturbances. The goal of this minimum control measure is to implement and enforce a program that will reduce pollutants in stormwater runoff to the regulated municipal separate storm sewer system from construction activities. The BMPs that have been established to complete this measure are listed below:

BMP 4-1: Erosion and Sediment Control Ordinance

Establish and maintain an Erosion and Sediment Control Ordinance to require erosion and sediment control best management practices, as well as sanctions to ensure compliance, under local law for all land disturbances of 2,500 square feet or more.

BMP 4-2: Erosion and Sediment Control Certification

Identify County positions that require Erosion and Sediment Control training and track employees to ensure their training is received and updated.

BMP 4-3: Land Development Procedures Review and Evaluation

Develop and maintain procedures for site plan review which incorporate consideration of potential water quality impacts, flooding and erosion, and site inspection and enforcement procedures.

Included with this document is a detailed description of the objective and measurable goals of each BMP, the strategies to ensure consistency with local TMDLs, the status of the County's compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program. The TMDL compliance is broken down by impairment type: e. coli and fecal coliform (EC/FC) or sediment (SED).

BMP 4-1: Erosion and Sediment Control Ordinance

Goal:

The goal of this BMP is to maintain an Erosion and Sediment Control (E&S) Ordinance that will reduce pollutants in stormwater runoff to the storm sewer system from construction activities. These regulations, included in the E&S Ordinance, require erosion and sediment controls as well as sanctions to ensure compliance under local law. This ordinance requires E&S controls for all land disturbances of 2,500 square feet or more and an engineered E&S Plan for any land disturbance greater than 10,000 square feet. The E&S Plan will require construction site operators to implement appropriate E&S best management practices specific to the site. Site inspection and enforcement actions are also incorporated into the County's E&S Ordinance.

Measurable Goals:

Roanoke County has evaluated the Erosion and Sediment Control Ordinance to keep it in compliance with any changes to regulations being made at the State level. New stormwater management regulations have been passed but have not gone into effect. Roanoke County's current Erosion and Sediment Control Ordinance is still in compliance with the regulations set forth and enforced by the Virginia Department of Conservation and Recreation (DCR). DCR reviewed the County E&S Program during July 2012. As a result of the DCR review, Roanoke County developed, and DCR approved, an alternative inspection program.



During Year Five, the County had **237** regulated land-disturbing activities, and a total of **100.5** acres disturbed. The monthly counts of land disturbing activities, both residential and commercial, can be found on the attached compact disk under the file titled **BMP 4-1 Erosion and Sediment Control Statistics.pdf**.

TMDL Consistency:

This ordinance targets reducing sediment in stormwater runoff from construction sites. These regulations require erosion and sediment BMPs on the site as well as sanctions to ensure compliance, under local law. (SED)

Evaluation and Modification:

No modifications are planned for this BMP. Roanoke County believes that the Erosion and Sediment Control Ordinance is a critical component in reducing pollutants in stormwater runoff to the regulated small municipal separate storm sewer system from construction activities. It is critical that it remain in compliance with the Virginia Erosion and Sediment Control Regulations.

Year	Action	Disturbances	Acres
2008 - 2009 (YEAR ONE)	E & S Ordinance Reviewed No changes or modifications	103	140
2009 - 2010 (YEAR TWO)	E & S Ordinance Reviewed No changes or modifications	313	252
2010 - 2011 (YEAR THREE)	E & S Ordinance Reviewed No changes or modifications	221	86
2011 - 2012 (YEAR FOUR)	E & S Ordinance Reviewed No changes or modifications	191	68
2012 - 2013 (YEAR FIVE)	E & S Ordinance Reviewed No changes or modifications	237	100.5

BMP 4-2: Erosion and Sediment Control Certification

Goal:

The goal of this BMP is to identify current Erosion and Sediment Control (E&S) certified employees and develop a program for certification maintenance, additional certifications, and cross-training.

Measurable Goals:

Community Development was identified as having positions whose job responsibilities necessitate erosion and sediment control training and certification. Currently the county utilizes training and certification through the Virginia Department of Environmental Quality's E&S training and certification program. Additional employees hired into positions whose job responsibilities have already been determined as needing training in E&S will be certified using this program. A table of the positions, the employee(s) in the positions, and their level of certification can be found on the attached compact disk under the file titled **BMP 4-2 Erosion and Sediment Control Certification Statistics.pdf**.

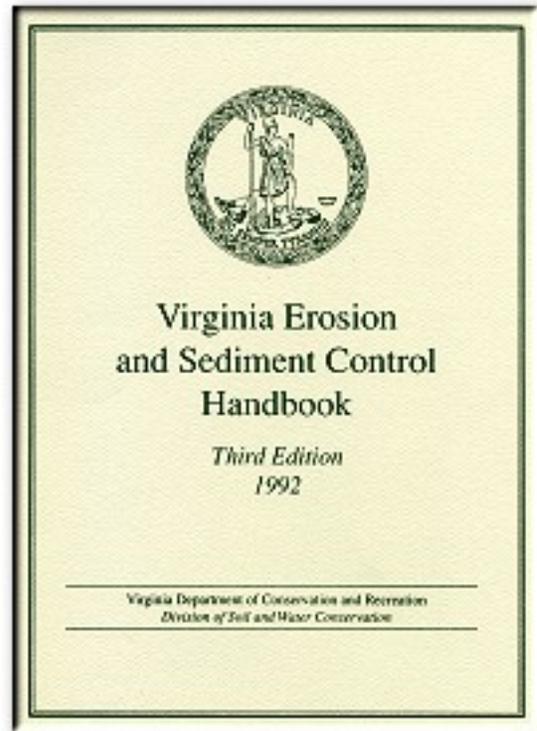
Additionally, the Department of Community Development and the Department of Parks, Recreation and Tourism have personnel trained as certified land disturbers.

