



2013  
Fairfax County  
**STORMWATER  
STATUS  
REPORT**



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June 2014



*Photos on cover (from top left): Fish sampling; Wolftrap Creek stream restoration in Vienna, VA; Fish – small mouth bass (*Micropterus dolomieu*) at Water Quality Field Day; Sampling station being serviced – Occoquan; Water Quality Field Day – Woodley Hills School; Tree planting; Stormwater Management Pond – Noman M. Cole, Jr., Pollution Control Plant.  
(photo credit Fairfax County)*

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### *State agencies*

Lake Barcroft Water Improvement District

Virginia Cooperative Extension, Environmental Horticultural Division of Fairfax County

Virginia Department of Conservation and Recreation

Virginia Department of Environmental Quality

Virginia Department of Forestry

### *County agencies*

Department of Planning and Zoning

Fairfax County Park Authority

Fairfax County Public Schools

Fire and Rescue Department, Hazardous Materials Investigative Services Section

Health Department

### *Department of Public Works and Environmental Services*

Building Design and Construction Division

Code Development & Compliance Division

Maintenance and Stormwater Management Division

Site Development and Inspection Division

Solid Waste Management Program

Urban Forest Management Division

Utilities Design & Construction Division

Wastewater Collection Division

Wastewater Planning and Monitoring Division

Wastewater Treatment Division

### *Other government agencies*

Northern Virginia Regional Commission

Northern Virginia Soil and Water Conservation District

### *Private organizations*

Clean Fairfax Council

Earth Sangha

Fairfax ReLeaf

Reston Association

# 1. Introduction

Stormwater runoff is rain and snowmelt that flows across the land and impervious areas such as paved streets, parking lots and rooftops. Stormwater runoff picks up and carries sediments, nutrients, toxic substances, pathogens and other pollutants to lakes, streams, rivers, wetlands and coastal waters. These pollutants have the potential to harm aquatic life, impair recreational uses, and pollute drinking water supplies. Impervious surfaces prevent water from infiltrating into the ground, causing stormwater runoff to enter storm drains. When stormwater runoff reaches high volumes it often results in a surge of stormwater emptying into receiving waters that may severely erode stream banks and damage sensitive stream ecosystems.

Fairfax County is a leader in stormwater management. Fairfax County's Stormwater Management Program supports the water quality goals of the Board of Supervisors' Environmental Agenda, which centers on two principles. These principles are conservation of limited natural resources must be interwoven into all government decisions and that the county must be committed to providing the necessary resources to protect the environment.

This report highlights the accomplishments of the stormwater management program during calendar year 2013:

1. - *Watershed Management Planning*: The Board of Supervisors adopted 13 watershed management plans that cover all 30 of the county's watersheds. The plans encouraged public involvement and provide an assessment of stormwater conditions and recommend protection strategies and improvement projects to be considered.
2. - *Stormwater Capital Projects*: The county and its partners continued to implement stormwater management-related capital projects, including flood mitigation projects, stormwater management facility retrofits, low impact development (LID) projects, stream restoration and stream stabilization projects.
3. - *Operations*: The county maintains and operates its stormwater management facilities and stormwater drainage infrastructure. The county also implements best management practices (BMPs) for guiding new development and redevelopment; operation of county roadways and parking areas; use of pesticides, herbicides and fertilizers on county properties; detection and elimination of sources of illegal discharges; spill response; controlling industrial and high risk runoff; and construction site erosion and sediment control.
4. - *Monitoring and Assessment*: The county conducts water quality monitoring, dry weather screening, wet weather screening, physical habitat evaluations and biological assessment of fish and aquatic macroinvertebrates.
5. - *Public Outreach and Education*: The county continues to partner with local organizations to educate residents about water quality and encourage environmental stewardship.
6. - *Strategic Initiatives*: The county and its partners work proactively to improve the county's stormwater management through the flood response program, MS4 program planning and watershed management planning.

While the Fairfax County Department of Public Works and Environmental Services (DPWES) Stormwater Planning Division (SWPD) compiled the data for this report, implementation of the county's stormwater program is accomplished through the collective efforts of its partners in county and state agencies and private organizations.

