

ROANOKE COUNTY, VIRGINIA

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

October 1, 2012

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in compliance with Permit No. VAR040022.



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The Town of Vinton
Virginia Save Our Streams Foundation
Roanoke Valley Television Station
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Signed Certification in Accordance with 4 VAC 50-60-370:

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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 to the maximum extent practicable (MEP). 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 permit 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 fourth 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, and Pollution Prevention and Good Housekeeping for Municipal Operations. 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 environmentally responsible 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. This regional perspective is instrumental in the effective reduction of pollutants into our rivers and streams.

Roanoke County's commitment to establishing and sustaining a comprehensive program that protects the County's stormwater quality has been made and will continue over the permit term to provide the Roanoke Valley citizens with clean water now and into the future. The Minimum Control Measures and associated BMPs for this reporting period (July 1, 2011 – June 30, 2012) are described in the following document.



MCM 1: Public Education and Outreach on Stormwater Impacts **Clean Up After Your Pet!**

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: e. coli and fecal coliform (EC/FC) or sediment (SED).

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. Modifications to this BMP for year five include attempting to post the information so that its usage can be tracked in the future.

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

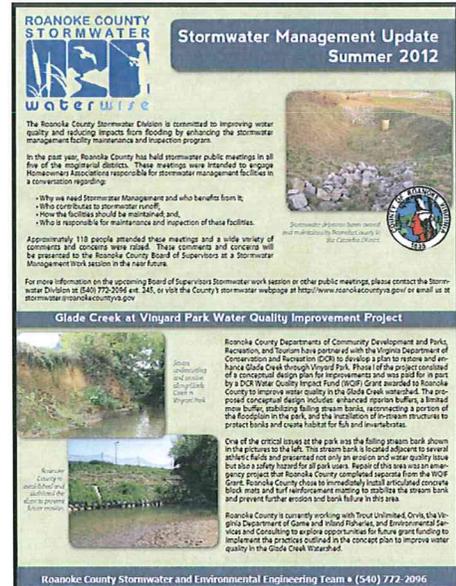
BMP 1-2: Roanoke County Stormwater Informational Mailer

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 Four, Roanoke County developed a summer informational mailer that was sent out on May 28, 2011. This mailer discussed the stormwater pond maintenance and inspection education and outreach program as well as the Glade Creek Water Quality Improvement Project.



This informational mailer was sent to approximately **60,000** residences. The stormwater website listed in the mailer received **4,131** views. In addition, 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 proper maintenance of stormwater facilities. Keeping these stormwater facilities maintained is critical for flood protection, erosion prevention, and water quality. (EC/FC & SED) It also explains the County's plans to implement BMPs on County owned properties along Glade Creek to improve water quality. (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. Because the number of citizens impacted by this mailer is so large, no modifications are planned for this BMP. The County's goal is to continue to distribute the mailer to its residents and utilize it as an effective outreach method.

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)	APPROX. 60,000

BMP 1-3: Stream Monitoring and Education

Goal:

In cooperation with the local Virginia Save Our Streams chapter, Roanoke County will provide stream monitoring and informational stream seminars 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 **ten** informational stream seminars and **20** local stream monitoring sessions. The ten stream school seminars targeted both adults and school age kids between 7th and 10th grade and had a total of **539** in attendance. The stream monitoring sessions targeted adult citizens and a total of **13** stream segments were monitored with **53** 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

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. The education programs were held in **21** different County schools and reached **4,407** 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", "Plants Eat Bad Chemicals", and "The Water Game". (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	Schools Participating	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

BMP 1-5: Stormwater Public Awareness Program

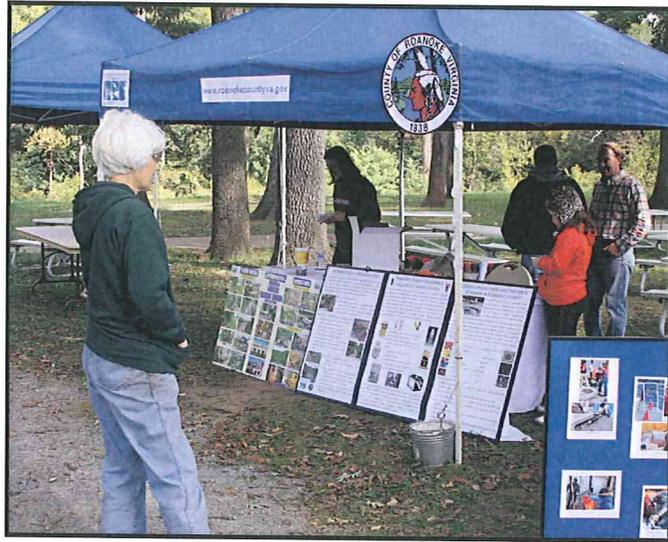
Goal:

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 **seven segments** on local news stations regarding stormwater runoff and associated pollutants on behalf of Roanoke County.