TMDL Consistency:

This program identifies County employees that need E&S training and tracks their certifications to determine if they have lapsed in their required training and certifications. This program minimizes County site erosion potential by educating our employees on correct E&S procedures and policy. (SED)

Evaluation and Modification:

No modifications are planned for this BMP. Roanoke County believes that the certification of all County employees that could significantly impact erosion through land disturbance is a critical component in reducing pollutants in stormwater runoff.



BMP 4-3: Land Development Procedures Review and Evaluation

Goal:

The goal of this BMP is to ensure that the procedures for site plan review incorporate considerations for water quality impacts by addressing the most current local stormwater management regulations which are outlined in the Roanoke County Stormwater Management Ordinance.

Measurable Goals:

Roanoke County has evaluated the Land Development Procedures to keep them in compliance with any changes to the Roanoke County Stormwater Ordinance and Manual or to regulations being made at the State level. New Stormwater regulations have just recently been approved at the State level and have not gone into effect at this time. The Roanoke County Land Development Procedures are still in compliance with the regulations set forth and enforced by the Virginia Department of Conservation and Recreation. These procedures can be found on the attached compact disk under the file titled **BMP 4-3 Land Development Procedures.pdf**.



TMDL Consistency:

The Land Development Procedures lists the steps needed for a site plan to meet the State and local Erosion and Sediment Control and Stormwater requirements. Keeping these procedures in compliance with any changes at the state level guarantees that new site plans are reviewed by the County with the most current regulations available. This program minimizes erosion and flooding potential due to the benefit of an educated engineering design team and construction crew on all Roanoke County public and private land development sites that require a site plan. (SED)

Evaluation and Modification:

This BMP will be modified to reflect Roanoke County becoming the local VSMP authority, effective July 1, 2014. Roanoke County believes that continuing the process of updating the Land Development Procedures is important to make sure that Roanoke County's site plan review is consistent with the most recent stormwater management regulations. As new state stormwater management regulations go into effect, the local ordinances and Land Development Procedures must change.

Year	Action	Changes and Modifications
2008 - 2009 (YEAR ONE)	Land Development Procedures Reviewed	No changes or modifications
2009 - 2010 (YEAR TWO)	Land Development Procedures Reviewed	No changes or modifications
2010 - 2011 (YEAR THREE)	Land Development Procedures Reviewed	No changes or modifications
2011 - 2012 (YEAR FOUR)	Land Development Procedures Reviewed	No changes or modifications
2012 - 2013 (YEAR FIVE)	Land Development Procedures Reviewed	No changes or modifications



MCM 5: Post Construction Stormwater Management in New Development and Redevelopment

Roanoke County recognizes that addressing water quality in post construction runoff is an important way to prevent the deposition of sediment and other pollutants into our streams and rivers. The BMPs that have been established to complete this measure are listed below:

BMP 5-1: Stormwater Management Ordinance and Manual

Roanoke County has developed a Stormwater Management Ordinance and Design Manual which addresses stormwater runoff from new development and redevelopment. This manual includes regulations and design standards for the design, construction, and maintenance of water quantity and quality best management practices.

BMP 5-2: Stormwater Management Facility Inspection Program

The County has developed a program to identify, track, and inspect all known permanent stormwater management facilities that discharge to the municipal storm sewer system.

BMP 5-3: Low Impact Development Utilization

The County will encourage and track any developments to be designed utilizing low impact development principles.

Included with this document is a detailed description of the objective and measurable goals of each BMP, the strategies to ensure consistency with local TMDLs, the status of the County's compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program. The TMDL compliance is broken down by impairment type: e. coli and fecal coliform (EC/FC) or sediment (SED).

BMP 5-1: Stormwater Management Ordinance and Manual

Goal:

The goal of this BMP is to adopt and enforce an ordinance and design manual that requires stormwater runoff to be addressed. These documents ensure that controls are in place that would prevent or minimize water quality and quantity impacts due to new development and redevelopment projects.

Measurable Goals:

Roanoke County began enforcing the Stormwater Management Ordinance and Manual on January 1, 2008. The Stormwater Management Ordinance regulates new development and redevelopment projects of 5,000 square feet and larger. The Stormwater Management Design Manual details structural and non-structural best management practices (BMPs) that are appropriate for this region. The Ordinance requires the designation of a responsible party who is legally bound to inspect and maintain the best management practices for the life of the BMP.

For Year Five, these documents have been evaluated to ensure continual compliance with the goals of this BMP and compliance with Federal and State Regulations. The Ordinance and Manual have been found to be consistent with State regulations and consistent with the prevention or minimization of water quality and quantity impacts. A copy of the Stormwater Management Ordinance and Manual can be found on the attached compact disk in two files titled **BMP 5-1 Stormwater Management Ordinance.pdf** and **BMP 5-1 Stormwater Management Manual.pdf**.

TMDL Consistency:

This Ordinance and design manual targets reducing the quantity and improving the quality of stormwater runoff from new development, re-development, and existing developed areas. This manual and ordinance protects against erosion from stream banks, construction sites, developed areas, and re-developed areas in addition to regulating illicit discharges. (SED & EC/FC)

Evaluation and Modification:

This BMP will be revised due to the new Virginia Stormwater Management Law and Regulations. A new Stormwater Management Ordinance will be adopted by the County before April 1, 2014.

