ROANOKE COUNTY, VIRGINIA

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

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Submitted to the Virginia Department of Conservation and Recreation in compliance with Permit No. VAR040022.

DCR
Virginia Department of Conservation & Recreation
State Parks • Soil & Water Conservation • Natural Heritage
Chesapeake Bay Local Assistance • Land Conservation
Outdoor Recreation Planning • Dam Safety & Floodplains

ROANOKE COUNTY STORMWATER
waterwise

COUNTY OF ROANOKE VIRGINIA 1838

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Contributing Agencies and Organizations:
Clean Valley Council
The City of Roanoke
The Town of Vinton
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."

Print Name: GEORGE W. SIMPSON, III Title: COUNTY ENGINEER

Signature: George W. Simpson, III Date: 10-1-09

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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 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 first annual report for this MS4 permit.

Strong regional cooperation has been pursued in the MCM areas of Public Education and Outreach, Public Participation and Involvement, and Pollution Prevention/Good Housekeeping. 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, 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, 2008 – June 30, 2009) are described in the following document.

Assessment of BMP's for 2006 305(b)/303(d) Impairments

In the 2006 303(b)/303(d) Water Quality Assessment Integrated Report, several of Roanoke County's stream segments were listed as impaired due to a variety of causes. This section will detail those impairments and assess the Program Plan for its success in addressing the causes of impairment to these waters.

Included in the table below are Roanoke County's impaired stream segments:

Impaired Stream Name	Impairment
Back Creek	E. Coli, Fecal Coliform
Carvin Creek	Fecal Coliform
Glade Creek	Fecal Coliform
Lick Run	Fecal Coliform
Mason Creek	Benthic Macroinvertebrate Bioassessments
Mason Creek	E. Coli
Mudlick Creek	Benthic Macroinvertebrate Bioassessments
Mudlick Creek	Fecal Coliform
Murray Run	E. Coli
Ore Branch	E. Coli
Peters Creek	E. Coli
Roanoke River	Benthic Macroinvertebrate Bioassessments
Roanoke River	E. Coli, Fecal Coliform
Roanoke River	PCB in Fish Tissue
Roanoke River	Dissolved Oxygen
Roanoke River, South Fork (Bottom Creek)	Temperature
Tinker Creek	Fecal Coliform

Roanoke County will continue to address these impairments through the successful implementation of the goals of each BMP in the MS4 Program Plan. Each of these BMPs target one or more types of impairing discharge to the local system. The BMPs listed below are those that have been completed in Year 1 (2008-2009) of the MS4 permit. These programs address the impairments listed above by increasing citizen's education and awareness of the many types of inputs that cause impairments to our local streams.

In additional to the BMPs listed below, Roanoke County is continuing to develop more programs that specifically target these listed impairments to the local waterways.

GOALS	E. Coli, Fecal Coliform	Benthic Bio-assessment	Temp-erature	PCB in Fish Tissue	Dissolved Oxygen
BMP 1-1: Educational Programs Review	☒	☒	☒	☐	☒
BMP 1-2: Roanoke County Stormwater Informational Mailer	☐	☒	☐	☐	☒
BMP 1-3: Stream Monitoring and Education	☐	☒	☐	☐	☐
BMP 1-4: Stormwater Education Program	☒	☒	☐	☐	☒
BMP 1-5: Stormwater Public Awareness Program	☒	☒	☐	☐	☒
BMP 1-6: Roanoke County Stormwater Webpage	☒	☒	☒	☐	☒
BMP 1-7: Business Education	☐	☒	☐	☐	☐
BMP 2-1: Storm Drain Stenciling Program	☒	☐	☐	☐	☒
BMP 2-2: Stormwater Public Event	☐	☒	☒	☐	☐
BMP 2-3: Stormwater Management Citizens Advisory Committee	☐	☐	☐	☒	☐
BMP 2-4: Annual Report Posted on Stormwater Website for Citizens to	☒	☒	☒	☒	☒
BMP 3-1: Storm Drain Map	☒	☒	☐	☐	☐
BMP 3-2: Illicit Discharge Ordinance	☒	☐	☐	☒	☒
BMP 3-3: Illicit Discharge Program	☒	☐	☐	☒	☒
BMP 4-1: Erosion and Sediment Control Ordinance	☐	☒	☐	☐	☐
BMP 4-2: Erosion and Sediment Control Certification	☐	☒	☐	☐	☐
BMP 4-3: Land Development Procedures Review and Evaluation	☐	☒	☐	☐	☐
BMP 4-4: Erosion and Sediment Control Certification	☐	☒	☐	☐	☐
BMP 5-1: Stormwater Management Ordinance and Manual	☐	☒	☐	☐	☐
BMP 5-2: Stormwater Management Facility Inspection Program	☐	☒	☐	☐	☐
BMP 5-3: Low-Impact Development Utilization	☐	☒	☒	☐	☒
BMP 6-1: Spill Prevention and Control Plans	☒	☐	☐	☒	☒
BMP 6-2: Household Hazardous Waste Event	☐	☐	☐	☒	☒
BMP 6-3: Storm Sewer Maintenance Program	☐	☒	☐	☐	☐
BMP 6-4: Pollution Prevention and Hazardous Waste Training	☐	☒	☐	☒	☒

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 Roanoke Valley area citizens.

BMP 1-2: Roanoke County Stormwater Informational Mailer

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

BMP 1-3: Stream Monitoring and Education

In cooperation with Virginia Save Our Streams, Roanoke County will provide stream monitoring and informational stream seminars for Roanoke County residents.

BMP 1-4: Stormwater Education Programs

Develop a stormwater educational program for Roanoke County school age children. Different programs will target appropriate grade levels.

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 high visibility 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 the objective and measurable goals of each BMP, the status of compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program.

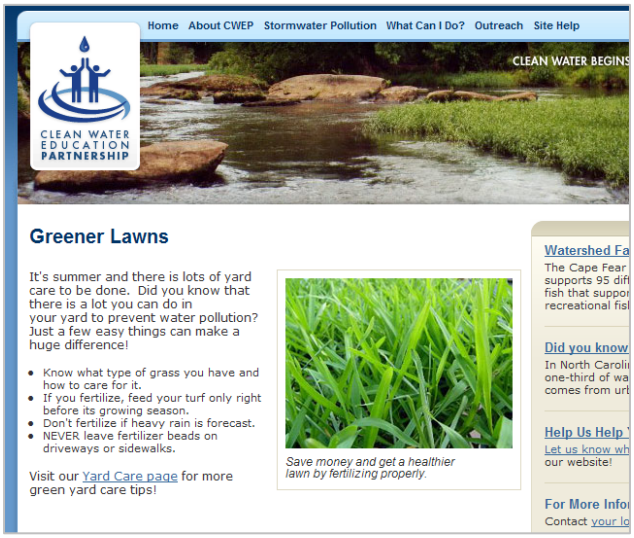
BMP 1-1: Educational Programs Review

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, flood-plain 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 and includes instructions on accessing the variety of educational materials located on the site. The address of the webpage where the educational programs list can be found is:



http://www.roanokecountyva.gov/Departments/Engineering/1Stormwater/9Stormwater+Resources.htm

Based on the website statistics, it shows that the stormwater programs database has been viewed 793 times between July 1, 2008 and June 30, 2009. A list of items in this database is included in Appendix A.

Evaluation and Modification:

The number of times that the database has been viewed shows that the website is an effective format to distribute the information concerning educational programs. Modifications to this BMP for year two include the addition of new locations where this database is accessible, therefore increasing the amount and variety of information distributed.

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 TMDL's. The mailer will be based on the unique issues and concerns for the Roanoke River Watershed.

Measurable Goals:

During this first annual period, Roanoke County developed a spring informational mailer that was sent out on March 1, 2009. This mailer discussed several water quality issues such as stormwater pond maintenance, local water quality projects, storm drain maintenance, flooding issues, and household tips to help water quality. The mailer also included contact information for stormwater concerns in the form of a phone number, email address, and website.

This informational mailer was sent to 50,000 residences and generated 5 citizen emails to ask stormwater questions or voice concerns about maintenance. The stormwater website listed in the mailer received 3,724 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.

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 of the large number of citizens impacted by this mailer, 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.

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.

www.deq.virginia.gov/info/program7.05.html

Measurable Goals:

During this annual period Roanoke County, in cooperation with Save Our Streams and Clean Valley Council, provided four informational stream seminars and 52 local stream monitoring sessions. The stream school seminars targeted school age kids between 3rd and 10th grade and had a total of 266 kids in attendance. The stream monitoring sessions targeted adult citizens and a total of 51 stream segments were monitored with 225 citizens participating. A report showing each segment that was monitored and the score each reach received is attached in Appendix A.

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.

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 storm water and related water quality issues. Different programs will target appropriate grade levels and will be SOL correlated.

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 **20** different County schools and reached **4011** students between first grade and 12th grade. The Storm Water Education Program descriptions and program statistics for each educational event are located in Appendix A.

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's goal is to 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.

BMP 1-5: Stormwater Public Awareness Program

Goal:

Roanoke County will develop 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 storm water quality issues to the attention of the citizens of Roanoke County.

Measurable Goals:

In this annual period, Roanoke County distributed bookmarks, bumper stickers, erasers, luggage tags, pencils, rulers, and brochures, all promoting the importance of water quality to the citizens of Roanoke County. In total, Roanoke County gave out 2,811 pieces of merchandise to the citizens of the County.

Three television spots were aired on Roanoke Valley Television (RVTV) on the program named "Roanoke County Today" for the months of July 2008, November 2008, and June 2009 on the local Government & Educational Access Station that serves the Roanoke area. These television spots covered a local water quality project that was in construction in Roanoke County. The segment also discussed drainage and stormwater issues, flooding, as well as water quality concerns for the Roanoke Valley region. Each of these spots played 5 times a week on the local access station for an entire month.

Evaluation and Modification:

In this first annual period, Roanoke County successfully distributed a variety of media bringing stormwater quality issues to the attention to the public through merchandise and television media. The County finds this BMP to be effective and intends to continue to distribute stormwater issues through a variety of media sources to continue to meet the goals of this permit.

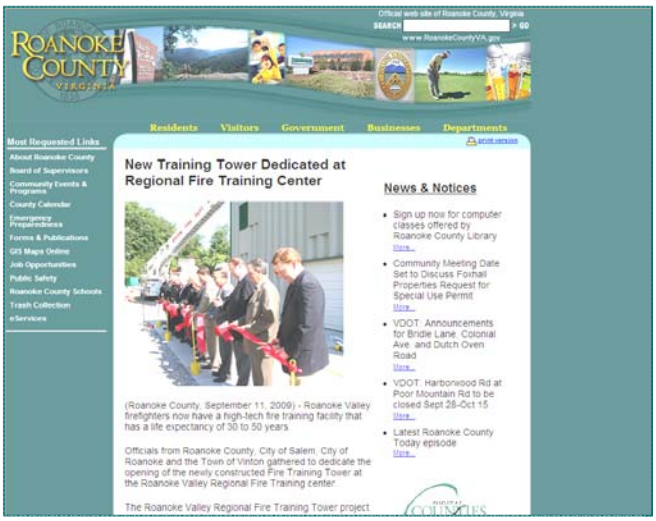
BMP 1-6: Roanoke County Stormwater Webpage

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 maintained and monitored the Roanoke County Stormwater webpage. This 17 page website is devoted to stormwater management, water quality, floodplain management and local water quality issues and information. These web pages 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 21,035 views to the stormwater webpage between July 1, 2008 and June 30, 2009. The number of visitors to each webpage for the first year of this permit has been monitored and submitted with this report in Appendix A.



Evaluation and Modification:

The County finds this BMP to be an effective method of information distribution and outreach. For year two of this permitting cycle, Roanoke County will utilize this information to determine if the content of some of the pages needs to be changed. Roanoke County plans to re-evaluate the most viewed and least viewed web pages on the stormwater website. The content will be updated on these pages to take advantage of the most viewed webpage and increase the viewing audience of the lease viewed webpage.

BMP 1-7: Business Education Program

Goal:

To develop a stormwater quality education program for specific commercial businesses within the County of Roanoke to 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:

In this annual period, Roanoke County continued this program by developing a list of target businesses and distributing information to business owners and personnel. The businesses in our target group where those businesses in the development community that were involved with stormwater development and those that have existing stormwater management facilities on site. In total, Roanoke County sent out 16 informational letters to commercial businesses housing stormwater management facilities and 93 letters to those involved with stormwater development plans. The County has received feedback from multiple recipients of this information and these letters have enabled the County to engage with the local commercial sector regarding stormwater and water quality issues. A list of the first year target businesses has been included in Appendix B.

Evaluation and Modification:

In this first annual period, Roanoke County successfully distributed letters to commercial businesses as an educational item. The County finds this BMP to be effective and intends to continue to distribute letters to local commercial businesses as an educational item. To make this BMP more effective, Roanoke County intends to expand the number of target businesses in which to educate to continue to meet the goals of this permit.

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 the storm water management plan. To garner this support, the County has coordinated several programs to engage the citizen's interest in storm water quality. The BMP's 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 citizen's 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 the objective and measurable goals of each BMP, the status of compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program

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 first year of this permit cycle, the County hosted a storm drain stenciling event on March 17, 2009 at the Central Middle School here in Roanoke County. During that event, twenty-six students stenciled storm drains.

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. By expanding the areas being stenciled, the education and outreach value is enhanced.

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 storm water quality improvements and to receive input from the public on the County's Stormwater management program.

Measurable Goals:

On August 18, 2008 Roanoke County held a Public Meeting to introduce the new stormwater permit and invited the public to comment and discuss changes to the permit. This event was intended to allow County citizens to be able to directly address stormwater officials. Only one county citizen attended this event.

On December 6, 2008, Roanoke County held a Volunteer Planting Day at the site of a local water quality project. This event invited the community to help plant a riparian buffer along a creek. Approximately 25 citizens joined the County for this event. This event allowed local citizens to ask questions from Roanoke County's stormwater staff about local water quality and the benefits of riparian plantings.

On March 27-29, 2009, Roanoke County maintained a booth at the Better Living Expo, held at the Salem Civic Center and presented by the Roanoke Regional Home Builders Association. At the Roanoke County booth, citizens are encouraged to ask County stormwater professionals questions regarding water quality, stormwater drainage, and local stormwater improvements.

On May 14, 2009, Roanoke County held a Ribbon Cutting and Celebration at Garst Mill Park to celebrate the completion of the stream restoration being done at the park. The County invited over 200 citizens, environmental groups, volunteers, partnering organizations, and state regulators to attend. This event was an opportunity for citizens to ask questions and directly engage county and state officials regarding stormwater issues.

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.

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, TMDL's, 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 two citizens advisory committee meetings this year, on September 10, 2008, and May 27, 2009. The meetings discussed local water quality projects, and introduced local environmental groups to the Stormwater Advisory Committee.

The September 10th meeting, the speaker was Kafi Nophlin, who discussed the Mudlick Creek Stream Restoration Project at Garst Mill Park. Kafi Nophlin offered an overview of the project by pointing out their goals and objectives, the grant received, and problems that they have encountered and overcame. Thirteen of the twenty members of the committee attended.

The May 27th meeting, the speaker was Charles E. (C.J.) Mitchem, a representative for the Upper Roanoke River Roundtable (URRR). The mission for URRR is to act as an advisory group that identifies and addresses issues of water quality and make recommendations about appropriate management solutions. Their goals are to identify local, regional, and basin-wide concerns and problems; seek the responsible use, orderly economic development and conservation of our land and water resources; and provide input to potential management solutions. Sixteen of the twenty members of the committee attended.