In total, Roanoke County gave out **3,802** 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:

In the fourth year, Roanoke County successfully distributed 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

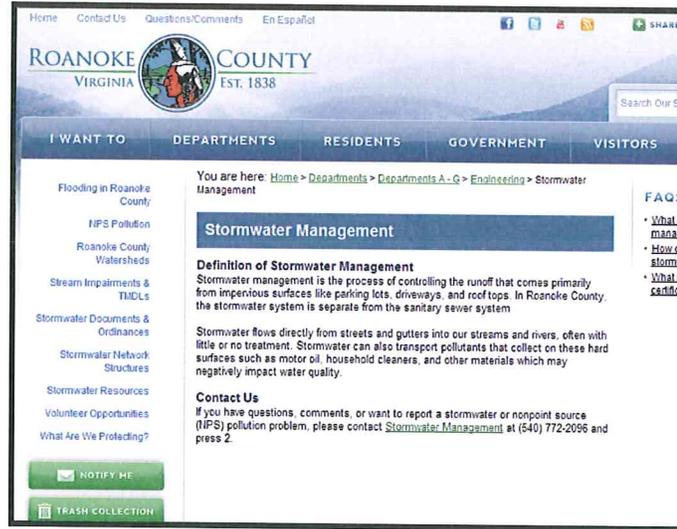
BMP 1-6: Roanoke County Stormwater Webpage

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, Save Our Streams monitoring, regional clean-ups, and other local water quality educational programs.

Measurable Goals:

In this annual period, Roanoke County redesigned the website for the entire County. During this process, the Stormwater page was examined and streamlined to give the citizen more ease in navigation. This 16 page website is still 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 4,131 views to the stormwater webpage between July 1, 2011 and June 30, 2012. The number of visitors to each webpage for the third 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 Year Five, 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. Roanoke County plans to also re-evaluate the most viewed webpages on the stormwater website to maximize on its popularity and get more information on those pages.

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

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 Four, the businesses in our target group were local Veterinarian Offices and Dog Kennels. These businesses can have a direct positive impact on local water quality through education on better pet waste cleanup and management. A pamphlet was sent to **32** businesses explaining the importance of property waste pick up and disposal. In addition, one animal hospital asked for **30** extra copies to give out to its clients. **25** additional copies were handed out by County Staff at the 2011 Fall Waterways cleanup for a total distribution of **87** copies of the brochure. A copy of this pamphlet



and a list of the fourth year target businesses can be found on the attached compact disk under the file titled **BMP 1-7 Business Education Flyer and Statistics.pdf**.

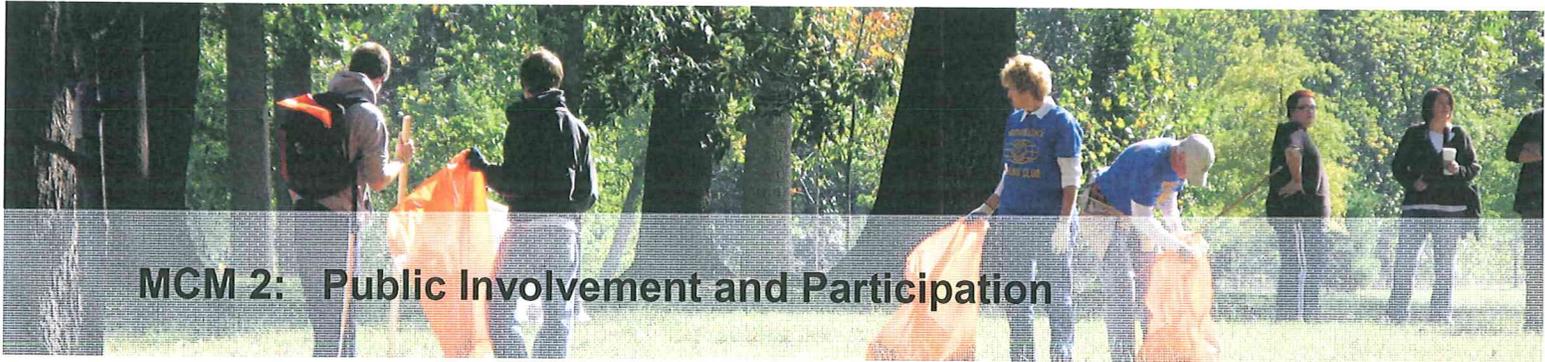
TMDL Consistency:

The program targets local Veterinarians and Kennels by educating them on the importance of pet waste pick up and disposal for water quality. The brochure specifically focuses on how pet waste placed in the storm drain, left in the grass, or left in the street will ultimately discharge to local creeks and streams where they cause or add to existing bacterial impairments in our waterways. (EC/FC)

Evaluation and Modification:

In this fourth annual reporting period, Roanoke County successfully distributed a total of **87** brochures as an educational item. The County finds this BMP to be effective and intends to continue to provide information to local commercial businesses as an educational item. To make this BMP more effective, Roanoke County intends to expand the number and type of target businesses in which to educate as a way to meet the goals of this permit.