Year	Action	Changes and Modifications
2008 - 2009 (YEAR ONE)	Stormwater Ordinance and Manual Reviewed	No changes or modifications
2009 - 2010 (YEAR TWO)	Stormwater Ordinance and Manual Reviewed	No changes or modifications
2010 - 2010 (YEAR THREE)	Stormwater Ordinance and Manual Reviewed	No changes or modifications
2011 - 2012 (YEAR FOUR)	Stormwater Ordinance and Manual Reviewed	No changes or modifications
2012 - 2013 (YEAR FIVE)	Stormwater Ordinance and Manual Reviewed	No changes or modifications

BMP 5-2: Stormwater Management Facility Inspection Program

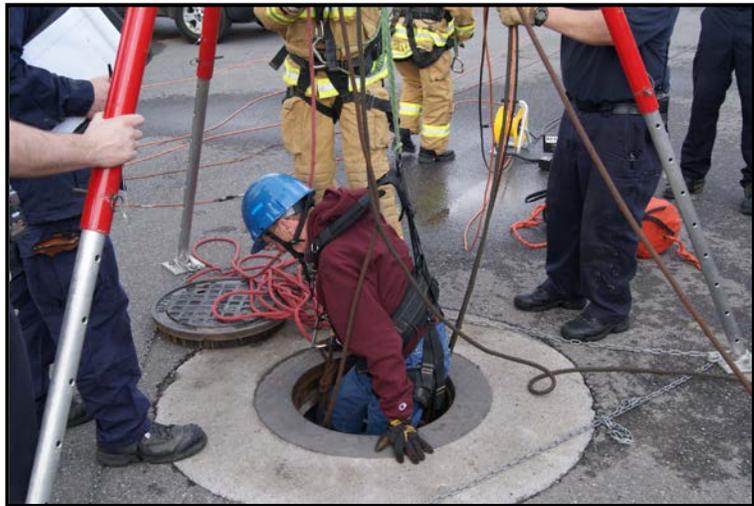
Goal:

The goal of this BMP is to enforce procedures for the Stormwater Management Facility Inspection Program.

Measurable Goals:

In the first annual period, Roanoke County developed a Stormwater Management Facility Inspection Program and implemented the program. Background information, design plans, and contact information was gathered and the inspection program started. Currently Roanoke County has a total of **715** known permanent stormwater facilities.

In this fourth annual period, Roanoke County inspected **75** permanent stormwater facilities. For each inspected pond, the County determined the treated acreage, HUC, and downstream impaired water body. This information can be found on the attached compact disk under the file titled **BMP 5-2 Stormwater Management Facility Inspection Statistics.pdf**.



TMDL Consistency:

This program ensures that all permanent stormwater facilities are adequately maintained and functioning properly. The proper function of these facilities is critical for flood protection and erosion prevention. (SED)

Evaluation and Modification:

Based on the new permit requirement to inspect all County owned stormwater management facilities annually, and other stormwater management facilities at least once every 5 years, this BMP will be modified to reflect the required inspection frequency.

Year	Stormwater Facilities Inspected	Total Number of Stormwater Facilities	BMP Maintenance Guides Given Out
2008 - 2009 (YEAR ONE)	56	461	n/a
2009 - 2010 (YEAR TWO)	62	511	n/a
2010-2011 (YEAR THREE)	134	595	125
2011 - 2012 (YEAR FOUR)	84	627	300
2012 - 2013 (YEAR FIVE)	75	715	300

BMP 5-3: Low Impact Development Utilization

Goal:

The goal of this BMP is to encourage and identify development projects that utilize Low Impact Development (LID) strategies.

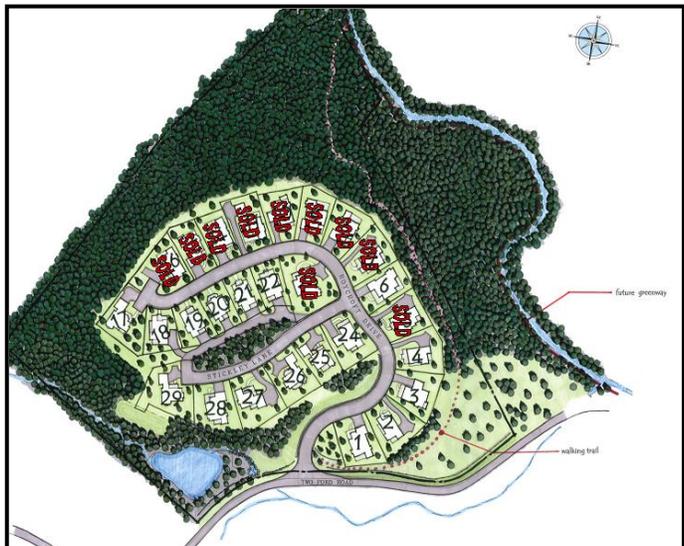
Measurable Goals:

In this annual period, Roanoke County has tracked the number of development projects and total acreage that has been developed using Low Impact Development principles for each HUC. No new development projects have been reviewed or approved that has utilized LID development practices in the last permit year.

Roanoke County continues to encourage Low Impact Development practices to be used in conjunction with or in place of structural measures for the reduction of stormwater runoff. The County understands that Low Impact Development strategies will help to minimize the reliance on expensive structural practices that require ongoing maintenance to remain effective.

TMDL Consistency:

This program encourages development projects that utilize Low Impact Development strategies which is an important way to prevent the deposition of sediment and other pollutants into our streams and rivers. (SED)



Evaluation and Modification:

With the new stormwater management regulations taking effect July 1, 2014, the need for this BMP will be reevaluated. The new regulation requirements may make this BMP irrelevant, and thus it may be discontinued.

Year	LID DEVELOPMENTS	SIZE	HUC
2008 - 2009 (YEAR ONE)	0		
2009 - 2010 (YEAR TWO)	1. THE PRESERVE AT TWO FORD ROAD	16.64 Ac	RU14
2010 - 2011 (YEAR THREE)	0		
2011 - 2012 (YEAR FOUR)	0		
2012 - 2013 (YEAR FIVE)	0		



MCM 6: Pollution Prevention and Good Housekeeping for Municipal Operations

Roanoke County's goal for the pollution prevention and good housekeeping program is to reduce pollutant runoff from Roanoke County Municipal operations. To perform this measure, the County needs to continue to evaluate our facilities and to also provide education and programs that will educate the County employees about pollution prevention and hazardous waste. The BMPs that have been established to complete this goal are listed below:

BMP 6-1: Spill Prevention and Control Plans and Illicit Discharge Inspection Program

Roanoke County will inspect and develop Spill Prevention and Control Plans for all of its municipal facilities that require a plan. Existing plans will be updated and annual training will be completed.