A short survey was distributed to each member of the team to provide feedback on the impact that each meeting has on the individual. A copy of the survey and the agenda, minutes and attendance for each meeting is included in Appendix B.

Evaluation and Modification:

Roanoke County proposes to continue this citizen's advisory committee. Based on the survey results, 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 four times a year.

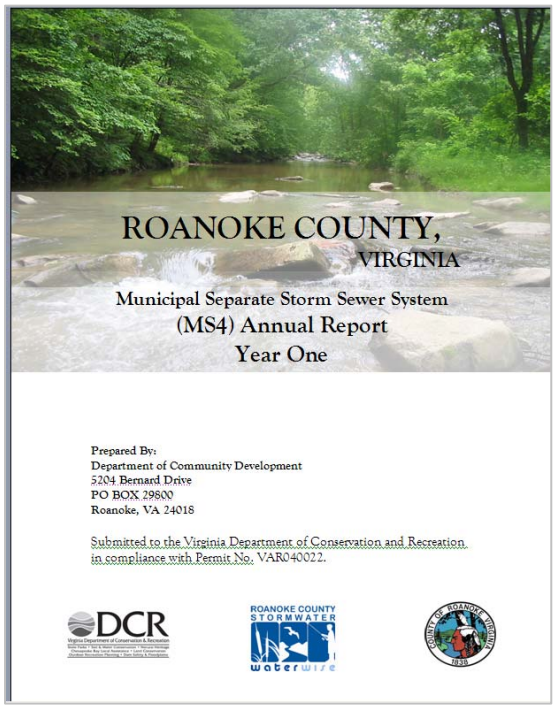
BMP 2-4: Annual Report Posted on Stormwater Website for Citizens to View

Goal:

The goal of this program is to post the Roanoke County's Municipal Separate Storm Sewer 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 first year annual report will be posted to the website by November 1, 2009 and each subsequent annual report will be posted by the same date each year for the duration of this permit cycle. Roanoke County will also make the annual reports available in hard copy at the Engineering front desk.



The webpage that the Roanoke County Registration Statement and MS4 Program Plan was posted on was viewed **805** times in the last annual period. This is the same page that the annual report will be posted on. A copy of the Registration Statement and Program Plan is also available at the customer service desk of the engineering department. No comments were received from the citizens regarding the Program Plan.

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

This minimum control measure's goal is to develop, implement, and enforce a program to detect and eliminate illicit discharges to the storm sewer system. The BMP's 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 Program 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 status of compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program.

BMP 3-1: Storm Drain Map

Goal:

To establish a program 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 has been completed for 25% of the known outfalls within the County. Twenty-one (21) new structures have been located. Two hundred and thirty five (235) outfalls have been analyzed to determine the corresponding HUC, impaired water, and drainage acreage.

Evaluation and Modification:

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

BMP 3-2: Illicit Discharge Ordinance

Goal:

To establish a program 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 is in compliance with current state regulations of the Virginia Department of Conservation and Recreation. Measures for appropriate enforcement are included in the Illicit Discharge Ordinance.

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. As the State Stormwater standards change, our illicit discharge program will remain in compliance.

BMP 3-3: Illicit Discharge Program

Goal:

To develop, implement, and enforce a program to detect and eliminate illicit discharges, as defined at 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.

Goals:

Determination of Screening Factors	YEAR 1
Desktop Determination of Illicit Discharge Potential	YEAR 2
Begin Field Screening and Indicator Monitoring	YEAR 3
Continue Field Screening and Indicator Monitoring	YEAR 4

Measurable Goals:

Roanoke County has continued this effort by developing 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.

To detect illicit discharges, Roanoke County has determined the screening factors for high illicit discharge potential. Along with the screening factors, the County included a contact sheet which lists all of the sources of information that will need to be contacted to complete the desktop determination of risk potential. These screening factors and contact sheet are included in Appendix C.

Evaluation and Modification:

No modifications are planned for this BMP. 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.

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 BMP's 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

Procedures for site plan review which incorporate consideration of potential water quality impacts, consideration for information provided by the public, and site inspection and enforcement procedures.

Included with this document is a detailed description of the objective and measurable goals of each BMP, the status of compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program.

BMP 4-1: Erosion and Sediment Control Ordinance

Goal:

The goal of this BMP is to maintain an Erosion and Sediment Control Ordinance that will reduce pollutants in storm water runoff to the storm sewer system from construction activities. These regulations, included in the Erosion and Sediment Control 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 Erosion and Sediment Control Plan for any land disturbance greater than 10,000 square feet. The E&S Plan will require construction site operators to implement appropriate erosion and control best management practices. Site inspection and enforcement actions are also incorporated into the County's Erosion and Sediment Control 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. No changes have been made in the past year on the state level, and the Roanoke County Erosion and Sediment Control Ordinance is still in compliance with the regulations set forth and enforced by the Virginia Department of Conservation and Recreation.

The County has had 54 regulated land-disturbing activities, and a total of 75.86 acres disturbed.

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.

BMP 4-2: Erosion and Sediment Control Certification

Goal:

The goal of this BMP is to identify current Erosion and Sediment Control certified employees and develop a program for 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 Department of Conservation and Recreation's Virginia Erosion and Sediment Control training and certification program. Additional employees hired into positions whose job responsibilities have already been determined as needing training in erosion and sediment control 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 in Appendix D.

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. A draft of the proposed changes to the Land Development Procedures has been completed and is currently under review by the Administration. A copy of this draft is included in Appendix D.

Evaluation and Modification:

No modifications are planned for this BMP. Roanoke County believes that continuing the process in 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 state stormwater management regulations change, 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.

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 BMP's 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 storm water runoff from new development and redevelopment. This manual includes regulations and design standard 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 also 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 status of compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program.

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 developments and redevelopments.

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.

In this first year, 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.

Evaluation and Modification:

No changes are planned for this BMP. New State Stormwater Regulations are in the process of being approved. It is vital that Roanoke County continues to keep its local Stormwater Management standards in compliance with these new regulations.

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 this first annual period, Roanoke County has developed a Stormwater Management Facility Inspection Program for Stormwater Management Facilities. This program outlines the steps of contact, inspection, notification and enforcement. The program also highlighted areas in which the County needs to gather additional information, plans, contact information, and legal maintenance agreements. A copy of this program is attached in Appendix E.

The County is currently in the stage of gathering background information, plans, and contact information for all of the ponds in addition to tracking and mapping new ponds. Currently Roanoke County has a total of 461 known permanent stormwater facilities.

The County has investigated and found all of the existing Stormwater Management Facilities that currently have legal maintenance agreements with the County. Only 163 out of 461 stormwater management facilities have maintenance agreements associated with them. As part of the inspection program, our goal is to contact all the owners of the facilities and request that they sign a maintenance agreement for their stormwater management facility.

This year, Roanoke County has also begun inspecting the stormwater facilities according to the Inspection Program. In this annual period, Roanoke County inspected 56 permanent stormwater facilities. For each inspected pond, the County has determined the treated acreage, HUC, and downstream impaired water body. This information is included in Appendix E in table format.

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 other pollutants into our streams and rivers.

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 strategies.

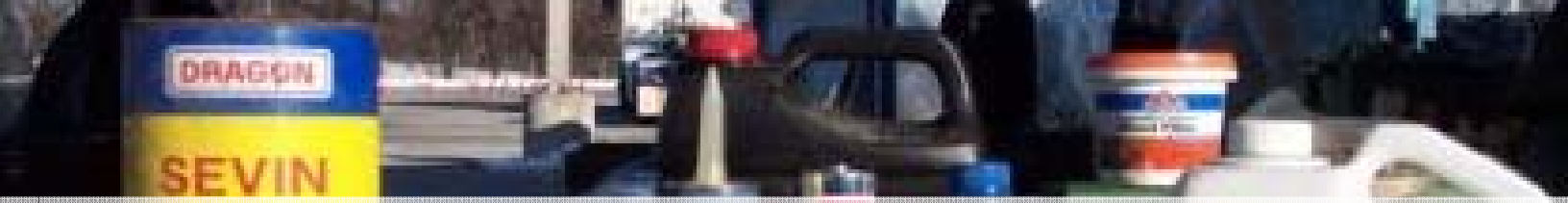
Measurable Goals:

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. Unfortunately due to the steep topography and rigorous stormwater quality and quantity regulations, no new development projects have pursued Low Impact Development practices above and beyond the existing water quality regulations.

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.

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 Developments 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.



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 also provide education and programs that will educate the County employees about pollution prevention and hazardous waste. The BMP's that have been established to complete this goal are listed below:

BMP 6-1: Spill Prevention and Control Plans

Roanoke County has developed Spill Prevention and Control Plans for all of its municipal facilities. These 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 storm sewer maintenance.

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 status of compliance with each BMP, and an evaluation of the BMP and any proposed modifications needed to better achieve the goals of the program.

BMP 6-1: Spill Prevention and Control Plans

Goal:

The goal of this BMP is to develop and update Spill Prevention and Control Plans for all of its municipal facilities. Each facility will be 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. These plans will be updated and annual training will be completed.

Measurable Goals

In this first annual period, Roanoke County evaluated the existing Spill Prevention Plans to determine areas that need additional information. The County has also determined what new facilities are in need of Spill Prevention Plans. A list of the facilities in need of an evaluation for potential of illicit discharge has also been included in the list. A copy of this evaluation list is included in Appendix F.

Evaluation and Modification:

No changes are planned for this BMP. Roanoke County will continue to update existing Spill Prevention and Control Plans and develop new plans according to the schedule listed in Appendix F. In the coming year, Roanoke County will begin inspecting the facilities for illicit discharge potential. 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 MS4 from a County facility.

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

The County of Roanoke participated in three Household Hazardous Waste Collection events: Aug. 3, 2008, Nov. 2, 2008 and May 3, 2009. The City of Roanoke, Roanoke County, Botetourt County, Roanoke Valley Resource Authority, and the Town of Vinton provided financial resources and volunteers, which enabled these days to be successful. Almost 900 people participated in the Household Hazardous Waste Collection days this year and 482 of the participants were residents of Roanoke County. The waste that was collected consisted of paint, paint thinner, oil, propane tanks, kerosene, batteries, driveway sealer, household cleaners, light bulbs, varnish, and pesticides.

Evaluation and Modification:

No changes are planned for this BMP. Roanoke County will continue to encourage good housekeeping practices through the Household Hazardous Waste Events. These events are an important way to keep these hazardous wastes from being disposed inappropriately into our streams and rivers.

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 additional areas where hazardous waste 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 8 men. These crews perform a large variety of duties including storm 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 **5** large projects, **7** small projects and **12** emergency 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 **$ 661,800.**

Evaluation and Modification:

No changes are planned for this BMP. Roanoke County will continue to maintain the County's storm sewer system. This action of maintaining the storm drain system will keep it functioning property and is an important opportunity to discover potential illicit connections to the storm drain system.

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 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, ninety-five new employees received this training.

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.

TMDL CONSISTENCY

Ronaoke County has several local streams that have a TMDL completed. The streams and associated pollutant, and waste load allocations are listed below. Roanoke County is committed to improving the quality of water that runs through the ridges and valleys of our region. This section will discuss the current ordinances, policies, and BMP's in this MS4 Program Plan that are applicable to reducing the pollutants that are imairing the quality of this regions waters. The existing policies have also been evaluated to determine the effectiveness of addressing the specific pollutants and determine procedures to ensure consistency with the TMDL.

TMDL Waterways and Impaired Tributaries*	Year Completed	Parameter	WLA
Tinker Creek Watershed	2004	**E-Coli**	
Carvin Creek			4.07E+12 (colony forming units/yr)
Glade Creek			8.02E+10 (colony forming units/yr)
Lick Run			3.29E+09 (colony forming units/yr)
Tinker Creek			5.36E+11 (colony forming units/yr)
Roanoke River Watershed	2006	**E-Coli**	
Ore Branch			1.07E+09 (colony forming units/yr)
Roanoke River			2.84E+11 (colony forming units/yr)
Roanoke River Watershed	2006	**Sediment**	
Roanoke River			1,823 (tons/yr)

***This information is based upon DEQ list of approved and draft TMDL's at http://www.deq.state.va.us/tmdl/develop.html**

Tinker Creek Watershed TMDL

The Tinker Creek Watershed TMDL, prepared on March 16, 2004, was approved by the Virginia Department of Environmental Quality (VDEQ). This study encompasses the waters of Tinker Creek, Glade Creek, Carvin Creek, Laymantown Creek and Lick Run. The water quality impairment was to the fecal coliform standard. This administration does not address the Waste Load Allocation (WLA) for Laymantown Creek, since the entire tributary resides in neighboring Botetourt County. *E. coli* is the new standard for bacterial impairment indicators. In this TMDL process, DEQ has translated fecal coliform values to *E. coli* values.

The Tinker Creek Watershed TMDL summarizes the potential point and non-point sources of fecal coliform. These sources include grazing livestock; pets; land application of manure; land application of bio-solids; urban/suburban runoff; failed/failing septic systems; uncontrolled discharges (straight pipes, dairy parlor waste, etc.) and wildlife.

Roanoke River TMDLs

The Roanoke River TMDLs, prepared on February 2006 and March 2006, were approved by the VDEQ. This study encompasses Wilson Creek, Ore Branch and the Roanoke River Watershed. Two impairments were cited in these TMDL's, E. coli and sediment. This administration does not address the WLA for Wilson Creek, since the entire tributary resides in Montgomery County.

The Roanoke River Bacterial TMDL summarizes the potential point and non-point sources of E. coli. These sources include: wildlife, human waste, livestock waste, and pets. The Roanoke River Benthic TMDL summarizes the potential sources for sediment. These sources include non-point sources: forested lands, agricultural lands, developed lands, wetlands, or barren lands. Other sources include point sources such as facilities that have discharge permits and in-stream bank erosion.

Applicable BMPs for Bacterial Impairments

As seen above, there are many sources of bacterial inputs into the water system. Because they are so varied and diffuse, Roanoke County is utilizing public education and involvement to address the bacterial impairment in the Tinker Creek and Roanoke River Watersheds. Most of the BMPs in the Public Education, Involvement and Participation measures ultimately educate and inform the citizens of Roanoke County about bacteria in our waterways. Roanoke County believes that education can serve as a way to eliminate the sources of bacteria in our streams.

> ***BMP 1-1:*** Educational Programs Review: 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 local Soil and Water Conservation Districts and Cooperative Extensions for landowners that are interested in agricultural cost-sharing options, among others.

BMP 1-2: Roanoke County Stormwater Informational Mailer: This mailer which is sent out to 50,000 residences includes information regarding ways to inspect your home septic system and urges residents to pick up after their pets.

BMP 1-3: Stream Monitoring and Education: This activity allows citizens to have an understanding of the many factors that can affect the life in a stream. The affects of pet waste and agricultural runoff are discussed as one of these important impacts to water health.

BMP 1-4: Stormwater Education Program: Several of the educational programs that are presented to Roanoke County Schools target sources of bacteria such as, "Who Polluted the River?", "Drains to Rivers!", and "After the Storm".

BMP 1-5: Stormwater Public Awareness Program: Our partners give out thousands of pieces of merchandise that have reminder slogans on them to be conscious of day to day items such as picking up after their pets.