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



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 management 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 citizens 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.

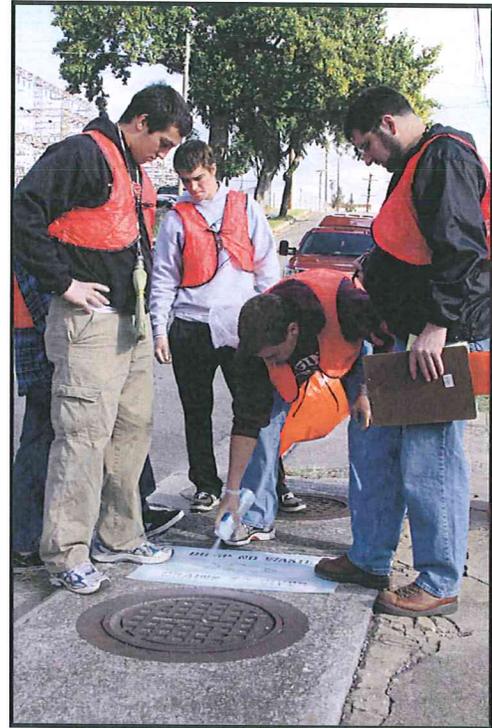
Measurable Goals:

In the fourth year of this permit cycle, the County hosted three storm drain stenciling events. Two of the events were held at Cave Spring Elementary School during March 2012, and one was held at North Cross Middle School during April 2012. A total of **109** students attended these events where **34** storm drains were stenciled.

In addition, Roanoke County staff stenciled approximately **198** storm drains while mapping new storm sewer in the County.

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. This year student attendance was significantly higher than previous years and the number of storm drains stenciled has increased. 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

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:

On October 1, 2011, Roanoke County sponsored the Fall Waterways Cleanup and Celebration. Roanoke County staff was available at a booth to address questions and comments about stormwater and water quality. Information highlighted at the booth included the benefits of stream buffers, the differences between storm and sanitary sewers, and the importance of pet waste pick up and disposal. Approximately **746** attended this event.



On November 4-5, 2011, the AECOP Green Living and Energy Expo was held at the Roanoke Civic Center. Roanoke County sponsored the Clean Valley Council to manage an exhibit at the event with information on stormwater and pollution prevention. Approximately **1,600** people attended this expo.

Throughout Year Four, Roanoke County held five public meetings to educate homeowners associations (HOAs) about stormwater management facility maintenance and enforcement. These meetings were held in each of the five magisterial districts and a total of **93** homeowners representing **37** HOAs were in attendance.

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. No modifications are planned for this BMP.

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, AECOP 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

BMP 2-3: Stormwater Management Citizens Advisory Committee

Goal:

The goal of this program is to establish a group of citizens that meet with local stormwater management officials to review ordinances, TMDLs, local projects, informational materials and educational components of the Stormwater Management program. 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 has held four citizens advisory committee meetings this year, on March 19, 2012, April 19, 2012, May 21, 2012, and June 28, 2012.

The March 19th meeting was held at the Roanoke County Administration Center. Stuart Lynde discussed Roanoke County's water quality improvement project in Vinyard Park and other water quality issues in the Glade Creek watershed.



The April 19th meeting was held at the Town of Vinton Municipal Center. This was an overview of stormwater regulations in the valley and included a roundtable discussion of stormwater issues and how the citizens advisory committee can be instrumental in moving forward to improve water quality.

The May 21st meeting was held at City of Roanoke Fire Station #5 and included a presentation on Stormwater Management Techniques and Systems.

The June 28, 2012 meeting was held at Walrond Park. Ms. Mary Dail, Biologist with the Virginia Department of Environmental Quality (VDEQ), presented an overview of VDEQ's local TMDL program. 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
3/19/2012	The Glade Creek in Vinyard Park Water Quality Improvement Project	10
4/19/2012	Experiences and Feedback on Regional Stormwater Issues	12
5/21/2012	Stormwater Management Techniques and Systems	14
6/28/2012	VDEQ Local Water Quality and TMDLs	16

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:

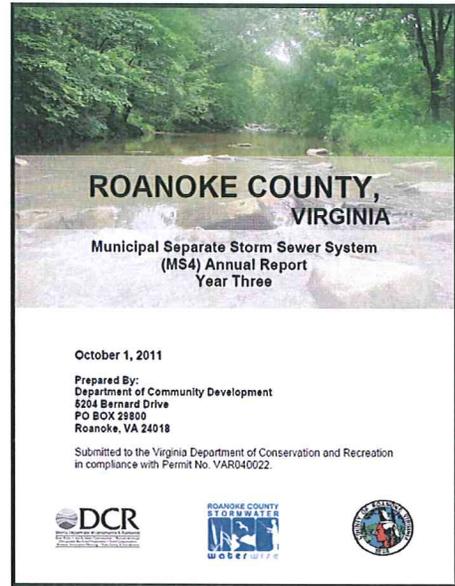
The general registration statement was posted to the Roanoke County Stormwater website on December 3, 2008. This will continue to be available on the website until the five year permit period is complete on June 30, 2013. The third year annual report was posted to the website on October 14, 2011. Roanoke County has also made the Stormwater Program Plan and Year One through Year Three 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:

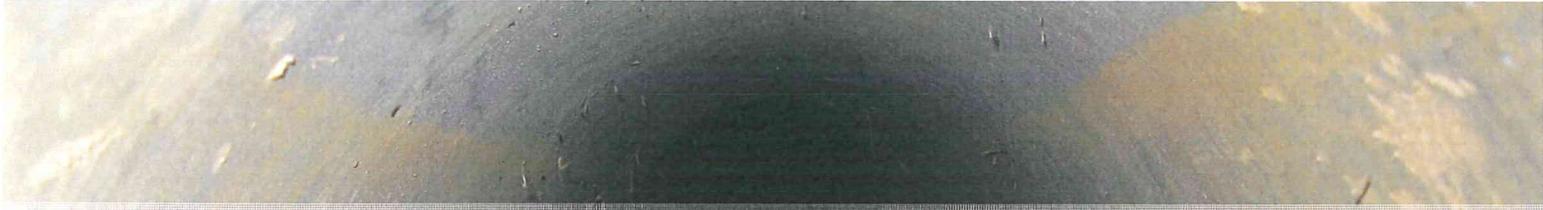
Access to the MS-4 Program Plan and Annual Reports gives Roanoke County Citizens a hefty education about all of the local streams and rivers, their impairments, and any approved TMDLs. In addition, the Program Plan and Annual Report detail the efforts that the County is taking to address these issues. 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.



Year	Items Posted to Website	Posted Date
2008 - 2009 (YEAR ONE)	GENERAL REGSITRATION STATEMENT	12/3/2008
2009 - 2010 (YEAR TWO)	ROANOKE COUNTY ANNUAL REPORT (YEAR ONE)	11/1/2009
2010 - 2011 (YEAR THREE)	ROANOKE COUNTY ANNUAL REPORT (YEAR TWO)	11/19/2010
2011 - 2012 (YEAR FOUR)	ROANOKE COUNTY ANNUAL REPORT (YEAR THREE)	10/14/2011



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 completed 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).

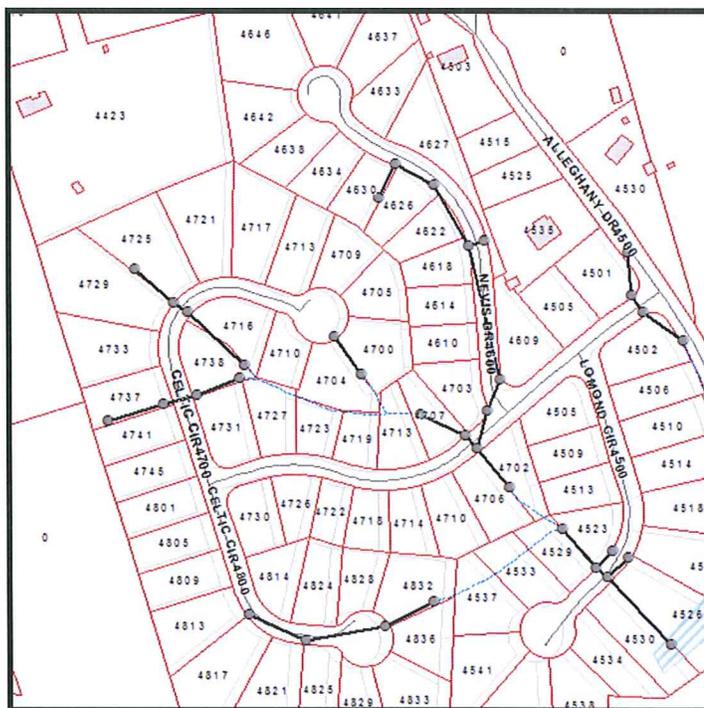
BMP 3-1: Storm Drain Map

Goal:

The goal of this program is to continue to develop 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 **55%** of the known outfalls within the County. **1,428** new structures have been located and mapped. **48** new outfalls have been mapped for a total of 463 outfalls mapped during this 5-year permit period. A list of all outfalls analyzed thus far in Year Four can be found on the attached compact disk under the file titled **BMP 3-1 Storm Drain Outfalls.pdf**.