BMP 6-2: Household Hazardous Waste Event

Roanoke County will participate in Household Hazardous Waste Collection events to help citizens dispose of household materials that could be hazardous to dispose of in landfills.

BMP 6-3: Storm Sewer Maintenance Program

Roanoke County will continue to provide a program for the maintenance and upgrade of the regulated municipal storm sewer system.

BMP 6-4: Pollution Prevention and Hazardous Waste Training

Roanoke County will continue the pollution prevention and hazardous waste training for County employees, maintenance workers, and landscaping crews, and encourage additional pollution prevention training to be attained by County employees.

Included with this document is a detailed description of the objective and measurable goals of each BMP, the strategies to ensure consistency with local TMDLs, the status of the County's compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program. The TMDL compliance is broken down by impairment type: e. coli and fecal coliform (EC/FC) or sediment (SED).

BMP 6-1: Spill Prevention and Control Plans and Illicit Discharge Inspection Program

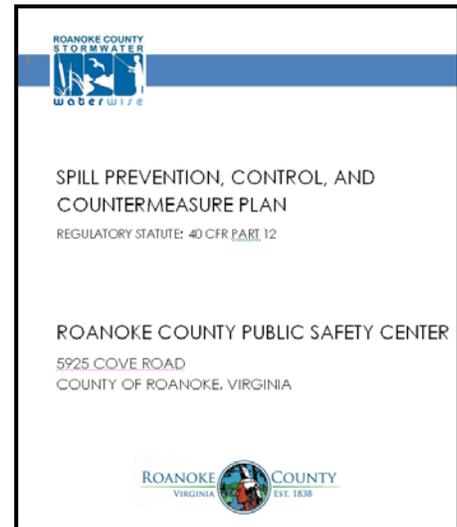
Goal:

The goal of this BMP is to develop and update Spill Prevention, Control, and Countermeasure (SPCC) Plans for all of Roanoke County’s municipal facilities. These plans will be updated and annual training will be completed. In addition, each facility will be inspected and evaluated for the potential for illicit discharges from storage yards, outdoor storage areas, waste transfer stations, fleet or maintenance shops and other municipal facilities. The disposal method for waste materials will be evaluated. Soluble or erodible materials will be analyzed and protected from exposure to precipitation. The application of fertilizers will be examined to meet manufacturer's recommendations. Any operation that has potential to discharge material into the municipal separate storm sewer system will be examined for potential for unwanted discharge.

Measurable Goals

To meet this goal, Roanoke County will inspect all County owned properties, review all existing SPCC Plans, and continue to determine if additional SPCC plans are needed. A list showing the review and inspection schedule for all County facilities can be found in a file on the attached compact disk under the file titled **BMP 6-1 SPCC Schedule.pdf**.

In Year Five, Roanoke County inspected **67** properties. One new SPCC Plan was written for the Fleet Service Center and is in the final stages of review. All existing SPCC plans are up to date and no modifications were needed. Illicit connections (floor drains and sinks not connected to sanitary sewer) were removed at the Kessler Mill facility.



TMDL Consistency:

This program minimizes the potential for pollution spills to enter the municipal storm drain system. Having updated SPCC Plans will aid in the education of County Employees that are in areas with some risk of pollution spills. This program also expands to evaluate any new County facilities, so that all working municipal facilities are protected. (EC/FC & SED).

Evaluation and Modification:

No changes are planned for this BMP. Roanoke County will continue to update existing SPCC Plans and develop new plans according to the schedule. This BMP is considered to be an effective method of evaluating and eliminating potential illicit discharges from municipal facilities, and preventing spills from entering the MS-4 from a County facility.

Year	Inspected Properties	New SPCC'S Completed	Updated SPCC'S
2008 – 2009 (YEAR ONE)	-	-	-
2009 - 2010 (YEAR TWO)	10	0	4
2010 - 2011 (YEAR THREE)	15	1	0
2011-2012 (YEAR FOUR)	65	0	0
2012-2013 (YEAR FIVE)	67	1*	0

*Under Final Review

BMP 6-2: Household Hazardous Waste Event

Goal:

The goal of this BMP is to encourage and identify strategies and events to help citizens dispose of household materials that could be hazardous to dispose of in bulk landfills.

Measurable Goal

In Year Five, the County of Roanoke participated in **12** Household Hazardous Waste (HHW) Collection events. A total of **456** people participated in the Household Hazardous Waste Collection days this year and **271** of the participants were residents of Roanoke County. The waste that was collected consisted of oil, antifreeze, paint, aerosols, pesticides, gasoline, kerosene, hydrochloric acid, phosphoric acid, ammonia, batteries, strippers, cleaners, fluorescent bulbs, and mineral spirits. Statistics for the HHW Events can be found in a file on the attached compact under the file titled **BMP 6-2 Household Hazardous Waste Statistics.pdf**. Additionally, the County participates in drug take back events. This year a drug take back event on April 27, 2013 collected 636 pounds of drugs from 4 locations in the County.

TMDL Consistency:

Currently there is no known benefit that this BMP will have on any TMDL waste load allocations approved prior to the issuance of this MS4 permit. Recently a TMDL waste load allocation has been approved for PCBs for the Roanoke River and the County expects this BMP to have a benefit in the reduction of that pollutant.



Evaluation and Modification:

The participation for the Household Hazardous Waste events has become stable. Roanoke County understands that these events are an important way to keep these hazardous wastes from being disposed inappropriately.