BMP 1-6: Roanoke County Stormwater Webpage: The second most popular page on the stormwater webpage is the "Nonpoint Source Pollution" page. This page illustrates how agriculture and straight pipes can contribute to the overall pollution problem.

BMP 2-1: Storm Drain Stenciling Program: 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 to enter the storm drain through the road-side inlets.

BMP 2-2: Stormwater Public Event: 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 is a common theme at each of these events since it is such a regional water quality issue.

Program Evaluation for Bacterial Impairments

Roanoke County is developing a program to address bacterial impairments to the local waterways. The existing local programs listed above support education of citizens to improve the inputs of bacteria into the streams. At this early stage of the permit, the County plans to identify additional BMP's that address bacteria as the pollutant of concern.

Applicable BMP's for Sediment Impairments

As seen above, there are many sources of sediment inputs into the water system. Because they are so varied and diffuse, Roanoke County is utilizing a variety of BMPs to address the sediment impairment in the Roanoke River Watershed. Most of the BMPs in the Public Education, Involvement and Participation educate and inform the citizens of Roanoke County about sediment in our waterways. Roanoke County believes that education can serve as a way to eliminate the sources of sediment in our streams.

In addition to utilizing education, Roanoke County has several BMPs that directly address the control of Erosion from construction sites, pre- and post- development. The programs that address sediment are listed below:

BMP 1-1: Educational Programs Review: Many of the sources available on our webpage provide extensive educational material concerning the damage that sediment can do to our waterways. For example, links are provided to the local and state erosion and sediment control regulations for developers that are interested in ways to stabilize a construction site.

BMP 1-2: Roanoke County Stormwater Informational Mailer: This mailer which is sent out to 50,000 residences includes information regarding ways do yard work and cover dirt piles to prevent erosion.

BMP 1-3: Stream Monitoring and Education: This activity allows citizens to have an understanding of the many factors that can affect the life in a stream. The affects of stream bank erosion are discussed as one of these important impacts to water health and stream habitat.

BMP 1-4: Stormwater Education Program: Several of the educational programs that are presented to Roanoke County Schools target sources of sediment such as, "Watersheds to Ocean", "Watershed Connections", and "Water: Nature's Recycling System".

BMP 1-5: Stormwater Public Awareness Program: Our partners give out thousands of pieces of merchandise that have reminder slogans on them to be conscious of day to day items such as filling bare spots in their yards to prevent erosion.

BMP 1-6: Roanoke County Stormwater Webpage: The second most popular page on the stormwater webpage is the "Nonpoint Source Pollution" page. This page illustrates how a citizen can prevent non-point source pollution through planting riparian buffers along creeks.

BMP 4-1: Erosion and Sediment Control Ordinance: 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.

BMP 4-2: Erosion and Sediment Control Certification: This program identifies County employees that need E&S training and makes sure they keep up on their required training. This program minimizes the erosion potential on Roanoke County sites.

BMP 5-1: Stormwater Management Ordinance and Manual: 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.

BMP 5-2: Stormwater Management Facility Inspection Program: This program enforces procedures for the inspection of existing stormwater management facilities. This ensures that all facilities are adequately maintained and functioning properly. The proper function of these facilities is critical for flood protection and erosion prevention.

BMP 5-3: Low Impact Development Utilization: This program encourages development projects that utilize Low Impact Development strategies. 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.

BMP 6-3: Storm Sewer Maintenance Program: 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.

Program Evaluation for Sediment Impairments

Roanoke County has an extensive program to address sediment impairments to the local waterways. The local programs listed above support education of citizens and strong local programs and enforcement mechanisms to minimize the inputs of sediment into the streams. In this early stage of the permit, no weaknesses or limitations have been discovered that would prevent the MS4 program from reducing sediment as the pollutant of concern.

1-1: EDUCATIONAL PROGRAMS DATABASE

BMP 1.1 Stormwater Resource Database (Environmental Education Efforts and Organizations)			
Source/Type of Information	**Material Information**	**Contact Information**	**Phone Contact**
ENVIRONMENTAL EDUCATION EFFORS AND ORGANIZATIONS			
Blue Ridge Soil & Water District Office	offers outreach in Roanoke County to school age children	http://brswcd.org/	540-483-5269
City of Roanoke	offers outreach in Roanoke City Public Schools	www.roanokegov.com	540-853-1315
Project Learning Tree	offers training in forestry-related educational programs for school age children	www.plt.org	804-328-3031(Virginia Department of Forestry)
Clean Valley Council	offers outreach in the Roanoke Valley to school age children	www.cleanvalley.org	540-345-5523
Project WET	offers training in water-related educational programs for school age children	www.projectwet.org	804-698-4442 (Virginia Department of Environmental Quality)
Project WILD	offers training in animal-related educational programs for school age children	www.projectwild.org	804-367-0188 (Virginia Department of Game and Inland Fisheries
VA Department of Education	offers information on VA Standards of Learning (See Science standards)	www.doe.virginia.gov/VDOE/Instruction/sol.html	1-800-292-3820
VA Cooperative Extension	offers information on a variety of water related education topics	www.ext.vt.edu	540-772-7524
Coordinating Committee For Automotive Repair (CCAR®)	offers information about water quality issues relating to automotive work	www.ccar-greenlink.org/vshops/vshop1/drain.html	
City of Greensboro, NC	basic stormwater information	www.greensboro-nc.gov/	
South Carolina State Programs	stormwater education information	www.scdhec.net/environment/water/	
Randolph County, NC Planning and Zoning	basic stormwater educational information	www.co.randolph.nc.us/planning_zoning/StormwaterEducation.htm	
VirginGlobe	list of links for Stormwater and Water Quality sites	http://virginglobe.com/links/links.html	
Raingardens	Rain garden information with plans etc to help with runoff	www.raingardens.org/Index.php	
City of Eugene, OR	cute site for kids explaining water systems	www.eugene-or.gov/portal/server.pt?open=512&objID=687&PageID=0&cached=true&mode=2&userID=2	
USDA CSREES and the Land Grant System	National Water Program	http://www.usawaterquality.org	
University of Maryland, College of Natural Resources	Riparian Buffer Systems	www.riparianbuffers.umd.edu	
Clark County Regional Flood Control District	Links for stormwater education	www.ccrfcd.org/	
South Carolina Department of Health and Environmental Control	SC page for funding sources for education	www.scdhec.net/water/ms4/html/funding.html	

"	water pollution information	www.scdhec.net/water/html/npspage.html	
Albemarle County, Virginia	Education programs in Charlottesville Area	www.albemarle.org/department.asp?department=epw&relpage=4135	
Storm Water Coalition	on-line educational products to order	www.stormwatercoalition.org/cfml/cat.cfm	
Journal for Surface Water Quality Professionals	newletter/journal	www.forester.net/sw_0205_public.html	
Adopt a Stream	educational information	www.dcr.virginia.gov/forms/DCR199-027.pdf	
City of Monterey, CA	stormwater issues educational information	www.monterey.org/publicworks/stormwater/	
State of Tennessee	Best Management Practices for Stormwater Educators	http://tennessee.gov/environment/ea/sbeap/stormwater/	
Non-Point Education for Municipal Officials (NEMO)	education on reducing runoff for communities and businesses	http://nemo.uconn.edu/	
Waste Reduction Resource Center	information about water management	http://wrrc.p2pays.org/industry/stormwater.htm	
National Agricultural Library	information about water and agriculture	www.nal.usda.gov/wqic/	
International Water Association	global stormwater information	http://www.iwahq.org/templates/ld_templates/layout_633184.aspx?ObjectId=634209	
US Geological Survey	National Water Quality Assessment Program	http://water.usgs.gov/nawqa/	
"	USGS Water Quality Information pages	http://water.usgs.gov/owq/	
"	classroom resources	http://ga.water.usgs.gov/edu/waterquality.html	
"	interactive water education	http://interactive2.usgs.gov/learningweb/explorer/topic_water.htm	
	water cycle information	http://ga.water.usgs.gov/edu/watercycle.html	
Global Environment Monitoring System	global inland water quality information	www.gemswater.org/	
Center for Environmental Quality at Wilkes University	water quality, drinking water, ground water, etc information	http://www.water-research.net/	
Wheeling Jesuit University.	classroom resources on stormwater	www.cotf.edu/ete/modules/waterq/waterq.html	
Chesapeake Bay Program	factors effecting water quality information	www.chesapeakebay.net/wquality.htm	
Education Planet	water pollution info website for other water issue also	www.educationplanet.com/search/Science/Environment/Water_Pollution	
Academy of Natural Sciences	water education information	www.ansp.org/education/resources/events.php	
VA Department of Conservation and Recreation	Soil and Water links	www.dcr.virginia.gov/soil_&_water/swintro.shtml	
Clean Water Education Partnership	pollution information	www.nccwep.org	
Yahoo Directory	water pollution links	http://dir.yahoo.com/Society_and_Culture/Environment_and_Nature/Pollution/Water/Nonpoint_Source_Pollution/	
Google Directory	water pollution/water issues links	http://directory.google.com/Top/Science/Environment/Water_Resources/	
KinderStart Search Engine	links on pollution issues for children	www.kinderstart.com/societycultureenvironment/environmentalissues/airandwaterpollution.html	
EcoIQ.com	water and waste water information	www.ecoiq.com/water/	
Eco-Rangers	teacher resource links on environmental issues incl. Water related issues	www.growingplanet.org/ecorangers.html	
Kitsap County, WA	Surface and Stormwater Management Program	www.kitsapgov.com/sswm/default.htm	

BMP 1.1 Stormwater Resource Database (Printed Materials and Publications)			
Source/Type of Information	**Material Information**	**Contact Information**	**Phone Contact**
PRINTED MATERIALS AND PUBLICATIONS			
VA Dept. of Conservation and Recreation	"Non-Point Source Pollution and You"	www.dcr.virginia.gov/soil_&_water/index.shtml	1-877-42WATER
	"Ways to keep your lawn green and the Chesapeake Bay clean"	www.dcr.virginia.gov/soil_&_water/index.shtml	"
	"Raindrops Keep Falling On My Head" (for school children)	www.dcr.virginia.gov/soil_&_water/index.shtml	"
	Roanoke River Watershed Yellow Pages	www.dcr.virginia.gov/soil_&_water/index.shtml	"
	Virginia Stormwater Management Program	www.dcr.virginia.gov/soil_&_water/stormwat.shtml	
	Soil and Water Conservation Programs	www.dcr.virginia.gov/soil_&_water/index.shtml	
City of Roanoke	"Flooding in Roanoke"	www.roanokegov.com	540-853-2731 (Office of Engineering)
	Tips for Improving Stormwater Quality in Roanoke	*see department of environmental management,*	540-853-2425 (Office of Environmental and Emergency Management)
	"Every Drop Counts"	*stormwater management*	
	Roanoke Valley Stormwater Guide		
	Make Your Home The Solution to Stormwater Pollution		
	Ten Things You Can Do to Prevent Stormwater Runoff Pollution-Bookmark		
	Take the Stormwater Challenge - Placemat Crossword Puzzle		
	Water- Efficient Landscaping : Preventing Pollution and Using Resources Wisely		
	Stormwater and the Construction Industry - 11"X17" poster		
	Stormwater Management : An Overview for Auto Recyclers - English and Spanish		
City of Roanoke, Roanoke County, Town of Vinton	"After the Storm" newsprint publication in Parks & Rec. papers (Winter 2003)	*see individual locality/agency websites*	540-772-2065
	"Meet Your Watershed" newsprint publicattion in Parks & Rec. mailers (Fall 2004)		
	"When it Rains, it Drains" newsprint publication in Parks & Rec. mailers (Winter 2005)		
VA Water Research Center at VA Tech	"Virginia Water Central" newsletter	www.vwrrc.vt.edu	540-231-5624
	A Guide To Protecting Virginia's Valuable Resource: Ground Water	www.vwrrc.vt.edu	
	A Guide To The National Drinking Water Standards and Private Water Systems	www.vwrrc.vt.edu	

	A Guide To Virginia's Ground Water	www.vwrrc.vt.edu	
Environmental Protection Agency (EPA)	Main Water Resources Page	www.epa.gov/water/	
	Stormwater information - National Pollutant Discharge Elimination System	www.epa.gov/npdes/stormwater	
	Storm Water Management Model Redevelopment Project	www.epa.gov/ednnrmrl/models/swmm/index.htm	
	Urban Stormwater Best Management Practice Study	www.epa.gov/ost/stormwater	
	Nonpoint Source Pollution Information	www.epa.gov/owow/nps/eduinfo.html	
	Office of Wetlands, Oceans and Watersheds	www.epa.gov/owow/	
Canaan Valley Institute	"Mid-Atlantic Highlands Action Program"	www.canaanvi.org	1-800-922-3601
	"ECHO" newsletter		
The Sierra Club	"The River Rag" Roanoke River Group publication	www.virginia.sierraclub.org/roanoke	
		rsegbert@adelphia.net	540-384-7448 (Roanoke Chapter Leader)
Piedmont Environmental Council	"Sources of Funds for Conservation"	www.pecva.org	540-347-2334
VA Department of Environmental Quality	"25 Ways to Help Virginia's Environment"	www.deq.state.va.us/education	
	Water Resources Home Page	www.deq.state.va.us/water	
Blue Ridge Soil & Water District	Annual Report	http://brswcd.org/	540-483-5269 extension 115 P.W. Morgan
Battelle	Environmental Publications	www.battelle.org/Environment/publications/EnvUpdates/winter2003/article9.stm	
Stormwater Manager's Resource Center	links to Stormwater Treatment Practice publications	http://www.stormwatercenter.net/Manual_Builder/Maintenance_Manual/9%20-%20BMP%20Maint%20Ed%20Materials%20and%20Links/ME_Introduction.htm	
US Dept of Education	Gateway to education materials	http://thegateway.org/	
"	ERIC publications on water issues	http://wdcrobcolp01.ed.gov/CFAPPS/ERIC/resumes/descriptorsummary.cfm?majordesc=Water%20Pollution%20	
Journal of Environmental Quality	downloadable publications on water issues	http://jeq.scijournals.org/cgi/collection/water_pollution?page=21	
North Dakota State Water Commission	water education materials	http://www.swc.state.nd.us/	