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:

No modifications are planned for this BMP. Roanoke County believes that the creation and evaluation of the Illicit Discharge Ordinance is an appropriate method to aid in the enforcement, detection and elimination of illicit discharges to the storm sewer system. New Stormwater regulations have just recently been approved at the State level and have not gone into effect at this time. As the County incorporates the new Stormwater regulations into our local ordinances, our illicit discharge program will remain in compliance with the stipulations of the most current state regulations.



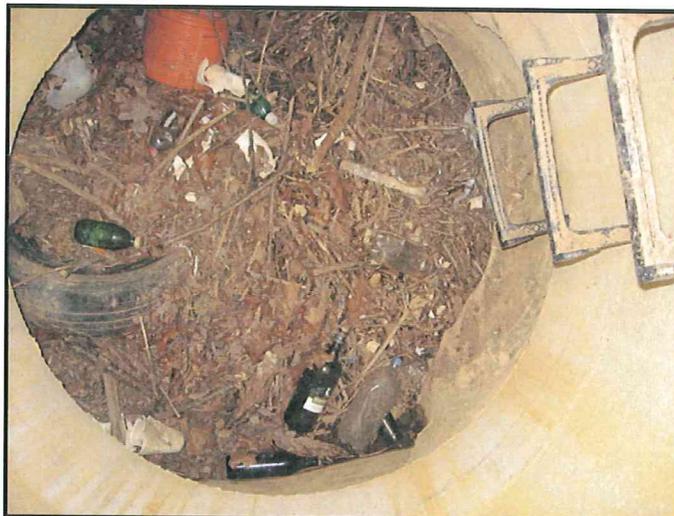
Year	Action	Modifications
2008 - 2009 (YEAR ONE)	Illicit Discharge Ordinance Reviewed	None
2009 - 2010 (YEAR TWO)	Illicit Discharge Ordinance Reviewed	None
2010 – 2011 (YEAR THREE)	Illicit Discharge Ordinance Reviewed	None
2011 - 2012 (YEAR FOUR)	Illicit Discharge Ordinance Reviewed	None

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.

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. In Year Five, Roanoke County hopes to devote additional staff to completing the schedule for Field Screening which is included on the attached compact disc under the file titled **BMP 3-3 Illicit Discharge Field Screening Schedule.pdf**.

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



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 and construction site 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. The results of this review shall be incorporated in the next annual report.



During Year Four, the County had **191** regulated land-disturbing activities, and a total of **68** 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

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:

Two county departments, Community Development, and Parks and Recreation were 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 Conservation and Recreation'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 within each department, 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**.

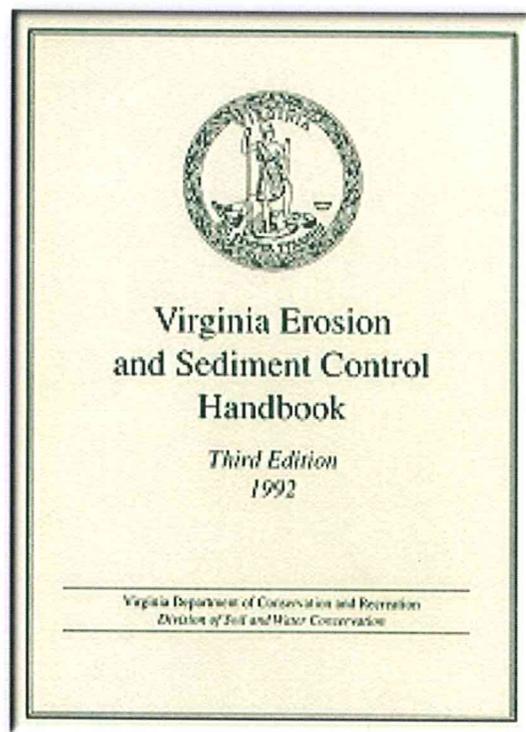
TMDL Consistency:

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:

In examining the employee's job responsibilities and certifications, **one** position was identified as needing additional certification. This certification is scheduled to be completed in Year Five of the permit period.

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**.