Year	HHW Events	Attendance
2008 - 2009 (YEAR ONE)	3	482
2009 - 2010 (YEAR TWO)	11	264
2010 – 2011 (YEAR THREE)	12	290
2011 – 2012 (YEAR FOUR)	12	271
2012 – 2013 YEAR FIVE	12	272

BMP 6-3: Storm Sewer Maintenance Program

Goal:

The goal of this BMP is to actively maintain the County's storm sewer system. Keeping the storm sewer system properly maintained is high on the County's priority list because it keeps the regulated storm sewer working as designed, minimizing the potential for flows to surcharge or surpass the capacity of the regulated storm sewer system. In addition, the maintenance crews also have the potential of discovering illicit connections and citing additional areas where pollutants may be entering the regulated storm sewer system.

Measureable Goals

The Stormwater Division of the Department of Community Development employs two stormwater construction and maintenance crews with a total of 7 employees. These crews perform a large variety of duties including municipal stormwater pond maintenance, installation of pipes and structures, repair of damaged structures, emergency response to flooding problems and all other county storm drain system maintenance.



This year **44** maintenance and improvement projects were completed. A total of **9,278** labor hours were committed towards storm sewer system maintenance and improvements to the municipal storm sewer system. The value of these improvements was estimated to be **\$664,739**. The completed projects and associated values of these improvements can be found on the attached compact disk under the file titled **BMP 6-3 Storm Drainage Maintenance and Improvements.pdf**.

TMDL Consistency:

This program is responsible for maintaining the regulated storm sewer system. This includes the improvement of eroding stream banks and channels. This program directly remediates existing areas where sediment is eroding and stabilizes the system, removing the input of sediment to the streams and channels. (SED) This program also increases the potential for discovering illicit connections to the storm drain system. (EC/FC)

Evaluation and Modification:

No changes are planned for this BMP. Roanoke County will continue to maintain the County's storm sewer system. Maintaining the storm drain system keeps it functioning properly and is an important opportunity to discover potential illicit connections to the storm drain system.

Year	Total Projects	Annual Period Improvement Value	Total in Improvements
2008 - 2009 (YEAR ONE)	24	\$661,800	\$661,800
2009 - 2010 (YEAR TWO)	54	\$241,600	\$903,400
2010 - 2011 (YEAR THREE)	56	\$1,034,000	\$1,937,400
2011 - 2012 (YEAR FOUR)	50	\$595,500	\$2,532,900
2012 - 2013 (YEAR FIVE)	44	\$664,739	\$3,197,639

BMP 6-4: Pollution Prevention and Hazardous Waste Training

Goal:

The goal of this BMP is to develop and maintain pollution prevention and hazardous waste training for County employees, grounds maintenance workers, and landscaping crews.

Measureable Goals

The County of Roanoke currently maintains basic hazardous waste training for employees in Fire and Rescue. The County's Environmental Assessment Team (EAT) is a team responsible for establishing and maintaining the environmental management system and ensures its conformance with state laws. The County's EAT is also involved in specifying hazardous waste training for applicable positions within the County.

All County employees receive environmental awareness and management training. Human Resources ensure this training is delivered to all County full-time employees. The training includes: the County's environmental policy and system to manage environmental resources, identification of potentially significant environmental impacts, environmental objectives and targets, and employee roles and environmental responsibilities. In this past year, **94** new employees received this training.

TMDL Consistency:

This program makes sure that all Fire and Rescue staff maintains basic hazardous waste training to prevent any mishandling of hazardous materials in ways that could be detrimental to the environment. This program is also responsible for educating County Employees on environmental awareness and management training. This effort targets every employee, whether they are in a high risk field or not, about some good housekeeping practices. This program trains every County employee to be the eyes and ears of pollution prevention. This will increase the likelihood that any potentially hazardous situation will be brought to the attention of a supervisor and adequately addressed. (SED)

Evaluation and Modification:

Roanoke County will evaluate and modify this BMP to reflect the training requirements in the new permit.

Annual Period	Number of New Employees Trained	Total Employees Trained
2008 - 2009 (YEAR ONE)	95	819
2009 - 2010 (YEAR TWO)	80	899
2010 – 2011 (YEAR THREE)	60	959
2011 – 2012 (YEAR FOUR)	74	1,033
2012 – 2013 (YEAR FIVE)	94	1,127



Stormwater Volume and Pollutant Load Estimation for Year Five

As part of Roanoke County's Fifth Annual Report, the volume of stormwater discharged and the quantity of pollutants is estimated for all water-bodies with a Waste Load Allocation (WLA).

In this section we will describe the methods and results of the calculations:

1. Estimated Drainage Area and Percent Impervious, for Sediment and E-Coli
2. Annual Precipitation
3. Estimation of Volume of Stormwater Discharged, for Sediment and E-Coli Analysis
4. Estimation of Colony Forming Units of E. Coli
5. Estimation of Total Suspended Solids Discharged Annually
6. Sediment and E-Coli TMDL Studies and Waste Load Allocations
7. Comparison of Discharges to Waste Load Allocations for Sediment and E.Coli
8. PCBs TMDL Studies and Wasteload Allocations
9. Issues for Further Study and Clarification

Estimated Drainage Area and Percent Impervious, for Sediment and E-Coli

In Roanoke County's Year Three Annual Report, the percent imperviousness for the County was derived from the Report on Roanoke County's Existing and Possible Urban Tree Canopy completed by the Virginia Department of Forestry in collaboration with Roanoke County and the Roanoke Valley-Alleghany Regional Commission. This report only considered impervious cover for the County's "urbanized areas". The report found the total impervious percentage for the County's "urbanized areas" was 11.2%. This average imperviousness was assumed constant for each drainage area in the County.