BMP 1.1 Stormwater Resource Database (Local and National Agencies)			
Source/Type of Information	**Material Information**	**Contact Information**	**Phone Contact**
EDUCATIONAL INSTITUTIONS:			
Virginia Tech	College of Natural Resources	www.vt.edu	
Roanoke College	Department of Environmental Science	www.roanoke.edu	
Virginia Western Community College	Natural Sciences & Mathematics Division	www.virginiawestern.edu	
Ferrum College	Environmental Science Program	www.ferrum.edu	
Longwood University	Department of Natural Sciences	www.longwood.edu/cleanva/	
North Carolina State University	Water Quality Group	www.bae.ncsu.edu/bae/programs/extension/wqg	
Foundation for Virginia's Natural Resources	Natural Resource Protection and Philanthropy	www.fvnr.org	
REGIONAL AGENGIES			
City of Roanoke	Office of Environmental and Emergency Management	www.roanokegov.com	540-853-2425
Town of Vinton	Department of Public Works	www.town.vinton.va.us	540-983-0646
County of Roanoke	Department of Community Development	www.co.roanoke.va.us	540-772-2065
Chesapeake Bay Foundation	Pollution in the Chesapeake Bay	www.cbf.org	
Hampton Roads (HR) Storm	Stormwater information website	www.hrstorm.org	
Smith Mountain Lake Association	Programs link	www.lynchburg.net/SMLA	540-297-4146
City of Salem	stormwater link on City of Salem website (	www.ci.salem.va.us	540-375-3032
Roanoke Valley Greenways	Home page	www.greenways.org	
Roanoke Valley Allegheny Regional Commission	Projects link	www.rvarc.org	540-343-4417
Blue Ridge Soil & Water District Office	Blue Ridge Soil & Water District Office	www.braswcd.org	540-483-5269
Clean Valley Council	Roanoke Valley Environmental Programs/Awards	www.cleanvalley.org	540-345-5523
STATE AGENCIES:			
VA Department of Conservation and Recreation	website	www.dcr.state.va.us	
VA Department of Forestry	Water Conservation Information	www.vdof.org	
VA Department of Game & Inland Fisheries	Education link	www.dgif.state.va.us	
VA Department of Environmental Quality	Vriginia Pollutant Discharge Elimination System	www.deq.state.va.us/vpdes	
"	water programs	www.deq.state.va.us/water/	
VA Department of Conservation and Recreation	Virginia Pollutant Discharge Elimination System	www.dcr.virginia.gov	
VA Department of Health	Office of Drinking Water & Health Hazards Control links	www.vdh.state.va.us	
VA Save Our Streams	volunteer stream monitoring programs	www.sosva.com	
VA Department of Transportation	Environmental link	www.virginiadot.org	

VA Cooperative Extension	Educational programs link	www.ext.vt.edu	
VA Department of Agriculture and Consumer Services	Regulatory services	www.vdacs.state.va.us	804-786-2373
VA Museum of Natural History	The Virginia Master Naturalist Program	www.vmnh.net/index.cfm/topic/master-naturalists	
NATIONAL AGENCIES:			
United States Fish and Wildlife Service	National Oceanic & Atmospheric Administration (NOAA): Portal links	www.fws.gov	276-623-1233
National Park Service	Nature Net link	www.nps.gov	
Natural Resource Conservation Service	Programs: Watershed Protection and Flood Prevention link	www.nrcs.usda.gov	
Farm Services Agency	Conservation programs link	www.fsa.usda.gov	540-977-2698
Non-Point Source Education for Municipal Officials (NEMO)	Publication on Water and Water Quality	http://nemo.uconn.edu/	
US Department of Energy's Smart Communities Network	Creating Energy Smart & Sustainable Communities	www.smartcommunities.ncat.org/	
Center for Watershed Protection	Publications and Technical tools for Watershed Protection	www.cwp.org/	
Stormwater Manager's Resource Center	Technical Assistance for Local Government regarding Stormwater Protection	www.stormwatercenter.net	
US Army Environmental Center	Watershed and Storm Water Management	http://aec.army.mil/usaec/compliance/watershed00.html	
Stormwater Coalition	Stormwater educational materials	www.stormwatercoalition.org/	
Agriculture Network Information Center	water quality web resources for adults	www.agnic.org	
National Wildlife Federation	watershed/water pollution information	www.nwf.org	
Federal Emergency Management Agency (FEMA)	information on flooding and flood issues	www.fema.gov/hazard/flood/index.shtm	

KiddyHouse.com	links for environmental education for kids and teachers	www.kiddyhouse.com/Themes/Environ/Water.html	
Environmental Organization/Web Directory	listings of internet sites dealing with water quality issues	www.webdirectory.com/	
The Natural World of North America (Nearctica)	water pollution information	www.nearctica.com/environ/water/pollute.htm	
"	water issues information	www.nearctica.com/environ/water/water.htm	
Infoplease	water issue information especially pollution	www.infoplease.com/ce6/sci/A0851609.html	
"	flooding information	www.infoplease.com/ce6/sci/A0818948.html	
UNESCO	global water information	www.wateryear2003.org/en/ev.php@URL_ID=5579&URL_DO=DO_TOPIC&URL_SECTION=201.html	
Sustainable Agri-Food Production and Consumption Forum	water issue information relating to agriculture	www.agrifood-forum.net/issues/water.asp	
Protecting Water	Storm water, storm drain overview	http://protectingwater.com/index.html	
Adopt A Watershed	Environmental stewardship, educational enhacement and community development	http://www.adopt-a-watershed.org/	
Environmental Health Center (division of National Safety Council)	general information on flooding	www.nsc.org/ehc/floods/1998CA.htm	
Geology Labs On-line	Virtual River, an interactive website for students on river discharge and flooding	http://vcourseware.sonoma.edu/VirtualRiver/	
Greenpeace	flooding information	http://archive.greenpeace.org/climate/flood_report/	
Learners On-line	"Life in the Flood Zone" student-oriented information	www.learnersonline.com/weekly/archive2001/week24/	
Audubon Galleries	brief information on flooding	www.audubongalleries.com/education/ex_flood.php	
Longwood College	Virginia's Water Resources	www.longwood.edu/cleanva	
University of Illinois, The Environmental Council	Environmental discovery, engagement, and scholarship	www.environ.uiuc.edu/	1-800-345-6087
The Pennsylvania State University	The Internet Watershed Educational Tool	www.interwet.psu.edu	

BMP 1-3: STREAM MONITORING AND EDUCATION

STREAM MONITORING SESSIONS SUMMARY

Stream	Site	Date	Participants	SCORE
Back Creek	BCK2	10/2/2008	2	9
Back Creek	Back Creek - BCK3	10/5/2008	2	9
Back Creek	Back Creek (Rt. 221)	10/14/2008	11	8
Back Creek	Back Creek (Rt. 221)	12/11/2008	11	8
Back Creek	Back Creek - BCK3	12/20/2008	2	10
Back Creek	Back Creek (Rt. 221)	4/14/2009	10	9
Back Creek	Back Creek - BCK3	6/14/2009	2	8
Big Laurel Creek	BLC1	9/14/2008	2	12
Big Laurel Creek	BLC1	10/18/2008	15	12
Big Laurel Creek	BLC1	6/27/2009	2	11
Bottom Creek	BTM2	8/20/2008	2	10
Bottom Creek	BTM2	2/7/2009	2	7
Carvins Creek	CRV-5	7/25/2008	2	8
Carvins Creek	CRV-2	12/29/2008	2	9
Carvins Creek	CRV-2	6/28/2009	2	8
Carvins Creek, West Branch	CWB	4/19/2009	2	7
Glade Creek	Gld-3	7/12/2008	10	9
Glade Creek	Gld-4	8/18/2008	3	11
Glade Creek	Gld-1	9/18/2008	2	10
Glade Creek	Gld-3	9/30/2008	6	10
Glade Creek	Gld-7	10/20/2008	2	9
Glade Creek	Gld-1	12/28/2008	2	9
Glade Creek	Gld-5	2/11/2009	2	12
Glade Creek	Gld-1	4/2/2009	2	11
Glade Creek	Gld-1	6/28/2009	2	10
Mudlick Creek	MDL-4	11/28/2008	3	2
Mudlick Creek	MDL	8/23/2008	2	7
Mudlick Creek	MDL	10/26/2008	2	5
Mudlick Creek	MDL	1/10/2009	2	5
Mudlick Creek	MDL	6/1/2009	2	5

BMP 1-4: STORMWATER EDUCATION PROGRAM DESCRIPTIONS

Clean Valley Council, Inc.
Outreach Programs
Elementary School

Preschool or Kindergarten (30 to 45 minutes)

Rigsby's Cleanup Surprise

(Science SOL K.9, K.10, & Civics SOL K.7)

Students will identify differences between natural and human-made objects. They will recognize that they have control over litter. Students investigate a park that's been littered and meet "Rigsby" the Raccoon, who teaches the harm that litter brings to all of his park pals. They will learn what kinds of litter can be recycled.

Vocabulary Introduced: Litter, Natural Objects, Man-made Objects, Recycling

Equipment needed: None

***Who Polluted the River?* (Can be adapted for grades K – 3)**

(Science SOL K.10, 1.8, 2.5, 2.7,3.9,3.10,3.11)

Students will identify sources of pollution and how they get into the river. A pickle jar is used to represent the river, and students help "pollute" the river. Prevention of water pollution is discussed, to include recycling, reusing, and reducing waste.

Vocabulary Introduced: Litter, Natural Objects, Man Made Objects, Recycling;
(For grades 2-3:Pollution, Acid Rain, Sewage, Pesticides, Fertilizer)

Equipment needed: None

Grade 1 (45 minutes)

Think Earth

(Science SOL 1.8 Economics 1.10,1.11)

Students identify natural resources which are found in the Greater Roanoke Valley and consider ways that they can personally reduce consumption of these resources.

Vocabulary Introduced: Natural Resources, Conservation

Equipment Needed: VCR

Wartville Wizard

(Science SOL 1.8, Economics 1.10,1.11)

Students will identify the components of a community: human resources, natural resources, capital resources used to produce goods. A 35-mmslide story explores litter as being an undesirable component.

Vocabulary Introduced: Community, Litter

Equipment Needed: Slide projector, Cassette Player

The Truth about Trash

(Science SOL 1.8)

Students will discover that trash has better uses than just throwing it in the "regular" trash can. Using the book, "A Pig Tale" or Pokemon posters, and a bag of collected trash, students will find better uses for trash. Interactive activity: Using plastic drink bottles, students will create toys from trash.

Vocabulary Introduced: Litter, Solid Waste, Natural Resources

Equipment Needed: By teacher: half sheet construction paper, google eyes, pom poms, pipe cleaners, extra construction paper, glue, tape, plastic drink bottles.

Grade 2- 5 (45 minutes)

New!* *The Green Game

(Science SOL 2.5, 2.8, 3.6, 3.10, 3.11, 4.2, 4.8, 5.6, 5.7)

Students will focus on ways in which they can care for their environment by playing a fun interactive game. The game format is a "greenopoly" board game played in up to 6 groups.

Vocabulary Introduced: Litter, Recycle, Conservation, Environment, Ecology, Natural Resources, Pollution

Equipment needed: None

New!* *The Water Game

(Science SOL 2.5, 3.6, 3.10, 3.11, 4.8, 5.4, **5.6**)

Students will play an interactive giant ground version of a board game that focuses on ways to preserve, conserve, and share our waters. The game can be played indoors or outdoors.

Vocabulary Introduced: Conserve, Preserve, Natural Resources, Water Pollution, Water Cycle, Hydrologic Cycle, Surface Water, Groundwater, Consumers, Desalination, Watershed,

Equipment needed: None

Grade 2 (45 minutes)

Kids-Eye View

(Science SOL 2.5, 2.8)

Students will define ECOLOGY and will focus on ways in which they can care for their environment. A list of "25 Things Kids Can Do" is part of the program.

Vocabulary Introduced: Ecology, Environment

Equipment Needed: VCR

The Lorax

(Science SOL K.5, 2.5, 2.8, 3.6, 3.10)

Students will listen to Dr. Seuss' story of the "Lorax" to learn about the human effects on animals and the environment. They will recognize that they have control over their consumption of natural resources.

Vocabulary Introduced: Conservation, Environment, Ecology, Natural Resources, Pollution

Equipment Needed: VCR

Travelin' Trash

(Science SOL K.5, 1.8, 2.5, 3.6, 3.10) ***Can be adapted for grades K–3.***

A series of activities/demonstrations that demonstrate the characteristics of marine debris, and how these characteristics affect where marine debris is found in the environment. Students will determine whether or not trash can float, be moved by the wind, or wash away.

Vocabulary Introduced: Buoyant, Marine Debris

Equipment Needed: None

Grade 3 (45 minutes)

***New!* Soil: Who Needs It?**

(Science SOL: 3.3, 3.5,3.6,3.7,3.8,3.9,3.10)

Students will discover why soil is important while viewing the DVD. This is followed by the interactive game, TRASH to SOIL
Vocabulary: Erosion, Humus, Organic, Decompose, Compost
Equipment Needed: VCR

Think Earth, "e"
(Science SOL 3.6, 3.10)
Students will examine the 3 R's as a means to conserve identified natural resources.
Vocabulary Introduced: Reduce, Reuse, Recycle
Equipment Needed: VCR

The Rotten Truth
(Science SOL 3.10)
Solid waste disposal is a major industry. Students learn different methods of waste disposal and ways they personally can reduce the waste stream.
Vocabulary Introduced: Solid waste disposal, Landfill, Compost, Waste stream
Equipment Needed: VCR

Grade 4 (45 minutes)

Aluminum (Plastic, or Paper) Recycling
(Science SOL 4.2, 4.8)
Students will follow a can to a recycling center and learn about recycling, how it works, why it's important, what they can do to help. Trash can be dangerous when it's not in its proper place: the garbage can or recycling can. Students will keep one piece of litter (aluminum can) in mind as they follow it from the street to a new container or usable item. This program can also substitute "Paper Recycling" or "Plastic Recycling" for the title. Students will see a variety of new materials that were recycled from other materials.
Vocabulary Introduced: Recycling, Reduce, Reuse, Natural Resources, Machines
Equipment needed: VCR

Environmental Bingo
(Science SOL 3.11,4.8)
Students will examine aspects of recycling and solid waste management, and then play a fun interactive game reviewing what they have learned.
Vocabulary Introduced: Litter, Recycle
Equipment needed: None

Grade 4 - 5 (45 Minutes)

Watersheds to Oceans
(Science SOL 4.8, 5.6; English SOL 4.2, 5.1, 5.8; Math SOL 4.12, 5.11)
Students will identify watersheds and map the movement of solid waste from storm drains to the ocean. The Enviroscape (or Watershed Demo Pans) will show the effects of erosion, pesticides, fertilizers, and litter on waterways and bodies of water. The effects of natural disasters and litter will be compared and contrasted.
Vocabulary Introduced: Litter, Solid Waste, Pollution, Watershed, Erosion, Pesticides, Fertilizers, Natural Disasters
Equipment needed: None

The Trash Train
(Science SOL: 3.11, 4.5, 4.8, 5.6, 5.7)
Students will follow trash as it is brought in by localities (Roanoke City, Roanoke County, and Vinton) as it is dumped on the transfer station floor for inspection, loaded onto "Trash Train" rail cars, and travels to the Smith Gap Landfill. Ways of decreasing the amount of trash will be addressed.
Vocabulary: Recycle, Decompose, Biodegrade, Ventilation, Wasteline Express, Synthetic, Leachate, Natural Buffer, Compost

Grade 5 (45 Minutes)

Oceans of Trash
(Science SOL 5.4)
A 35 mm slide presentation and discussion review of Roanoke Valley's connections to the ocean and ocean characteristics. Marine debris is a health hazard, presenting a threat for entanglement by marine mammals and aquatic life.
Vocabulary Introduced: Salinity, Estuary, Riparian
Equipment Needed: Slide projector/ Screen (or blank wall), Overhead Projector

Clean Valley Council, Inc.
Outreach Programs
Middle School

Grade 6-8 (45 minutes)

***New!* The Chemistry of Recycling**
(Science SOL 6.1, 6.4, LS.1, LS 6, PS.1, PS.2, PS.4)
This two-part program starts with the cycles of recycling. Students are given cycles of recycled products and try to determine the identity of each product. The second part of the program is a ***mini-lab*** where students try to identify the type of plastic by testing the reaction of each plastic in different solutions. Students will see a variety of new products that were recycled from other materials.
Vocabulary Introduced: Recycle, Decompose, Biodegrade, Compost, Ingot, Extruded, Alloyed, Density, Resins
Equipment needed: Overhead Projector in classroom, 16 small ***glass*** beakers