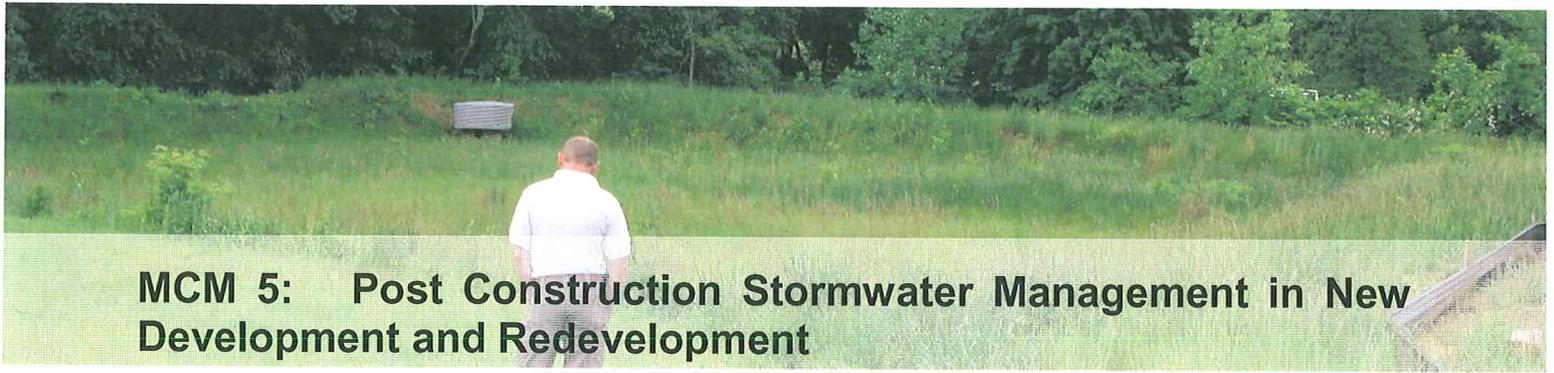
TMDL Consistency:

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:

No modifications are planned for this BMP. 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 must change, and keeping the Land Development Procedures up to date with our ordinances makes the procedures a useful tool to utilize when developing land.

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



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 Four, 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 legal document 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:

No changes are planned for this BMP. New Stormwater regulations have just recently been approved at the State level and have not gone into effect at this time. It is vital that Roanoke County continues to keep its local Stormwater Management standards in compliance with these new regulations.

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

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 **627** known permanent stormwater facilities.

In this fourth annual period, Roanoke County inspected **84** 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.xls**.



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:

Currently the County is on schedule with the Inspection Program and no changes are planned for this BMP. Continuing to track and inspect permanent stormwater facilities is vital for the long-term success of the facilities and the prevention of the transport of sediment and other pollutants into our streams and rivers.

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

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.

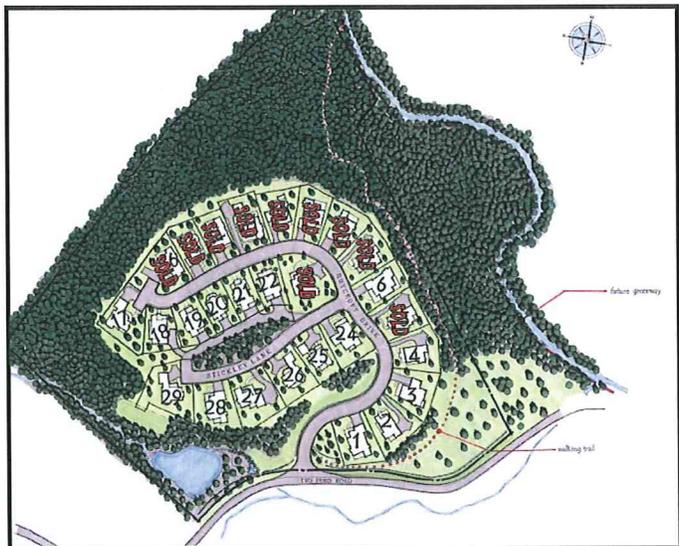
Measurable Goals:

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:

No changes are planned for this BMP. Roanoke County will continue to encourage Low Impact Development in its region. The County will also continue to track the number, size, and HUC of Low Impact Development projects in the region. The use of Low Impact Development will help to minimize the reliance on expensive structural practices which is an important way to prevent the deposition of sediment and other pollutants into our streams and rivers.

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		
2010 - 2011 (YEAR FOUR)	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

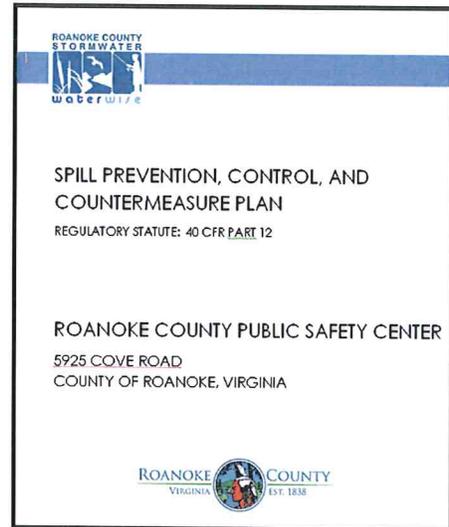
Goal:

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 Four, Roanoke County inspected **65** facilities. One new SPCC Plan is needed and shall be written during Year Five. All existing SPCC plans are up to date and no modifications were needed. Although these 65 facilities were also inspected for illicit discharge potential, some information is still needed to determine if the potential for illicit discharges exists. This research will be completed during Year 5 and included in the Year 5 annual report.