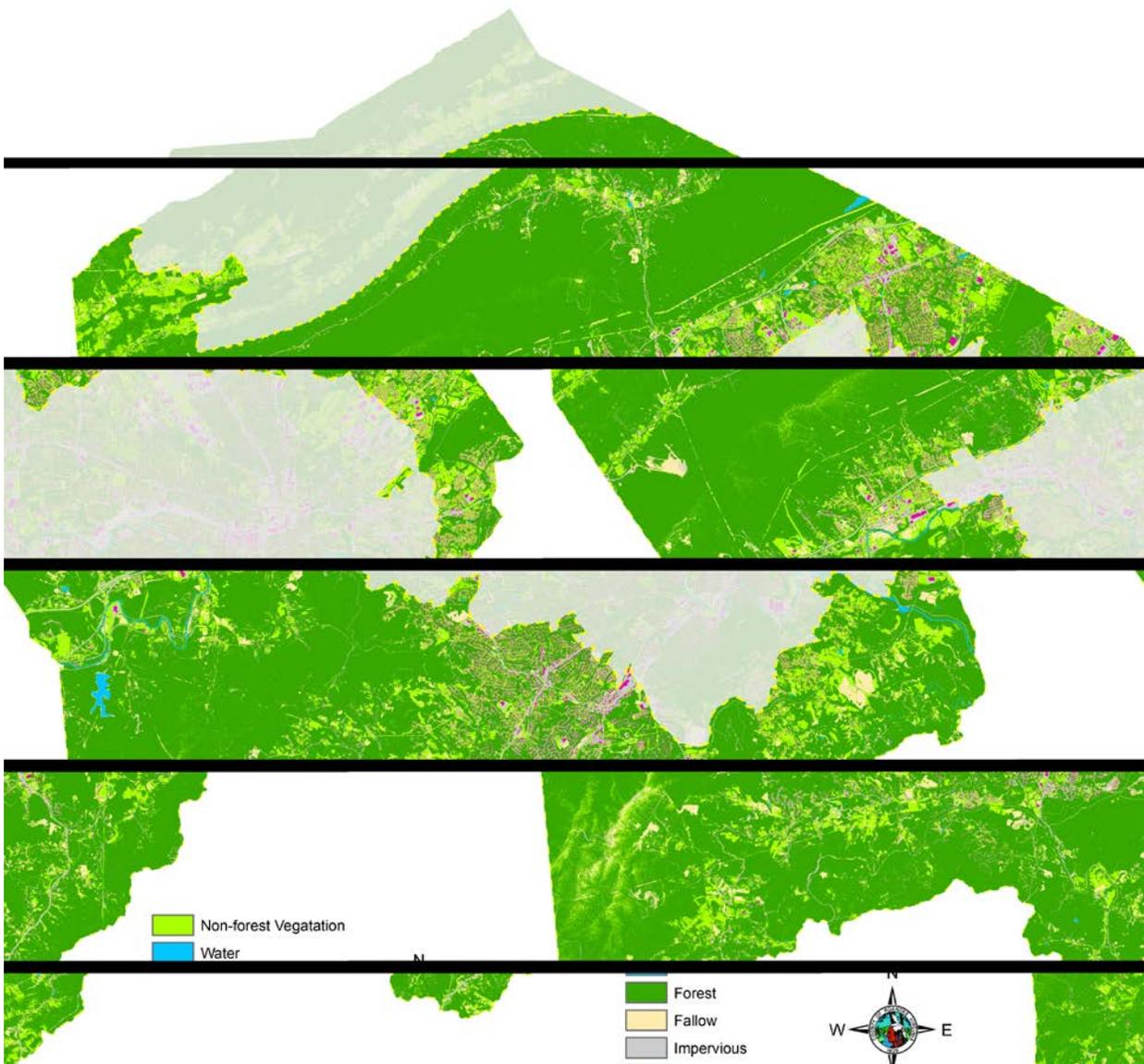
For the Year Four Annual Report, the percent impervious across the entire County was derived from the Roanoke County Land cover Data Set. This data set is based on the United States Department of Agriculture's 2008 1 meter National Agriculture Imagery Program (NAIP) Imagery. The NAIP imagery covers the entire extent of Roanoke County and it defines six delineated classes: water, forest, grasslands, buildings, fallow, and impervious. For the purposes of pollutant load estimation, we assumed that impervious areas are made up of buildings and impervious classes only. Using these data, imperviousness was calculated for each watershed with an identified waste load allocation. Also, data used for watershed delineations in Year Four was changed to reflect County boundary changes. As a result the drainage area of each impaired watershed was changed.

For Year Five, the drainage area and percent impervious for each impaired stream have been adjusted to reflect changes in the urbanized areas based on the 2010 U.S. Census. All drainage areas were also re-delineated to ensure that only areas that are within the urbanized areas, based on the 2010 U.S. Census (MS4 regulated areas of the County) are included. The revised drainage areas and impervious percentages are shown in the table on the following page.

Impaired Watershed	Drainage Area (ac)	Percent Impervious
Carvins Creek	3,862	25.22%
Glade Creek	2,368	20.89%
Lick Run	327	35.77%
Ore Branch	882	26.11%
Roanoke River(1)	20,812	20.39%
Roanoke River(2)	27,023	21.10%
Tinker Creek	2,830	13.32%

- (1) For purpose of E-Coli TMDL
(2) For purpose of Sediment TMDL,

NAIP Imagery, 2008, used to calculate Imperviousness for Regulated Watersheds



Annual Precipitation

Roanoke County gathers its annual precipitation from the Local Climatological Data from NOAA's National Climatic Data Center. Roanoke County used the data from the Roanoke Regional/Woodrum Field Airport (KROA) due to its close proximity to the County. This data was collected on a monthly basis from July 1, 2012 to June 30, 2013 and compiled for this report. The total precipitation for the July 1, 2012 to June 30, 2013 period was **42.26 inches**.