Drains to Rivers!
(Science SOL 6.7, 6.9, LS.11, LS.12, ES.9)
Students will discover what happens to common household waste, as it becomes "runoff". Solutions for cleaner and less runoff will be explored, using an Enviroscape runoff model or watershed demo pans that represent individual parts of a community.
Vocabulary Introduced: Litter, Solid Waste, Natural Resources, Storm Drain, Runoff, Nonpoint Source Pollution
Equipment Needed: None
***Excellent Precursor to *Reeling in Runoff* Program**

Reeling in Runoff
(Science SOL 6.7, 6.9, LS.11, LS.12, ES.9)
Students will discover practical solutions for preventing water pollution. Best Management Practices (BMPs) are systems, activities, and structures that can reduce and prevent nonpoint source pollution. Solutions for cleaner and less runoff will be explored, using a model that represents individual parts of a community.
Vocabulary Introduced: Litter, Solid Waste, Natural Resources, Storm Drain, Runoff, Nonpoint Source Pollution, BMPs
Equipment Needed: None

Oceans of Trash
(Science SOL 6.9, LS.4, LS.7, LS.10, LS.11, LS.12)
A 35 mm slide presentation and discussion review of Roanoke Valley's connections to the ocean and ocean characteristics. Marine debris is a health hazard, presenting a threat for entanglement by marine mammals and aquatic life.
Vocabulary Introduced: Salinity, Estuary, Riparian
Equipment Needed: Slide projector/ Screen (or blank wall), Overhead Projector

Environmental Jeopardy

New! Water Jeopardy
(Science SOL 6.2, 6.3, 6.6, 6.9, LS.7, LS.12, PS.6)
Students will examine aspects of environmental issues, and then play a fun interactive game reviewing what they have learned. Four topics to choose from (choose one) are *Energy, Solid Waste, Ecological Footprint, or Water*.
Vocabulary Introduced: Energy, Natural Resources, Renewable Resources, Litter,

Solid Waste, Recycle
Equipment needed: None

Stream School (offered in the Fall and Spring)
Science SOL 6.5, 6.7, LS.7, LS.10, LS.12, ES.7, ES.9, ES.11, BIO.3, BIO.9, CH.1)

Students will participate in a field trip experience at a local stream to identify macroinvertebrates and perform chemical tests. This will enhance their understanding of the factors involved in determining water quality, and the connection between point source and non-point source pollution in their waterways.
Vocabulary Introduced: Riparian Corridor, Litter, Erosion, Point Source Pollution, Nonpoint Source Pollution
Equipment Needed: Old sneakers or water shoes/boots

Watershed Connections
(Science SOL 6.3, 6.5, 6.7, 6.9, LS.7, LS.10, LS.12)
A 35 mm slide presentation and discussion will examine watersheds and determine the problems associated with erosion, pollution, and litter.
Vocabulary Introduced: Riparian Corridor, Litter, Erosion
Equipment needed: Screen, Electrical Outlet

Plants Eat Bad Chemicals
(Science SOL 6.7, 6.9, LS.3, LS.4, LS.7, LS.10, PS.7)

The students will learn about the process of Phytoremediation, where plants remove, transfer, stabilize or destroy contaminants in soil and groundwater. Through classroom demonstrations the students will observe groundwater and soil contamination as a result of chemicals accumulating in soil and water, and review plant anatomy.
Vocabulary Introduced: Phytoremediation, Groundwater, Transpiration, Contamination, Infiltration, Riparian
Equipment Needed: None

Water: Nature's Recycling System:
(Science SOL 6.1, 6.7, 6.9, LS.1, LS.3, LS.7, LS.10)
This interactive program takes students through the Water Cycle with emphasis on water management, topography, infiltration, runoff and erosion. Through hands on activities and demonstrations students will discuss these occurrences and how they are influenced by human activities.
Vocabulary Introduced: Precipitation, Evaporation, Transpiration, Topography, Infiltration, Erosion, Runoff
Equipment Needed: None

***Land Use: For the People, the Government, or the Environment*?:**
(Science SOL:6.2, 6.5, LS.12)
Students will discover what decisions need to be made when they try to place a school on a tract of land that has many aspects to be considered: citizens, government regulations, environmental impacts. These decisions will carry costs and
benefits, value, and personal choices. Principles to be discussed include:

a. scarcity forces choices b. resource management decisions are made by people acting alone or in groups c. changes in rules and laws alter incentives and decisions d. people value things differently.

Vocabulary Introduced:

Costs and Benefits = positive and negative factors involved as a result of choices
Natural Resources = all the Earth's materials that make other products
Incentives = rewards or punishment for behavior
Hammock = stand of preserved, original trees
Hazardous Waste = waste that is harmful to the environment and people
Groundwater = water found beneath the soil's surface
Water conservation = the careful use and protection of water resources in quantity and quality
Wetlands = landforms that are wet at least part of the year and have a particular type of soil and plants
Scrub Habitat = area with small trees, bushes or plants that have low moisture
Superfund = underground storage site of hazardous waste on a list to be cleaned up and restored by the government
Watershed address = area you live in that drains to the nearest creek, stream, or river

Equipment needed: Overhead projector

Aluminum (Plastic, or Paper) Recycling
(Science SOL 6.2, 6.6, 6.9, LS.12)

Students will follow a can to a recycling center and learn about recycling, how it works, why it's important, what they can do to help. Trash can be dangerous when it's not in its proper place: the garbage can or recycling can. Students will keep one piece of litter (aluminum can) in mind as they follow it from the street to a new container or usable item. This program can also substitute "Paper Recycling" or "Plastic Recycling" for the title. Students will see a variety of new materials that were recycled from other materials.

Vocabulary Introduced: Recycling, Reduce, Reuse, Natural Resources, Machines

Equipment needed: VCR

Clean Valley Council, Inc.
Outreach Programs

High School

Grade: 9 –12 (45 minutes)

New! The Chemistry of Recycling
(Science SOL ES.1, ES.7, BIO.1, CH.1, CH.2, PH.1)
This two-part program starts with the cycles of recycling. Students are given cycles of recycled products and try to determine the identity of each product. The second part of the program is a *mini-lab* **where students try to identify the type of plastic by testing the reaction of each plastic in different solutions. Students will see a variety of new products that were recycled from other materials.**
Vocabulary Introduced: **Recycle, Decompose, Biodegrade, Compost, Ingot, Extruded, Alloyed, Density, Resins**
Equipment needed: **Overhead Projector in classroom, 16 small** *glass* **beakers**

After the Storm
(Science SOL BIO.9, CH.1, CH.6, PH.4; English SOL: 9.4, 11.4)
Students will discover what happens after it rains, and what ends up in our streams, lakes, rivers, and oceans. How ecosystems can collapse due to turbidity and low oxygen levels will be outlined and suggestions for filtering runoff by use of wetlands and green roofs will be discussed.
Vocabulary Introduced:
Solid Waste, Natural Resources Storm Drain, Runoff, Nonpoint Source Pollution, Fecal Coliforms, Hypoxic, Groundwater, Water Conservation and Quality, Wetlands, Green Roof, Watershed Address
Equipment Needed: **Overhead Projector, VCR**

Water: Woes to Wonders
(Science SOL BIO.9, CH.1, CH.6, PH.4, English SOL: 9.4, 11.4)
Students will discover why the overuse of groundwater has been described as a non-renewable resource that is being "mined". Wetlands will be described and students will see what makes wetlands awesome natural wonders. Activities and demonstrations will discuss their watershed address, and suggestions for the quality and quantity of water preservation will be discussed.
Vocabulary Introduced:
Solid Waste, Natural Resources, Storm Drain, Runoff, Nonpoint Source Pollution, Groundwater, Water Conservation, Wetlands, Riparian, Watershed Address
Equipment Needed: **Overhead Projector, VCR**

How Much is 6000 cubic km of Water?
(Science SOL BIO.9, CH.1, CH.6, PH.4, Mathematics SOL: A.10, English SOL: 9.4, 11.4)
Students will discover that the water cycle is the most impressive geothermal cycle on earth. The transfer and storage of water on a global scale gives the appearance of an abundance of water,
but with only 1% available for people, plants, and animals we need to be extremely careful in
managing Earth's water resources. Activities and demonstrations will address the causes of water pollution and suggestions for the quality and quantity of water preservation will be discussed.
Vocabulary Introduced: **Solid Waste, Natural Resources, Storm Drain, Runoff, Nonpoint Source Pollution, Water Conservation, Watershed Address**
Equipment Needed**: Overhead Projector, VCR**

Stream School
(Science SOL 6.5, 6.7, LS.7, LS.10, LS.12, ES.7, ES.9, ES.11, BIO.3, BIO.9, CH.1)
Students will participate in a field trip experience at a local stream to identify macroinvertebrates
and perform chemical tests. This will enhance their understanding of the factors involved in
determining water quality, and the connection between point source and non-point source
pollution in their waterways.
Vocabulary Introduced: **Riparian Corridor, Litter, Erosion, Point Source Pollution, Nonpoint**
Source Pollution, Macroinvertebrates
Equipment Needed: Old sneakers or water shoes/boots

Environmental Jeopardy and Water Jeopardy
(Science SOL ES.7, ES.9, ES.11, BIO.5, BIO.8, BIO.9, PH.8)
Students will examine aspects of environmental issues, and then play a fun interactive game
reviewing what they have learned. Four different topics to choose from (***choose one***) are *Energy,*
Solid Waste, Ecological Footprint, or Water.
Vocabulary Introduced: Energy, Natural Resources, Renewable Resources, Litter, Solid Waste,
Recycle
Equipment needed: *None*

Oceans of Trash
(Science SOL ES.7, ES.9, ES.11, BIO.5, BIO.8, BIO.9)
A 35 mm slide presentation and discussion review of Roanoke Valley's connections to the ocean
and ocean characteristics. Marine debris is a health hazard, presenting a threat for entanglement by marine mammals and aquatic life.
Vocabulary Introduced: *Salinity, Estuary, Riparian*
Equipment Needed: Slide projector/ Screen (or blank wall), Overhead Projector

Watershed Connections
(Science SOL ES.7, ES.9, ES.11, BIO.3, BIO.9)

A 35 mm slide presentation and discussion will examine watersheds and determine the problems associated with erosion, pollution, and litter.
Vocabulary Introduced: *Riparian Corridor, Litter, Erosion*
Equipment needed: *Screen, Electrical Outlet*

Plants Eat Bad Chemicals
(Science SOL ES.2, ES.7, ES.9, BIO 9)
The students will learn about the process of Phytoremediation, where plants remove, transfer, stabilize or destroy contaminants in soil and groundwater. Through classroom demonstrations the students will observe groundwater and soil contamination as a result of chemicals accumulating in soil and water, and review plant anatomy.
Vocabulary Introduced: *Phytoremediation, Groundwater, Transpiration, Contamination, Infiltration, Riparian*
Equipment Needed: *None*

Water: Nature's Recycling System:
(Science SOL ES.2, ES.7, ES.9, BIO.9)
This interactive program takes students through the Water Cycle with emphasis on water management, topography, infiltration, runoff and erosion. Through hands on activities and demonstrations students will discuss these occurrences and how they are influenced by human activities.
Vocabulary Introduced: *Precipitation, Evaporation, Transpiration, Topography, Infiltration, Erosion, Runoff*
Equipment Needed: *None*

Land Use: For the People, the Government, or the Environment?:
(Science SOL: ES.7, ES.11, BIO.5, 8, 9, Government SOL: 12.6, 12.8, 12.10, 12.13, 12.14, 12.15, 12.16)
Students will discover what decisions need to be made when they try to place a school on a tract of land that has many aspects to be considered: citizens, government regulations,
environmental impacts. These decisions will carry costs and benefits, value, and personal choices. Principles to be discussed include: a. scarcity forces choices b. resource management
decisions are made by people acting alone or in groups c. changes in rules and laws alter incentives and decisions d. people value things differently.

Vocabulary Introduced:
Costs and Benefits = positive and negative factors involved as a result of choices
Natural Resources = all the Earth's materials that make other products
Incentives = rewards or punishment for behavior
Hammock = stand of preserved, original trees
Hazardous Waste = waste that is harmful to the environment and people
Groundwater = water found beneath the soil's surface
Water conservation = the careful use and protection of water resources in quantity and quality
Wetlands = landforms that are wet at least part of the year and have a particular type of soil
and plants
Scrub Habitat = area with small trees, bushes or plants that have low moisture
Superfund = underground storage site of hazardous waste on a list to be cleaned up and restored by the government
Watershed address = area you live in that drains to the nearest creek, stream, or river

Equipment needed: *Overhead projector*

Aluminum (Plastic, or Paper) Recycling
(Science SOL ES.7, ES.11, BIO.5, BIO.9, PH.4)
Students will follow a can to a recycling center and learn about recycling, how it works, why it's important, what they can do to help. Trash can be dangerous when it's not in its proper place: the garbage can or recycling can. Students will keep one piece of litter (aluminum can) in mind as they follow it from the street to a new container or usable item. This program can also substitute "Paper Recycling" or "Plastic Recycling" for the title. Students will see a variety of new materials that were recycled from other materials.
Vocabulary Introduced: *Recycling, Reduce, Reuse, Natural Resources, Machines*
Equipment needed: *VCR*

SCHOOL PROGRAMS SUMMARY 2008-2009

DATE	SCHOOL	EDUCATOR	PROGRAM	#	GRADE
9/11/2008	WILLIAM BYRD HIGH	LINDA BARKER	OCEANS OF TRASH	106	9
9/12/2008	WILLIAM BYRD HIGH	LINDA BARKER	OCEANS OF TRASH	112	9
9/15/2008	WILLIAM BYRD HIGH	LINDA BARKER	OCEANS OF TRASH	140	9,11,12
9/16/2008	WILLIAM BYRD HIGH	LINDA BARKER	OCEANS OF TRASH	91	9,11,12
9/16/2008	WILLIAM BYRD HIGH	LINDA BARKER	OCEANS OF TRASH	91	9,11,12
10/17/2008	CAVE SPRING	LINDA BARKER	STREAM SCHOOL	90	3
10/17/2008	NEW LIFE CHRISTIAN	BETH WALTON	WATERSHEDS TO OCEANS	21	4
10/23/2008	HIDDEN VALLEY HIGH	LINDA BARKER	STREAM SCHOOL	67	10
10/29/2008	HIDDEN VALLEY HIGH	LINDA BARKER	STREAM SCHOOL	99	10
12/12/2008	FORT LEWIS ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	42	5-12
1/5/2009	WILLIAM BYRD HIGH	LINDA BARKER	AFTER THE STORM	77	11-12
1/5/2009	WILLIAM BYRD HIGH	LINDA BARKER	AFTER THE STORM	78	11-12
1/6/2009	CAVE SPRING ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	101	5
1/6/2009	CAVE SPRING ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	100	5
1/8/2009	WILLIAM BYRD HIGH	LINDA BARKER	AFTER THE STORM	76	11-12
1/8/2009	WILLIAM BYRD HIGH	LINDA BARKER	AFTER THE STORM	77	11-12
1/20/2009	CENTRAL MIDDLE	LINDA BARKER	DRAINS TO RIVERS	25	6
1/30/2009	MOUNT PLEASANT ELEMENTARY	BETH WALTON	WATERSHEDS TO OCEANS	67	5
2/3/2009	FORT LEWIS ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	33	5
2/4/2009	CLEARBROOK ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	34	5
2/9/2009	CAVE SPRING HIGH SCHOOL	LINDA BARKER	WATERSHED CONNECTIONS	106	9
2/19/2009	BONSACK ELEMENTARY	BETH WALTON	WHO POLLUTED THE RIVER?	90	3
2/20/2009	CAVE SPRING HIGH SCHOOL	LINDA BARKER	WATER: NATURE'S	104	
2/24/2009	CENTRAL MIDDLE	LINDA BARKER	OCEANS OF TRASH	26	
2/28/2009	BURLINGTON ELEMENTARY	BETH WALTON	WATERSHEDS TO OCEANS	87	4