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

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 Four, the County of Roanoke participated in **12** Household Hazardous Waste (HHW) Collection events. A total of **469** 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**.



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 in future Program Plans.

Evaluation and Modification:

The participation for the Household Hazardous Waste events has increased from the previous permit year. Roanoke County understands that these events are an important way to keep these hazardous wastes from being disposed inappropriately into our streams and rivers.

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

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 **50** projects were completed. A total of **16,480** 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 **\$595,500.00**. 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 Sewer Maintenance Program Statistics.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

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 and part-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, **74** new employees received this training.

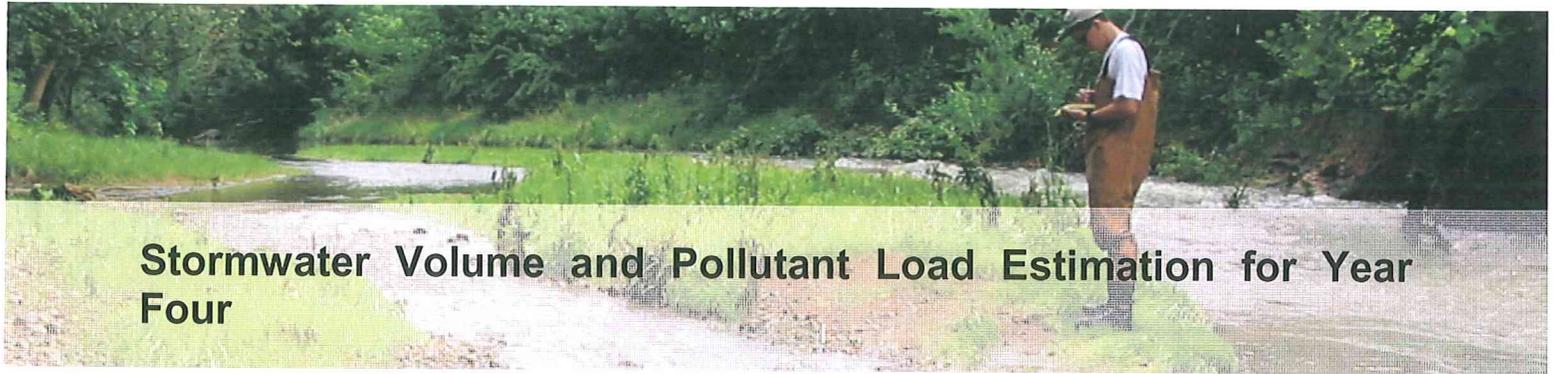
TMDL Consistency:

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 considers this BMP to be successful and proposes to continue this program. Roanoke County will continue the pollution prevention and environmental awareness training for all County employees and encourage additional pollution prevention training to be attained by County employees in grounds maintenance and landscaping areas.

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



Stormwater Volume and Pollutant Load Estimation for Year Four

As part of Roanoke County's Fourth 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 for the following:

1. Estimated Percent Impervious (across total MS4)
2. Annual Precipitation
3. Estimation of Volume of Stormwater Discharged
4. Estimation of Colony Forming Units of E. Coli
5. Estimation of Total Suspended Solids Discharged Annually

Percent Impervious for Roanoke County

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.