Estimation of Volume of Stormwater Discharged, for Sediment and E-Coli Analysis

Using the percent impervious for each watershed and the annual precipitation, Roanoke County has used the formula below to derive the volume, in cubic feet, of runoff from the regulated MS4 for each of the watersheds with an identified WLA. The results are shown below:

$$R \text{ ft}^3 (\text{runoff}) = x.xx * \left(\frac{y.yy \text{ in} * 1 \text{ ft}}{12 \text{ in}} \right) \left(\frac{z.z.z \text{ mi}^2 * 27,880,000 \text{ ft}^2}{1 \text{ mi}^2} \right)$$

Where: x.xx = Estimated percent impervious
 y.yy = Annual precipitation of reporting period 2012 - 2013 (taken from NOAA, Roanoke Regional Airport Station (KROA), inches)
 z.z.z = Area of MS4, square miles
 R = Runoff Volume Estimate, cubic feet

Watershed with WLA	Drainage Area of MS4 (ac)	Runoff Depth (in)	Stormwater Runoff Volume (ft ³)
Carvin Creek	3,862	10.66	1.49E+08
Glade Creek	2,368	8.83	7.59E+07
Lick Run	327	15.12	1.80E+07
Ore Branch	882	11.03	3.53E+07
Tinker Creek	2,830	5.25	5.13E+07
Roanoke River(1)	20,812	8.62	8.75E+08
Roanoke River(2)	27,023	8.92	8.75E+08

(1) For Purpose of E-Coli TMDL

(2) For Purpose of Sediment TMDL

Estimation of Colony Forming Units of E. Coli

Roanoke County has utilized the Simple Method (Schueler, 1987) to calculate urban stormwater loading for bacteria. This method was originally derived to calculate bacteria in the form of Fecal Coliform using the National Median Concentrations for Chemical Constituents in Stormwater factor for fecal coliform. To convert to the E. coli standard for bacteria to make this calculation consistent with the WLA, Roanoke County has converted Fecal Coliform to E. coli using the regression model developed by the Virginia Department of Environmental Quality. These methods and results are detailed below.

The Simple Method:

$$L(\text{cfu/year}) = 103 \times R \times C \times A$$

Where:

- L = Annual load (cfu/yr)
- R = (x.xx * y.yy")
= Annual Runoff Estimate, inches
- C = Bacteria Concentration (1,000/mL)
= 15,000/mL (factor for fecal coliform)
- A = (z.zz mi² * 640.09)
= Area (ac)
- 103 is the Conversion Factor for Bacteria

The Virginia Department of Environmental Quality Conversion from Fecal Coliform to E. Coli

$$E\ coli = 2^{[-0.0172 - 0.91905 * \text{Log}_2(\text{fecal coliform})]}$$

Watershed with WLA	Drainage Area of MS4 (ac)	Runoff Depth (in)	E Coli (cfu/yr)
Carvins Creek	3,862	10.66	8.39E+09
Glade Creek	2,368	8.83	4.50E+09
Lick Run	327	15.12	1.20E+09
Ore Branch	882	11.03	2.23E+09
Tinker Creek	2,830	5.25	3.51E+09
Roanoke River	20,812	8.62	3.24E+10

Estimation of Total Suspended Solids Discharged Annually

Roanoke County has utilized the Simple Method (Schueler, 1987) to calculate urban stormwater loading for total suspended solids. This method is identical to the method used for Fecal coliform with different values for pollutant concentration and conversion factors. See method below:

The Simple Method:

$$L \text{ lbs (annual load)} = 0.226 \times R \times C \times A$$

Where:

- L = Annual load (lbs/yr)
- R = (x.xx * y.yy")
= Annual Runoff Estimate, inches
- C = Pollutant Concentration (mg/L)
= 54.51 mg/L (factor for TSS)
- A = (z.zz mi² * 640.09)
= Area (ac)
- 0.226 is the Conversion Factor for TSS

$$L \text{ tons (annual load)} = \frac{L \text{ lbs (annual load)}}{2000 \text{ lbs}}$$

Watershed with WLA	Drainage Area of MS4 (ac)	Runoff Depth (in)	Total Suspended Solids (tons/yr)
Roanoke River	27,023	8.92	1.48E+03

Sediment and E-Coli TMDL Studies and Waste Load Allocations

There have been three sediment and e-coli TMDL Studies performed by DEQ, in Roanoke County, with 7 TMDL impairments identified as follows:

TMDL Study	Date Approved by EPA	Impairment	Impaired Streams
Tinker Creek Watershed E-Coli TMDL Study	August 5, 2004	E-Coli	Glade Creek, Carvin Creek, Lick Run, Tinker Creek
Roanoke River and Ore Branch E-Coli TMDL Study	August 2, 2006	E-Coli	Ore Branch, Roanoke River
Roanoke River Benthic TMDL Study	September 7, 2006	Benthic (Sediment)	Roanoke River

Tinker Creek Watershed E-Coli TMDL Study

<u>Stream</u>	<u>WLA (colony forming units/year)</u>
Glade Creek	8.02E+10
Carvin Creek	4.07E+12
Lick Run	3.29E+09
Tinker Creek	5.36E+11

Study states that an approximate 75% reduction in bacteria from existing developed lands is needed to meet these WLAs. Addressing this TMDL is a part of the Implementation Plan that is currently being prepared by DEQ.

Roanoke River and Ore Branch E-Coli TMDL

<u>Stream</u>	<u>Current Discharge* colony forming units/Year)</u>	<u>WLA colony forming units/Year)</u>	<u>% Reduction Required</u>
Ore Branch	2.13E+11	1.07E+09	99.5%
Roanoke River	2.37E+13	2.84E+11	98.8%

* Current discharge based on TMDL study

Study states that approximately 99% reduction in bacteria from stormwater runoff from developed lands is needed to meet these WLAs. Addressing this TMDL is a part of the Implementation Plan that is currently being prepared by DEQ.