SCHOOL PROGRAMS SUMMARY 2008-2009 (CONT'D)

3/4/2009	OAK GROVE ELEMENTARY	LINDA BARKER	WHO POLLUTED THE RIVER?	85	K
3/6/2009	OAK GROVE ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	90	5
3/9/2009	MOUNT PLEASANT ELEMENTARY	BETH WALTON	WHO POLLUTED THE RIVER?	60	1
3/17/2009	CENTRAL MIDDLE	LINDA BARKER	STORM DRAIN STENCILING	26	
3/18/2009	BURLINGTON ELEMENTARY	BETH WALTON	WATERSHEDS TO OCEANS	90	5
3/19/2009	WILLIAM BYRD MIDDLE	LINDA BARKER	OCEANS OF TRASH	100	
3/20/2009	WILLIAM BYRD MIDDLE	LINDA BARKER	OCEANS OF TRASH	205	
3/23/2009	FORT LEWIS ELEMENTARY	LINDA BARKER	WHO POLLUTED THE RIVER?	34	K
3/23/2009	GREEN VALLEY ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	61	
3/23/2009	MASON COVE ELEMENTARY	BETH WALTON	WHO POLLUTED THE RIVER?	36	K
3/23/2009	MASON COVE ELEMENTARY	BETH WALTON	WATERSHEDS TO OCEANS	37	4
4/2/2009	GLENVAR ELEMENTARY	LINDA BARKER	WATERSHEDS TO OCEANS	66	4
4/6/2009	GLENVAR ELEMENTARY	LINDA BARKER	WHO POLLUTED THE RIVER?	69	2
4/18/2009	CLEAN VALLEY DAY	CVC	PUPPETS WITH PIZZAZ	25	
4/22/2009	BONSACK ELEMENTARY	BETH WALTON	WATERSHEDS TO OCEANS	69	4
4/22/2009	CAVE SPRING ELEMENTARY	LINDA BARKER	WATERSHEDS TO OCEANS	46	4
4/24/2009	BACK CREEK ELEMENTARY	LINDA BARKER	WATERSHEDS TO OCEANS	57	4
4/25/2009	QUEST AT ROANOKE RIVER	LINDA BARKER	STREAM SCHOOL	10	6-8
4/29/2009	MOUNT PLEASANT ELEMENTARY	BETH WALTON	WATERSHEDS TO OCEANS	65	4
4/29/2009	PENN FOREST ELEMENTARY	LINDA BARKER	WATERSHEDS TO OCEANS	110	4
5/4/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	DRAINS TO RIVERS	25	6
5/7/2009	OAK GROVE ELEMENTARY	LINDA BARKER	WATERSHEDS TO OCEANS	44	4
5/8/2009	OAK GROVE ELEMENTARY	LINDA BARKER	WATERSHEDS TO OCEANS	46	4
5/12/2009	CAVE SPRING ELEMENTARY	LINDA BARKER	WATERSHEDS TO OCEANS	40	4
5/12/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	DRAINS TO RIVERS	19	6
5/12/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	ENVIRONMENTAL JEOPARDY	19	6

SCHOOL PROGRAMS SUMMARY 2008-2009 (CONT'D)

5/13/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	DRAINS TO RIVERS	28	6
5/13/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	ENVIRONMENTAL JEOPARDY	28	
5/14/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	DRAINS TO RIVERS	109	6
5/14/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	ENVIRONMENTAL JEOPARDY	44	6
5/18/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	DRAINS TO RIVERS	26	6
5/18/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	ENVIRONMENTAL JEOPARDY	26	6
5/20/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	DRAINS TO RIVERS	26	6
5/20/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	ENVIRONMENTAL JEOPARDY	26	6
5/21/2009	BENT MOUNTAIN ELEMENTARY	LINDA BARKER	OCEANS OF TRASH	10	5
5/21/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	DRAINS TO RIVERS	26	6
5/21/2009	HIDDEN VALLEY MIDDLE	LINDA BARKER	ENVIRONMENTAL JEOPARDY	26	6
6/17/2009	CUB SCOUT DAY CAMP	LINDA BARKER	WATER: NATURES	36	1-3
6/17/2009	CUB SCOUT DAY CAMP	LINDA BARKER	REELING IN RUNOFF	38	4-5
6/18/2009	CUB SCOUT DAY CAMP	LINDA BARKER	ENVIRONMENTAL BINGO:WATER	88	1-5

STUDENTS REACHED 4011
SCHOOLS VISITED 20

BMP 1-6: ROANOKE COUNTY STORMWATER WEBPAGE VISITORS

STORMWATER WEBPAGES

	PAGE	#	%
1	STORMWATER MANAGEMENT	3730	17.7%
2	NPS POLLUTION	2604	12.4%
3	FLOODING IN ROANOKE COUNTY	1717	8.2%
4	PALM VALLEY STREAMSIDE PLANTING	1182	5.6%
5	WHAT ARE WE PROTECTING	1168	5.6%
6	STORMWATER NETWORK STRUCTURES	1147	5.5%
7	LOCAL PROJECTS	1028	4.9%
8	GARST MILL STREAM RESTORATION	908	4.3%
9	FLOODPLAIN MANAGEMENT	900	4.3%
10	ROANOKE COUNTY WATERSHEDS	899	4.3%
11	STORMWATER CONTACTS	859	4.1%
12	PROPERTY PROTECTION	848	4.0%
13	ELEVATION CERTIFICATE	844	4.0%
14	VOLUNTEER OPPORTUNITIES	828	3.9%
15	MISSION	805	3.8%
16	HIDDEN VALLEY STORMWATER REGIONAL FACILITY	773	3.7%
17	STORMWATER RESOURCES	795	3.8%
	TOTAL VIEWS	**21,035**	

BMP 1-7: BUSINESS EDUCATION PROGRAM

	FIRM	CONTACT	STREET ADDRESS	CITY	ST	ZIP
1.	**Star City Developers**	Chad McGhee	PO BOX 159	Cloverdale	VA	24077
2.	**Wolf Creek Inc.**	Elmer Craft	PO BOX 481	Vinton	VA	24179
3.	**Osterhoudt, Prillaman, Natt, Helcher, Yost, PLC**	Edward A. Natt, Esq.	3140 Chaparral Drive, Suite 200-C	Roanoke	VA	24018-4370
4.	**Oaks Development Corporation**	William Cranwell	1480 South Main Street	Blacksburg	VA	24060
5.	**Roanoke County School Board**	Chris Lowe	Roanoke County Public Schools 5937 Cove Rd.	Roanoke	VA	24019
6.	**Feather Gardens Association**	David Justis	2400 Feather Garden Circle, ,	Vinton	VA	24179
7.	**Woodhill Corporation**	T. D. Steele	210 1st. St. SW #510	Roanoke	VA	24011
8.	**Brookfield Association**	Larry Bartlett	3005 Valley Stream Drive	Roanoke	VA	24014
9.	**F W Finney Construction Corporation**	Fred Finney	PO BOX 13	Vinton	VA	24179
10.	**Hollins University Board of Trustee**	Kerry Edmonds	Hollins University,	Roanoke	VA	24020
11.	**Musselwhite and Associates**	Charles Tull	102 North Mitchell,	Vinton	VA	24179
12.	**Springwood Park Owners Association**	Doug Freeman	3214 Electric Rd., SW Ste. 200	Roanoke	VA	24018
13.	**Mattern & Craig**	Tom Austin	701 1st Street, SW,	Roanoke	VA	24016
14.	**Parker Design Group**	Sheldon Bower	816 Roanoke Blvd	Salem	VA	24153
15.	**Caldwell White Associates**	Frank Caldwell	4203 Melrose Ave	Roanoke	VA	24017
16.	**Hill Studio PC**	Charlie Craig	120 Campbell Ave	Roanoke	VA	24016
17.	**Degen Architects**	Larry Degen	3536 Brambleton Ave	Roanoke	VA	24018
18.	**Pierson Engineering & Surveying**	Kim Dooley	P.O.Box 311	Daleville	VA	24083
19.	**Providence Engineering**	Shawn Goldsmith	819 Naff Road	Boones Mill	VA	24065
20.	**Lumsden Associates**	Lee Henderson	4664 Brambleton Ave	Roanoke	VA	24018
21.	**Jerome Henschel PC**	Jerome Henschel	1317 Peters Creek Road	Roanoke	VA	24016
22.	**Lumsden Associates**	Tim Hoezle	4664 Brambleton Ave	Roanoke	VA	24018
23.	**Balzer & Associates**	Sean Horne	1208 Corporate Circle	Roanoke	VA	24018
24.	**Jones & Jones Assoc. Arch, PC**	Jyke Jones	6120 Peters Creek Road	Roanoke	VA	24019
25.	**HSMM**	Rich McDearmon	1315 Franklin Road, SW	Roanoke	VA	24016
26.	**LMW Engineering**	Douglas Merredith, Jr.	102 Albemarle Ave, SE	Roanoke	VA	24017
27.	**Gay and Neel, Inc.**	John Neel	328 Mountain Avenue	Roanoke	VA	24016
28.	**Mr. David Perfater**	David Perfater	5935 Monet Drive	Roanoke	VA	24018
29.	**Pierson Engineering & Surveying**	Rodney Pierson	P.O. Box 311	Daleville	VA	24083
30.	**Kinsey & Shane & Associates**	Butch Traylor	201 West Main Street	Salem	VA	24153
31.	**Spectrum Design, PC**	Cassndra Van-Hyning	10 Church Ave, SE	Roanoke	VA	24011
32.	**Draper Aden Associates**	Larry Wallace	2206 South Main Street	Blacksburg	VA	24060
33.	**LMW Engineering**	Chris Waller	102 Albemarle Ave, SE	Roanoke	VA	24017
34.	**Engineering Concepts**	Bobby Wampler	P.O. Box 619	Fincastle	VA	24090
35.	**LMW Engineering**	Richard White	102 Albemarle Ave, SE	Roanoke	VA	24017
36.	**Hughes Assoc. Architects**	Mike Woolwine	656 Elm Ave, SW	Roanoke	VA	24016
37.	**ACS Design**	Wayne Wilcox	2003 Peters Creek Road	Roanoke	VA	24017
38.	**Balzer & Associates**	Joey Judy	1208 Corporate Circle	Roanoke	VA	24018
39.	**Hill Studio PC**	David Hill	120 Campbell Avenue	Roanoke	VA	24011
40.	**ACS Design**	Dan Early	2003 Peters Creek Road	Roanoke	VA	24017
41.	**Balzer & Associates**	Craig Balzer	1208 Corporate Circle	Roanoke	VA	24018
42.	**Lumsden Associates**	Kirk Lumsden	4664 Brambleton Ave	Roanoke	VA	24018

BMP 2-3: CITIZENS ADVISORY COMMITTEE MEETINGS

September 10, 2008 Meeting Agenda
September 10, 2008 Meeting Minutes

May 27, 2009 Meeting Agenda
May 27, 2009 Meeting Minutes

Stormwater Committee Questionnaire

AGENDA
Citizen's Stormwater Advisory Committee –Phase Two
Wednesday, September 10, 2008- 6:00 pm
Jefferson Center
L L Rice Room 2nd Floor
Roanoke, VA

I. Opening/sign in

II. Supper

III. Agenda Amendments

IV. Unfinished Business

V. Information

Adjournment (Time:_____)

CITIZEN'S ADVISORY COMMITTEE MEETING
STORMWATER MANAGEMENT PROGRAM – PHASE 2

MINUTES FOR WEDNESDAY, SEPTEMBER 10, 2008

Executive Committee and the Citizen's Advisory Committee met at 6PM at the Jefferson Center, 514 Luck Avenue, in the Rice Room on the second floor.

Present: Linda Barker, CVC; Christopher Blakeman, City of Roanoke; Megan Daily, Roanoke County; Mark Garland, City of Roanoke; Anita McMillan, Town of Vinton; Ann Masters, CVC; Kafi Nophlin, Roanoke County; Vince Reynolds, Town of Vinton; Ray Sandifer, Town of Vinton; Shane Sawyer, Roanoke County; George Simpson, Roanoke County; Beth Walton, CVC; Fran Szechenyi, CVC.

Apologies: Maureen Castern, City of Roanoke; Chris Craft, City of Roanoke; Jeffrey Ganthner, Town of Vinton; David Henderson, Roanoke County; Dave Jones, Town of Vinton; Jeannie Keen, Roanoke County; Cary Lester, City of Roanoke; Mike Rakes, City of Roanoke; Pat Rucker, City of Roanoke.

Masters opened the meeting by welcoming everyone and introducing Fran Szechenyi as Norma's replacement. Supper was service by Mary's Party Works.

Amendments to the Agenda: None

Program: Kafi Nophlin, Roanoke County, presented a power point presentation on the **Mudlick Creek Stream Restoration Project at Garst Mill Park.** Nophlin offered an overview of the project by pointing out their goals and objectives, the grant received, problems that they have encountered and overcomed. See attached.

Linda Barker, CVC, reported on her meeting at the Virginia Citizens Water Quality, Charlottesville regarding the findings of the Roanoke River. Topic discussed: Virginia Fish Kills, Smith Mountain Lake Water Quality, Save our Streams, and Major River basins under VDH Fish Consumption Advisories. See attached.

Announcements:
1. Hollins University will hold its E-Waste: business 11/6&7; citizens 11/8.
2. Masters showed sample of the DEQ ruler.
3. Szechenyi gave a recap of the Spring Clean Valley Day.
4. Masters handed out copies of natural cleaning formulas from *Clean & Green*.

AGENDA
Citizen's Stormwater Advisory Committee –Phase Two
Wednesday, May 27, 2009- 6:00 pm
Jefferson Center
L. L. Rice Room 2nd Floor
Roanoke, VA

I. Welcome	Ann Masters
II. Roll Call	Fran Szechenyi
III. Supper	
IV. Water Quiz	Ann Masters
V. Education Reports	Linda Barker
VI. Speaker	Rep: Upper Roanoke River Roundtable Charles E. (C.J.) Mitchem, Jr., P.E. Project Manager Stearns & Wheler, LLC Upper Roanoke River Roundtable
VII. Questions	
VIII. Adjournment	

CITIZEN'S ADVISORY COMMITTEE MEETING
STORMWATER MANAGEMENT PROGRAM – PHASE 2

MINUTES FOR WEDNESDAY, May 27, 2009

Executive Committee and the Citizen's Advisory Committee met at 6PM at the Jefferson Center, 514 Luck Avenue, in the Rice Room on the second floor.

Present: Linda Barker, Christopher Blakeman, Maureen Castern, Chris Craft, Dave Jones, Cary Lester, Anita McMillan, Ann Masters, Kafi Nophlin, Mike Rakes, Vince Reynolds, Ray Sandifer, Shane Sawyer, George Simpson, Patrick Trout, Fran Szechenyi.