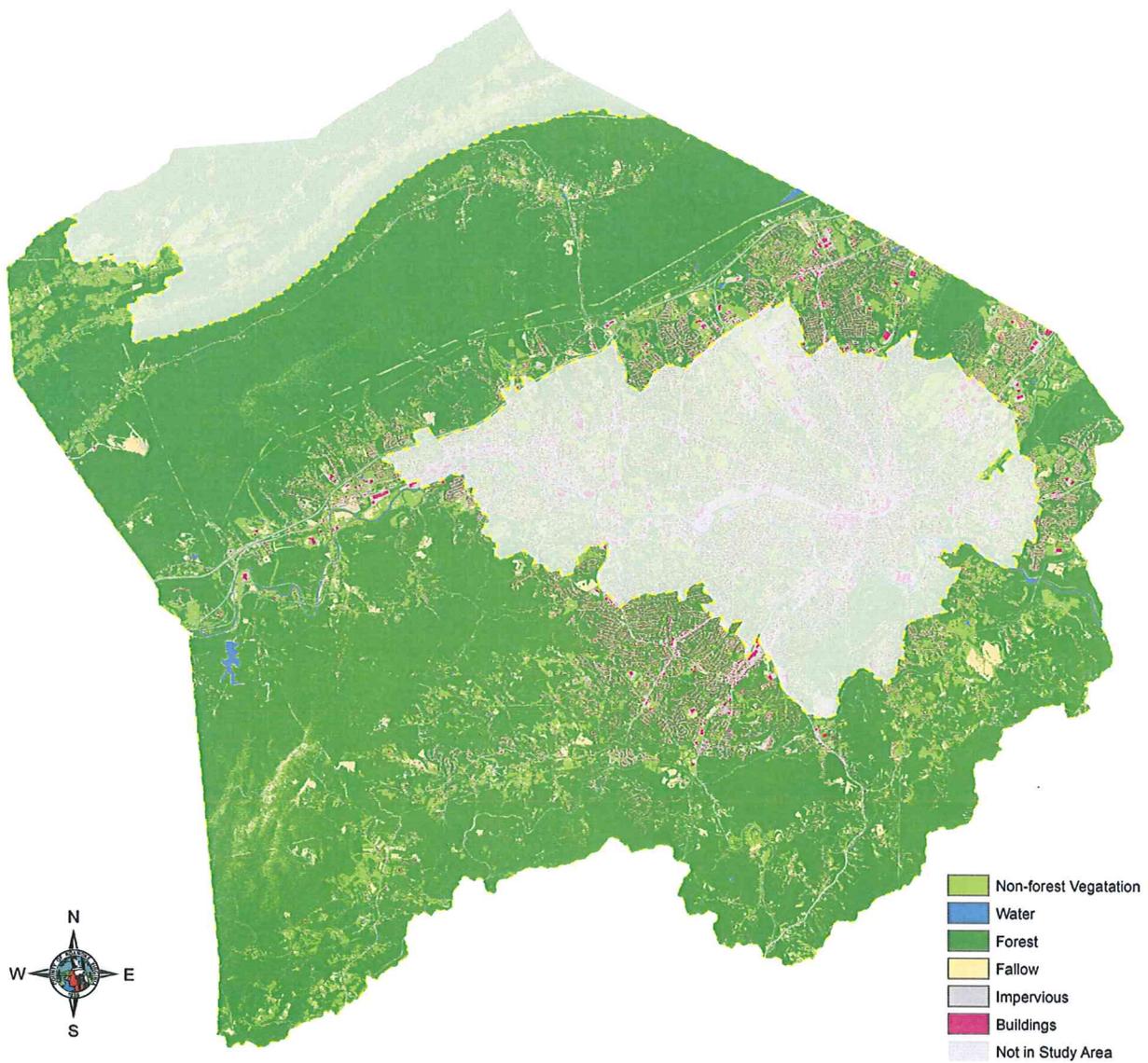
During Year Four, the Percent Impervious across the entire County was derived from the Roanoke County Land cover Data Set. This data set is based on the United States Department of Agriculture's 2008 1 meter National Agriculture Imagery Program (NAIP) Imagery. The NAIP imagery covers the entire extent of Roanoke County, instead of just in the urbanized areas. The NAIP data 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, a new and more accurate imperviousness was calculated for each watershed with an identified waste load allocation.

Similarly, the data we based our watershed delineations on during Year Three has also changed in Year Four. During Year Four, the County boundary line changed significantly from the boundary used prior to the 2010 Census. As a result, the area of each impaired watershed within the "County Limits" has changed.

The new drainage areas and resulting impervious percentages are shown in the table on the following page.

Watershed	Drainage Area (ac)	Impervious Area (ac)	Percent Impervious
Carvins Creek	7,842.88	1,033.39	13.2%
Glade Creek	3,483.88	536.09	15.4%
Lick Run	327.43	117.05	35.7%
Ore Branch	881.97	230.28	26.1%
Roanoke River	142,134.16	10,096.55	7.1%
Tinker Creek	2,829.81	376.98	13.3%

NAIP Imagery 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, 2011 to June 30, 2012 and compiled for this report. The total precipitation for the July 1, 2011 to June 30, 2012 period was **42.89 inches**.

Estimation of Volume of Stormwater Discharged

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:

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

Where: x.xx = Estimated percent impervious (across total MS4)
 y.yy = Annual precipitation of reporting period 2011 - 2012 (taken from NOAA, Roanoke Regional Airport Station (KROA), inches)
 z.zz = Area of MS4, square miles
 R = Runoff Volume Estimate, cubic feet

Watershed with WLA	Drainage Area of MS4 (ac)	Volume (ft ³)
Carvins Creek	7,842.88	1.61E+08
Glade Creek	3,483.88	8.35E+07
Lick Run	327.43	1.82E+07
Ore Branch	881.97	3.58E+07
Roanoke River	142,134.16	1.57E+09
Tinker Creek	2,829.81	5.86E+07

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 is 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:

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

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

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

Watershed with WLA	Drainage Area of MS4 (ac)	E Coli (cfu/yr)
Carvins Creek	7,842.88	8.99E+09
Glade Creek	3,483.88	4.92E+09
Lick Run	327.43	1.21E+09
Ore Branch	881.97	2.26E+09
Roanoke River	142,134.16	7.29E+10
Tinker Creek	2,829.81	3.55E+09

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)	Total Suspended Solids (tons/yr)
Roanoke River	142,134	2.67E+03