Roanoke River Benthic (Sediment) TMDL

<u>Stream</u>	<u>WLA (tons/Yr)</u>
Roanoke River	1680.0

Study states that excessive sediment is the most probable stressor identified that is adversely affecting benthic organisms (macroinvertebrates that live on the stream bed). These organisms form the basis of the food chain for larger animals such as fish.

Study states that to reach the WLA, a 69.5% reduction in sediment from all developed lands and in-stream erosion is required.

In-stream erosion is the largest contributor of sediment.

Addressing this TMDL is a part of the Implementation Plan that is currently being prepared by DEQ.

Comparison of Discharges to Waste Load Allocations for Sediment and E-Coli

E-Coli

Watershed with WLA	Drainage Area of MS4 (ac)	Calculated E-Coli (cfu/yr) (2012-2013)	Wasteload Allocation (cfu/yr)	Apparent Compliance Status
Carvins Creek	3,862	8.39E+09	4.07E+12	Compliant
Glade Creek	2,368	4.50E+09	8.02E+10	Compliant
Lick Run	327	1.20E+09	3.29E+09	Compliant
Ore Branch	882	2.23E+09	1.07E+09	50% Reduction Required
Tinker Creek	2,830	3.51E+09	5.36E+11	Compliant
Roanoke River	13,155	3.24E+10	2.84E+11	Compliant

Benthic (Sediment)

Watershed with WLA	Drainage Area of MS4 (ac)	Calculated Total Suspended Solids (tons/yr) (2012 – 2013)	Wasteload Allocation (tons/yr)	Apparent Compliance Status
Roanoke River	27,023	1.48E+03	1.68E+03	Compliant

PCBs TMDL Studies and Wasteload Allocations

There has been one PCBs TMDL Study performed by DEQ, in Roanoke County, with 6 TMDL impairments identified as follows:

TMDL Study	Date Approved by EPA	Impairment	Impaired Streams
Roanoke River PCBs TMDL Study	April 9, 2010	PCBs	Masons Creek, Peters Creek, Tinker Creek, Wolf Creek, Unnamed Tributary, Roanoke River

<u>Stream</u>	<u>Current Discharge (mg/yr)*</u>	<u>WLA (mg/yr)</u>
Masons Creek	14.6	0.1
Peters Creek	490.0	4.7
Tinker Creek	4045.4	38.4
Wolf Creek	1053.2	10
Unnamed Tributary	52.8	0.5
Roanoke R	5038.7	47.9

*Based on TMDL study

PCBs were previously used in electrical equipment and other industrial uses. Their manufacture was banned in the United States in 1979. However, they are very stable molecules that can persist in the environment for long periods of time. PCBs reach streams from land that is contaminated by PCBs. Once in streams, PCBs are largely contained in stream sediments.

Note that the WLAs are very small, on the order of milligrams/year. The WLAs requires a PCB reduction of 99.05%.

Addressing this TMDL is not a part of the Implementation Plan that is currently being prepared by DEQ. DEQ intends to address PCBs through a different process. PCBs cleanup will most probably consist of testing suspected contaminated sites and performing site specific clean ups.

This TMDL Study inadvertently left out a WLA for the Town of Vinton. It appears that the Town of Vinton's WLA has been lumped into the County's WLA.

PCBs contamination are a result of background levels (due to the ubiquitous nature of PCBs), deposition to the land by air and rain, and continued release from unknown legacy sites. PCB's cannot be addressed by the same stormwater BMPs that may be effective for nutrients, bacteria, and sediment.

Roanoke County has not calculated PCBs discharge on an annual basis as we do not know any empirical method that correlates with land use and runoff volumes.

Issues for further Study and Clarification

Through its MS4 Permit, effective July 1, 2013, Roanoke County is required to develop TMDL Action Plans for each of its impaired streams, by July 1, 2015. These Action Plans must include the steps that Roanoke County intends to take to meet its wasteload allocations. Therefore a clear understanding of the TMDL studies that developed the wasteload allocations and the County's current yearly pollutant discharges are critical to ensure that the County develops effective Action Plans that meet the regulatory requirements and are cost-effective for its citizens. Following are some issues that Roanoke County desires to clarify with the assistance of DEQ.

1. Roanoke County understands that the MS4 area that is covered by the wasteload allocations are the urban lands as designated by the U.S. Census in its latest census. Due to the 2010 census, Roanoke County's urbanized area was enlarged. Roanoke County's wasteload allocations need to be adjusted by DEQ to account for this change.
2. The Tinker Creek TMDL Study and Roanoke River and Ore Branch TMDL Study indicates, respectively, that a 75% and 99% reduction in E-Coli would be required to meet the wasteload allocations. However, Roanoke County's calculations using the Simple Method, and information from its GIS system indicate that all of its streams that have wasteload allocations for E-Coli are in compliance, except for Ore Branch. Roanoke County's calculations indicate that Ore Branch requires a 50% reduction in E-Coli, rather than the 99% reduction that is identified in the TMDL study. Roanoke County desires to work with DEQ to better understand the differing results from the TMDL studies and Roanoke County's calculations.
3. The Roanoke River Benthic TMDL Study indicates that an approximate 69.5% reduction in sediment from developed lands and from in-stream erosion is necessary to meet the wasteload allocations. However, Roanoke County's calculations using the Simple Method, and information from its GIS system indicate that the Roanoke River is in compliance with its wasteload allocation. Roanoke County desires to work with DEQ to better understand the differing results from the TMDL study and Roanoke County's calculations.
4. The Roanoke River PCBs TMDL Study needs to be revised to give the Town of Vinton a share of the wasteload allocation.
5. Roanoke County is unaware of any good empirical method to calculate PCBs yearly discharge from a watershed.
6. The calculated E-Coli and Sediment discharges are based solely on land use and precipitation values. Impacts from existing BMPs are not reflected in these calculations. As the County's GIS system is improved to better locate and quantify their beneficial effects, they will be integrated into future water quality calculations.