Apologies: Megan Daily, Mark Garland, David Henderson, Jeannie Keen, Pat Rucker, Beth Walton.

Masters opened the meeting by welcoming everyone and introduce Charles (C.J.) Mitchem as our guest speaker. Supper was service by Mary's Party Works.

Amendments to the Agenda: None

Masters gave the committee a water quiz which was provided by the Department of Conservation and Recreation. This was fun activity for the committee.

Education Report:
Linda Barker, CVC, gave Beth Walton's stormwater program reports: September, 2008 to May, 2009; Roanoke City 33 programs, 686 students; Roanoke County 32 programs, 695 students; Vinton 12 programs, 297 students; Private 3 programs, 66 students for a total of 80 programs, 1,744 students.

Barker's stormwater report: 143 programs for 4,069 students. Events included: stormwater stenciling for middle schools in Roanoke City, County and Vinton; Vinton 125th Birthday celebration; Stream Schools for Roanoke County and Vinton; Mudlick Creek Restoration Ribbon Cutting; Eastern Coalfields Regional Roundtable on Watersheds, Breaks, Virginia. Clean Valley Council has 13 stormwater programs. The Water Jeopardy program is a new program that has been added this year. Barker will email to the committee when the date is set for the water stream monitoring after the Mudlick Creek Restoration.

Speaker: Our speaker was Charles E. (C.J.) Mitchem, representative for the Upper Roanoke River Roundtable (URRR). The mission for URRR is to act as a advisory group that identifies and addresses issues of water quality and will make recommendations about appropriate management solutions. Their goals are to identify local, regional, and basin-wide concerns and problems; seek the responsible use, orderly economic development and conservation of our land and water resources; provide input to potential management solutions.
URRR held its first Roanoke River Watershed Conference in 1999 at Explore Park. The first general membership meeting of the Upper Roanoke River Roundtable was held in June 2001 at Virginia Western Community College. They will have their General Membership meeting with the Watershed Conference scheduled for this Fall possibly at Ferrum University. The standing committees are: strategic planning, financial, community engagement, water quality (most active), agriculture and forestry, and river and lake management. The roundtable has been working on several projects in the watershed including a rain garden at the Roanoke wastewater treatment plant, stream restoration on the North Fork at McDonald's Mill, and pet waste stations at local parks and greenways. C.J. pointed out that partnering is invaluable. Current projects: Crave Cove Improvements, Glade Creek Restoration is a collaboration with Trout Unlimited and Orvis (long term project 10-20 years). The following projects are associated with their current VCR grant: Homeowner Fertilizer Phosphorus Reduction Program, City Garden Participation, Pet Waste Collection, Riparian Buffer Restoration, Volunteer Stream Monitor, and Education and Outreach.

Announcements:
Masters will work on setting up another Stormwater Meeting for the end of June at the Arboretum. Information to follow.

Meeting was adjourned at 7:40PM.
Respectfully submitted by Fran Szechenyi.

Submit by Email

Stormwater Citizens Advisory Committee Questionnaire

Citizen Name:

Email:

This questionnaire is being provided to help measure success and improve the content of the presentations for the Stormwater Citizen Advisory Committee. Please respond to the questions in the areas provided.

Roanoke County

Administration Building
5204 Bernard Drive
Roanoke, VA 24018
Phone: (540) 772-2065
Fax: (540) 772-2108
www.roanokecountyva.gov

Question 1: Are you aware that Roanoke County has stormwater regulations required by the Federal Government?

Answer Yes/No

Question 2: Are there issues that you would like to be presented during a future committee meeting?

List Topics

Question 3: Is there anyone that you would suggest to be added to this committee?

List Name and Email/Phone

Question 4: Do you feel that the stormwater committee meetings are useful and informative regarding stormwater management and the quality of the Roanoke River Watershed? If no, please comment at the bottom of this form.

Answer Yes/No

Question 5: How do you feel about the frequency of the stormwater meetings? Do you think we should meet more or less often? Are there other days that would work better for you?

List preferences

Additional Comments

List comments

BMP 3-2: ILLICIT DISCHARGE PROGRAM SCREENING FACTORS

Defining Illicit Discharge Screening Factors for Roanoke County		
Past Discharge Complaints and Reports	Frequency of past discharge complaints, hotline reports, and spill responses per watershed. Any sub-watershed with a history of discharge complaints should automatically be designated as a high risk potential watershed.	• Drainage Crew Interview • County Engineer Interview • Western Virginia Water Authority Interview/Data
Poor Dry Weather Quality	If dry weather quality has been collected for local streams, it can be an extremely useful resource to screen sub-watershed for risk potential. Look for high concentrations of e. coli or high ammonia-nitrogen or conductivity.	• Request monitoring data from DEQ monitored streams. • Research any other monitoring that may be underway in the County.
Density of Industrial NPDES Permits or Generating Sites	The density of NPDES Industrial or other potential pollution generating sites can be a good screening factor. If land use and permit information is available, it can be used to map areas with a high density of industrial discharge or a specific discharge.	• Map all NPDES Industrial permits • Download SIC code handbook from OSHA website to be able to have more detail on the SIC code of permitted industries. http://www.osha.gov/pls/imis/sic_manual.html
Storm Water Outfall Density	The density of outfalls in a sub-watershed is an effective potential screening factor. Those areas that have more than 20 outfalls per watershed mile should be analyzed first. Breakpoints for outfall density can be statistically analyzed based on the frequency across all sub-watersheds.	• Map areas with more than 20 outfalls per watershed mile. • Statistically analyze frequency of outfalls across all sub-watersheds to create breakpoints for analysis.
Age of Sub-watershed Development	The average age of development in a sub-watershed may predict the potential for illicit discharge problems. High risk areas include areas where the original development is over 50 years old.	• Map areas that were developed before 1960. • Map areas that were developed before 1930. • Map areas that were developed before 1900.

Defining Illicit Discharge Screening Factors for Roanoke County (cont'd)		
Presence of Older Industrial Operations	Older industrial areas tend to have a high potential for illicit cross-connections. Sanitary sewers may not have been installed to handle wash water, process water, and other discharge flows when the operation was originally constructed. In the past, storm drains were used to handle non-sewage discharges at older industrial facilities.	• Map areas that are industrially zoned and predate the Clean Water Act (developed before 1972).
Aging or Failing Sewer System	Older and aging infrastructure experiences more leaks, cross-connections, and broken pipes that can contribute sewage to the storm drain system. The key factor to determine is the approximate age of the sewer pipes and their construction materials.	• Talk with WVWA about aging areas. • Look at WVWA GIS data to map sewer system.
Density of Aging Septic System	Sub-watersheds located outside of the sewer service area are presumably served by septic systems. Septic systems more than 30 years old are prone to failure. High risk areas are those where older septic households exceeds 100 per square mile.	• Talk with WVWA about aging septic areas. • Look at WVWA GIS data to map septic areas.

BMP 4-2: EROSION AND SEDIMENT CONTROL CERTIFICATION

E & S CONTROL INSPECTION/PLAN REVIEWER CERTIFICATIONS

Department	Position	# of Employees	Required Certification
Parks and Recreation	Parks maintenance foreman (845)	3	Program Administrator
Parks and Recreation	Parks Crew Leader (842)	6	RLD/Contractor
Community Development	Combination Code Complliance Inspector (308)	6	Inspector
Community Development	Development Review Coordinator (321)	1	Program Administrator
Community Development	Stormwater Operations Supervisor (873)	1	Inspector
Community Development	Stormwater Maintenance Foreman (820)	2	RLD/Contractor
Community Development	Motor Equipment Operator III (703)	3	RLD/Contractor
Community Development	Civil Engineer I (214)	1	Plan Reviewer
Community Development	Civil Engineer II (216)	2	Plan Reviewer

E & S CONTROL INSPECTION/PLAN REVIEWER CERTIFICATIONS

NAME		CERTIFICATION	CERTIFICATE #	EXPIRATION DATE
Atkinson	Bob	Professional Engineer	0402 041822	1/31/2011
Bailey	Jeff	Professional Engineer	0402 0032993	1/31/2011
Simpson	George	Professional Engineer	0402 014167	8/31/2011
Cooper	Matt	Plan Reviewer	497	11/30/2009
Yates	Morgan	Plan Reviewer	458	5/31/2011
Biller	Justin	Combined Administrator	543	5/31/2009
Blankenship	Lindsay	Combined Administrator	690	11/30/2010
Daily	Megan	Combined Administrator	722	11/30/2010
Thompson	Philip	Combined Administrator	698	11/30/2010
Covey	Arnold	Program Administrator	164	11/30/2011
Sowder	Denise	Program Administrator	313	5/31/2010
Altice	Jeff	Inspector	1926	5/31/2010
Bowles	Jimmy	Inspector	2089	11/30/2010
Brokaw	Dan	Inspector	901	5/31/2012
Carroll	Curtis	Inspector	1966	11/30/2010
Carper	Steve	Inspector	1965	11/30/2010
Fowler	Bill	Inspector	3740	11/30/2010
Fuller	RG	Inspector	3848	11/30/2010
Holland	Dale	Inspector	1945	5/31/2010
Peters	Bruce	Inspector	3469	5/31/2012
Waldron	Larry	Inspector	3930	5/31/2011
Wimmer	Randy	Inspector	1934	5/31/2010
Yates	Morgan	Inspector	1929	5/31/2010
Balon	Jeff	Parks Maintenance Supervisor		12/7/2009

BMP 4-3: LAND DEVELOPMENT PROCEDURES REVIEW AND EVALUATION

ROANOKE COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT
DEVELOPMENT REVIEW CHECKLIST

PROJECT NAME: _____

PROJECT NUMBER: _____

ENGINEER: _____

DATE: _____

GENERAL:

_____ ***Vicinity Map showing the location of the site and the surrounding area must be shown.***

_____ ***North Arrow must be shown.***

_____ ***Roanoke County Cover Sheet is required.***

_____ ***Check Bonding Amounts. All public improvements must be included in the site bond.***

_____ ***Show all physical improvements such as buildings, parking lots, access roads, utility construction, etc.***

_____ ***SWPPP Permit must be obtained for any disturbed areas of more than one (1) acre.***

_____ ***Are any DEQ or Army Corps of Engineers jurisdictional waters present? If so, plan must be submitted to the respective agency for review and approval.***

_____ ***Benchmark must be shown on plan.***

_____ ***Topography map with a suitable scale and contour interval.***

STREETS: ***Refer to Roanoke County's Public Street and Parking Design Standards and Specifications and VDOT specifications.***

_____ ***Miscellaneous Construction Standards. (Section 203.00)***

_____ ***VDOT approval required (temporary and/or permanent). (Section 203.01)***

_____ ***Street categories on the plans. (Section 200.09)***

_____ ***Pavement surface shown as asphalt. (Section 200.04)***

STREETS (CON'T):

_____ ***Subdivisions creating > 1500 vpd, additional entrances are required. (Section 200.11)***

_____ ***Reverse frontage shown for streets which are classified as primary/arterial and/or carry in excess of 5,500 vpd as determined by the director. (Section 200.05 and 200.06)***

_____ ***Street connections are aligned opposite of each other or separated a minimum of 200 ft. (Section 200.12)***

_____ ***ROW is extended to boundary where applicable. (Section 200.02)***

_____ ***Curb and gutter shown for all development except for property zoned AG-3 or AG-1. (Section 200.07)***

~~*DRAINAGE*~~ *STORMWATER MANAGEMENT*: ***Refer to Roanoke County Department of Community Development's ~~Drainage Standards~~ Stormwater Management Ordinance and Stormwater Management Design Manual, latest edition(s).***

_____ ***VDOT approval.***

_____ ***Correct peak discharge method used. ~~Drainage maps are submitted outline T_c path, land uses on and off-site.~~ Appropriate run-off coefficients are used. ~~(Section 503.00)~~ (SWM Manual Chapter 4: Stormwater Hydrology)***

_____ ***Drainage Area Map including the following:***

- ***Site and drainage area boundaries.***
- ***Off-site drainage areas.***
- ***Pre- and post- developed land uses with corresponding acreage.***
- ***T_c flow path.***
- ***Existing and proposed topographic features.***

_____ ***Stormwater Narrative describing stormwater management strategy and assumptions.***

_____ ***Minimum 15" dia. culvert shown for entrance conditions. ~~(Section 504.01, Para. B, 1)~~ (SWM Manual Chapter 6: Culverts)***

_____ ***All culverts in drainage easements and storm sewers ~~are concrete~~ shown with appropriate headwall (>36") or end section (</= 36"). ~~(Section 504.01, Para. D and Section 504.04, Para. B, 1 and 2)~~ (SWM Manual Chapter 6: Culverts)***

_____ ***Plan and profiles are shown along with storm sewer and hydraulic calculations. ~~(Section 504.03, Para. D)~~ (SWM Manual Chapter 7: Storm Drains)***

_____ ***Sites which drain in excess of 100 acres, a flood study is submitted and/or is a FEMA studied area, and the minimum finished floors are shown on the plans and plat. Elevation certificate notification on the plans and plat. For flood studies, the engineer should assume off-site developed. Residential buildings minimum 2.0 ft. above base flood elevation and commercial buildings 1.0 ft. above BFE. (Refer to Roanoke County Zoning Ordinance, latest edition, Section 30.74)***

_____ ***A digital version of the HEC-RAS flood study to be supplied to the County. (SWM Manual Chapter 12: Environmentally Sensitive Areas)***

~~DRAINAGE (CON'T):~~

_____ ***For inlets draining less than 100 acres, an easement is shown for the 100 yr. ponding elevation on the plans and plat. ~~(Section 504.01, Para. C, d)~~ (SWM Manual Chapter 3: Easements)***

_____ ***Correct easement widths are shown on the plat. ~~(Section 504.01, Para. E, 5, Section 504.02, Para C, 5, and Section 504.03, Para. D, 5)~~ (SWM Manual Chapter 3: Easements)***

_____ ***Liners, inlet and outlet protection shown on the plans IAW calculations. ~~(0 to 4 fps, grass liner, 4 to 7 fps EC-1, Type A, 7 to 18 fps, calculations determining the minimum liner and stone size required, 18 fps and greater energy dissipater). (Section 504.04, Para. C)~~ (SWM Manual Chapter 5: Open Channels)***

~~STORMWATER MANAGEMENT:~~ ***~~Refer to Roanoke County Department of Community Development's Drainage Standards (DS), latest edition and the Department of Community Development's Design, Construction, and Maintenance~~***

~~***Standards Requirement for acceptance of Stormwater Management Facilities in Single-Family Subdivisions (ORD).***~~

_____ ~~***Drainage map submitted with existing land uses identified for on and off-site, T_c shown for pre- and post- development, and existing land uses correctly identified. (Undeveloped c = 0.35 grass and c = 0.30 for woods.) (DS, Section 503.00)***~~

_____ ***Access easements, min. ~~15~~ 20 ft. width ~~for slopes 0 to 8%, min. 20 ft. width for 8 to 18%, > 18% slope, min. width of 25 ft. (ORD, Para. IV, A).~~ (SWM Manual Chapter 3: Easements)***

_____ ~~***Access roads are paved (Cat I, pavement design) with an approved VDOT***~~

~~***entrance. Min. 12 ft. wide. (ORD, Para. IV, B)***~~ ***All stormwater structures and BMPs shall be accessible by vehicle. Access easements intended to be vehicle accessible shall have a maximum slop of 10 percent for unpaved surfaces and 18 percent for paved surfaces.***

_____ ***Routing shown for 10/2 and 25/10 submitted. ~~(DS, Section 503.03, Para. B)~~ (SWM Manual Chapter 4: Stormwater Hydrology)***

_____ ***Emergency spillway designed to pass the 100 year storm with 1.0 ft. of freeboard. ~~(DS, Section 503.03, Para. B)~~ (SWM Manual Chapter 9: Stormwater Detention)***

_____ ***Easement shown to encompass ~~high water mark and/or 15 ft. outside toe of embankment~~ the 100-year flooding area of all stormwater basins or other holding structures, plus a minimum distance of 20-feet around the facility. ~~Fencing is required if the pond is over 4.0 ft. deep, takes four hours to drain or the interior slopes are steeper than 3 to 1. (DS, Section 505.02, Para. A, 6 and ORD, Para. III)~~ (SWM Manual Chapter 3: Easements)***

_____ ~~***Compaction and testing requirements shown. (ORD, Para. III)***~~

_____ ***Check bonding amounts. ~~(ORD, Para. V)~~ (SWM Ordinance 23-3.5)***

_____ ***Maintenance Agreements and Plans for all Stormwater Management Facilities. (SWM Manual Chapter 14: Maintenance of Stormwater Management Facilities)***

WATER QUALITY

_____ ***Existing and proposed percent impervious cover and subsequent determination of the appropriate land development situation to which the site applies: Situation 1, 2, 3 or 4. (SWM Ordinance 23-5.3)***

_____ ***Technology based criteria: proper selection of BMP based on impervious cover (if applicable). (SWM Manual Chapter 11: Stormwater Pollutant Removal Practices)***

_____ ***Performance-based criteria: pre- and post- developed pollutant load and pollutant removal requirement calculations and worksheets (if applicable). (SWM Manual Appendix 11-A)***

_____ ***Calculation of Water Quality Volume (WQ_V).***

_____ ***Soils investigation including geotechnical report, or boring logs (if applicable).***

_____ ***BMP detail showing all relevant dimensions, and locations of all conveyance system outfalls into basin with pretreatment and outlet protection.***

_____ ***Landscape plan, planting schedule and specifications if chosen water quality BMP incorporates plant material in to the design.***

_____ ***Adequate channel calculations for receiving channel.***

_____ ***Maintenance Agreements and Plans for all Stormwater Management BMPs. (SWM Manual Chapter 14: Maintenance of Stormwater Management Facilities)***

EROSION AND SEDIMENT CONTROL: ***Refer to Virginia's Erosion and Sediment Control Handbook, latest edition, and Roanoke County Erosion and Sediment Control And Steep Slope Development Ordinance Chapter 8.1, as amended***

_____ ***An ESC plan is required if the disturbance is greater than 5,000 sf, if not an agreement in lieu of may be required. (Ch 8.1-6 RCESC)***

An Erosion and Sediment Control Narrative is included and contains the following items (Ch. 6 VESCH):

_____ ***Project description: Briefly describes the nature and purpose of the land disturbing activity, and the area (acres) to be disturbed.***

_____ ***Existing site conditions: A description of the existing topography vegetation and drainage.***

_____ ***Adjacent areas: A description of the neighboring areas such as streams, lakes, residential areas, roads, etc., which might be affected by the land disturbance.***

_____ ***Off-site areas: Describe any off-site land-disturbing activities that will occur (including borrow sites, waste or surplus areas, etc.). Will any other areas be disturbed?***

_____ ***Soils: A brief description of the soils on the site giving such information as soil name, mapping unit, erodibility, permeability, depth, texture and soil structure.***

_____ ***Critical areas: A description of the areas on the site which have potentially serious erosion problems (e.g. steep slopes, channels, wet weather/underground springs, etc.)***

_____ ***Erosion and sediment control measures: A description of the methods which will be used to control erosion and sedimentation on the site (Must meet Chapter 3 VESCH).***

_____ ***Permanent stabilization: A brief description, including specifications, of how the site will be stabilized after construction is completed.***

_____ ***Stormwater runoff considerations: Will the development site cause an increase in peak runoff rates? Will the increase runoff cause flooding or channel degradation downstream? Describe the strategy to control stormwater runoff.***

EROSION AND SEDIMENT CONTROL (CON'T):

_____ ***Calculations: Detailed calculations for the design of temporary sediment basins, permanent stormwater detention basins, diversions, channels, etc. Include calculations for pre- and post-development runoff.***

_____ ***Note to be included in ESC Plan:***

The location of all off-site fill or borrow areas associated with the construction project will be provided to Roanoke County Department of Community Development. An Erosion Control Plan or measures may be required for this area.

The following Minimum Standards must be met (VESCH Ch 8):

_____ ***MS-1: Temporary and permanent stabilization of denuded areas (Permanent within 7 days for areas at final grade, Temporary for areas not to final for 30 days).***

a) Are practices shown on the plan?
b) Are the limits of clearing and grading shown on the plan?
c) Seed Specifications?

_____ ***MS-2: Protection or stabilization of on-site and off-site stockpiles and borrow areas.***

_____ ***MS-3: Permanent Stabilization of denuded areas not otherwise stabilized.***

_____ ***MS-4: Install E&S Measures as first step in land-disturbing activity.***

_____ ***MS-5: Earthen controls and structures stabilized immediately upon installation.***

_____ ***MS-6: Sediment Traps (less than 3 acres drainage) and basins (greater than 3 acres of drainage).***

a) Are traps/basins properly sized?
b) Are the details shown on the plans?
c) Are the calculations included in the narrative or plan?

_____ ***MS-7: Design and construction of cut and fill slopes to minimize erosion.***

_____ ***MS-8: Concentrated flow down cut and fill must be in adequate channel, flume, or slope drain.***

_____ ***MS-9: Slopes protected from seepage.***

EROSION AND SEDIMENT CONTROL (CON'T):

_____ ***MS-10: Storm sewer inlets must have adequate inlet protection.***

_____ ***MS-11: Outlet protection and channel lining is required prior to operation storm sewer system.***

_____ ***MS-12: Minimize impacts when working in and around live watercourse.***
a) DEQ and/or Army Corps of Engineers permits may be required.

_____ ***MS-13: Temporary vehicular stream crossings for more than 2 trips in 6 months.***

_____ ***MS-14: Other federal, state and local regulations must be met when working in live watercourses.***

_____ ***MS-15: The bed and banks of disturbed watercourses must be stabilized immediately.***

_____ ***MS-16: Utility installations.***

- ***a) No more than 500 feet of open trench at any one time.***
- ***b) Excavated material shall be placed on uphill side of trench.***
- ***c) Effluent of dewatering system must be filtered.***
- ***d) Proper backfill and compaction.***
- ***e) Re-stabilize immediately.***

_____ ***MS-17: Keep paved or public areas clean (Construction Entrances)***

_____ ***MS-18: Temporary measures should be removed with 30 when no longer needed.***

- ***a) Schedule for maintenance***

_____ ***MS-19: Address increases in stormwater volume, velocity, and peak runoff.***

- ***a) Are offsite, contributing areas accounted for?***
- ***b) Are offsite, receiving areas and channels described and adequate***
- ***c) Are calculations included in the narrative or plan and adequate?***

_____ ***The limits of clearing and grading must be shown.***

_____ ***Existing and proposed contours must be shown.***

_____ ***Existing vegetation (trees, grassed areas, or unique vegetation) must be shown.***

EROSION AND SEDIMENT CONTROL (CON'T):

_____ ***Location of all erosion control practices.***

_____ ***The ESC plan should cover all phases of construction. (Ch 8, ESC Plan)***

_____ ***Current ESC detail sheet is included with appropriate bond amounts. (Refer to Roanoke County ESC Ordinance)***

_____ ***A maintenance schedule for the erosion controls measures must be set forth.***

STEEP SLOPE DEVELOPMENT: ***Refer to Virginia's Erosion and Sediment Control Handbook, latest edition, and Roanoke County Erosion and Sediment Control And Steep Slope Development Ordinance Chapter 8.1***

_____ ***Cut slopes or fill slopes shall not be greater than 2:1 (horizontal:vertical), unless a geotechnical report is provided for the proposed slopes.***

_____ ***Cut slopes or fill slopes shall not be greater than 25 vertical feet in height, unless a geotechnical report is provided for the proposed slopes. Cut slopes or fill slopes less than or equal to 3:1 (horizontal:vertical) may exceed 25 vertical feet in height and shall not require a geotechnical report.***

_____ ***For any cut slopes or fill slopes greater than or equal to 2:1 (horizontal:vertical) and greater than or equal to 25 vertical feet in height, as-built plans showing that the finished geometry is in substantial conformity with the design shall be provided to the plan-approving authority.***

_____ ***Fill materials, compaction methods and density specifications shall be indicated on the site development plans. Fill areas intended to support structures shall also be indicated on the site development plans. Compaction test results (per VDOT standards) shall be submitted to the plan-approving authority.***

_____ ***Development plans for all new subdivisions shall show proposed lot grades to ensure positive drainage.***

CONSTRUCTION/FIELD CHANGES:

_____ *Note:* ***None without approval of the Consulting Engineer and Roanoke County.***

_____ ***Any new alignments, change in grades, alternative pipe sizes or manholes will require a new set of plans stamped by the Consulting***

Engineer. County engineers will review plans within one day of submittal. Plan sheets can be 8.5 x 11 if the information is legible.

BUILDING COMMISSIONER:

_____ ***Building footprint***

_____ ***Engineered retaining wall design(s) on civil drawings or attached with submittal***

_____ ***Accessible route(s) & entrance(s) to building per IBC sections 1104 & 1105 & ANSI A117.1 Chapers 4 & 5 by line diagram***

_____ ***All accessible parking spaces/van accessible spaces as required (IBC table 1106.1 & section 1106.5)***

_____ ***Include handicap sign detail VUSBC section 1106.8***

_____ ***Indicate type of material, size & test standard met of all private utility lines (water, sewer, electrical, sprinkler, etc.)***

_____ ***Location of fire department connection, sprinkler post, indicator valve, backflow preventer, etc., where applicable.***

_____ ***If roof stormwater is conveyed through storm sewer, please indicate size & type of material of storm sewer piping. Include stormwater calculations & rainfall rates used to size piping.***

BMP 5-2: STORMWATER MANAGEMENT FACILITY INSPECTION PROGRAM

Old Pond Inspection Standard Operating Procedures

(For Inspectors and Engineers)

STORMWATER POND INSPECTION PREPARATION

(To be completed before inspection protocol is initiated.)

Plans, Plats and Stormwater Maintenance Agreements Search (Engineering)

1. Pond plat, and Pond plans and as-builts search.
2. Download to local folder organized by tax parcel id number
   (T:/Stormwater Management/PondInspection/PARCELID)
3. Create a paper folder organized by tax parcel id number
   Sections: Contact, Correspondence, Inspection, Enforcement, Agreements, Plats & Plans
   (Location to be in front of Audrey's Desk)
4. Create an index linking project name with parcel id so projects may be cross referenced.

STORMWATER POND INSPECTION PROCEDURE

(To be completed on an annual/biannual cycle.)

I. **Contact Property Owner before Inspection (Engineering)**

5. Pond Inspection Notification letter sent and a copy filed.
   ~~*(All letters to be sent out by October 15 of the calendar year.)*~~
6. Stormwater Pond contact form included with letter.
7. Update files with current contact information.
   (HOA contacts can change every two years.)
8. Provisions for meeting owner at the site, if site is locked.
9. If a meeting with a citizen is needed, include inspector to schedule.

II. **Inspection (Inspector or Engineer)**

10. Each person will have a list of ponds that are their responsibility.
    ~~By Inspector region?~~
11. Go to the paper file and pull a hard copy of:
    Plans - Pond Grading Plan and Utilities/Storm Drain Schedule
    Notification Letter - to give to property owners that are unaware of inspection
12. Go to site and fill out **Inspection Checklist**
13. Take digital photographs w/ photo number record for each inspection item.
14. Return **Plans** and **Notification Letter** to file.
15. Update **Contact/Status Sheet** with date of inspection.
16. **Save** digital photos (in file w/ date as the title)
17. **Print** Photos to include in file with inspection checklist.

III. Inspection Letter (Inspector or Engineer) GOOD FACILITY

18. Fill out & sign good pond form letter.
19. Attach inspection checklist and printed pictures.
20. List any additional items requiring correction or monitoring.
21. Send letter to all listed contacts through certified mail.
    (For commercial ponds there could be both a local contact (rentor/storefront contact) and the parcel owner listed as potential contacts.)
22. Indicate a re-inspection date on the Contact sheet in the folder.
    GOOD FACILITY - *(The re-inspection date would be one/two years after the date of the current inspection.)*
    BAD FACILITY - *(The re-inspection date would be 30, 60 or 90 days after the date of the current inspection, dependant on the severity of the problems.)*

BMP 6-1: SPILL PREVENTION AND CONTROL PLANS

Spill Prevention Plan Evaluation

Roanoke County drafted Spill Prevention Plans for County facilities and they were completed on December22, 2003. For the Year 1 of the Roanoke County MS4 Stormwater Permit # VAR040022 these plans are being evaluated to determine areas that need additional information. Below is the listing of each completed Spill Prevention Plan:

Completed Spill Prevention Plans:

County Facility	***SPCC***	***ID Potential***
Clearbrook Fire Station*, Public Safety Building #7*	*2003-2008*	*2009-10*
Public Safety Center*, 3568 Peters Creek Road*	*2003-2008*	*2009-10*
Hollins Fire Station*, Public Safety Building #5*	*2003-2008*	*2009-10*
Fort Lewis Public Safety Building #9*, 3915 W. Main Street*	*2003-2008*	*2009-10*
Cave Spring Fire Station*, 4212 Old Cave Spring Road*	*2003-2008*	*2009-10*

Facilities needing to be reviewed:

County Facility	***SPCC***	***ID Potential***
Masons Cove Public Safetly*, 3810 Bradshaw Road*	*2009-10*	*2009-10*
Hollins Public Safety, *7401 Barrens Road*	*2009-10*	*2009-10*
Catawba Public Safety, *5585 Catawba Hospital Road*	*2009-10*	*2009-10*
Mount Pleasant Public Safety*, 8600 Jae Valley Road*	*2010-11*	*2010-11*
Vinton Public Safety*, 120 W Jackson Avenue*	*2010-11*	*2010-11*
Bent Mountain Public Safety*, 9606 Bent Mountain Road*	*2010-11*	*2010-11*
Back Creek Public Safety*, 7125 Bent Mountain Road*	*2010-11*	*2010-11*
Roanoke County Safety Center, *5905 Cove Road*	*2011-12*	*2011-12*
Read Mountain Public Safety, *Botetourt County*	*2011-12*	*2011-12*
North Roanoke Public Safety Center #1*, Hershberger Road*	*2011-12*	*2011-12*
Cave Spring Rescue Station*, 3206 Valley Forge Avenue*	*22011-12*	*2011-12*
Kessler Mill Service Center*, 1206 Kessler Mill Road*	*2012-13*	*2012-13*
Roanoke County Garage*, 622 South Market Street*	*2012-13*	*2012-13*
Public Safety Training Center*, 6231 Twine Hollow Road*	*2012-13*	*2012-13*
Roanoke County Sheriff's Department *, 401 E Main Street, Salem*	*2012-13*	*2012-13*