## 2. Watershed Management Planning

Starting with the Little Hunting Creek Watershed Management Plan in 2003, the county embarked on a watershed management planning initiative that assessed the needs of the county's 30 watersheds. Thirteen plans covering all 30 watersheds were developed and contain proposed improvements to be considered over the next 25 years. The overarching goals of the watershed plans are:

1. - Improve and maintain watershed functions in Fairfax County, including water quality, habitat and hydrology.
2. - Protect human health, safety and property by reducing stormwater impacts.
3. - Involve stakeholders in the protection, maintenance and restoration of county watersheds.

The following is a list of the plans, the associated watersheds and the dates the plans were adopted by the Board of Supervisors:

1. - Little Hunting Creek Watershed Management Plan (February 2005)
2. - Popes Head Creek Watershed Management Plan (January 2006)
3. - Cub Run and Bull Run Watershed Management Plan (February 2007)
4. - Difficult Run Watershed Management Plan (February 2007)
5. - Cameron Run Watershed Management Plan (August 2007)
6. - Middle Potomac Watersheds Management Plan (May 2008)
  - Included watersheds: Bull Neck Run, Dead Run, Pimmit Run, Scotts Run, and Turkey Run
7. - Pohick Creek Watershed Management Plan (December 2010)
8. - Sugarland Run and Horsepen Creek Watershed Management Plan (December 2010)
9. - Belle Haven, Dogue Creek and Four Mile Run Watershed Management Plan (January 2011)
10. Lower Occoquan Watershed Management Plan (January 2011)
  - Included watersheds: High Point, Kane Creek, Mill Branch, Occoquan, Old Mill Branch, Ryans Dam, Sandy Run, and Wolf Run
11. Nichol Run and Pond Branch Watersheds Management Plan (January 2011)
12. Accotink Creek Watershed Management Plan (February 2011)
13. Little Rocky Run and Johnny Moore Creek Watershed Plan (February 2011)

The plans were developed with the assistance of the community through public meetings and stakeholder group meetings. This public involvement process helped to ensure that the plans met the needs in the watershed and have the support of county residents. Public involvement is encouraged during plan implementation and periodic updates are given to the watershed advisory groups and other public interest groups. The last update presentation was held in November 2012 on implementing the watershed plans and the broader stormwater management program. The presentation is available online at <http://www.fairfaxcounty.gov/dpwes/watersheds>.

The number of structural projects selected for implementation each year is determined as part of the annual budget process. Efforts to include implementation of non-structural projects and policy recommendations from the watershed plans are ongoing.

Each watershed management plan includes a list of proposed non-structural projects, such as stream buffer restorations, rain barrel programs and community outreach and education. The first six plans that were adopted also include more than 300 policy and action recommendations that, when implemented, will improve environmental stewardship in the county's communities and watersheds. These non-

structural projects and policy recommendations, in concert with the structural projects, represent a holistic approach to watershed management.

The non-structural recommendations have been reviewed, categorized by feasibility and consolidated by themes. Project feasibility, MS4 permit compliance, effectiveness and resource needs were considered. Priority will be given to permit-related recommendations, but this will not preclude other recommendations from being implemented. At this time, more than half of the recommendations are categorized as “ongoing”, which means the recommendations have been or continue to be implemented through outreach and education. Additionally, policy-based recommendations are expected to be incorporated as future amendments to the newly adopted Stormwater Ordinance, which becomes effective July 1, 2014, are made and as updates to the Public Facilities Manual (PFM) become available. The Stormwater Ordinance was developed in compliance with the latest Virginia Stormwater Management Program (VSMP) regulations adopted by the state in September 2011.

### 3. Stormwater Capital Projects

The Department of Public Works and Environmental Services (DPWES) stormwater management business area operates and maintains Fairfax County's storm drainage system, often referred to as the municipal separate storm sewer system (MS4). This system is designed to receive and transport stormwater runoff throughout the county. Additionally public stormwater management facilities are designed to affect the quantity and quality of stormwater. These facilities are constructed and retrofitted by multiple county organizations and through partnerships with local and regional organizations.

This section summarizes the capital projects, by type, completed during calendar year 2013.

#### New Construction of Stormwater Management Ponds

There were no new regional stormwater management facilities completed in 2013.

#### Flood Mitigation

Preventing and reducing the impacts of flooding remain high priorities for Fairfax County. Part of the county's approach to flood mitigation consists of constructing site-specific solutions to residential drainage problems. In 2013 DPWES completed nine such projects (Table 3-1).

**Table 3-1: Flood mitigation projects completed in 2013.**

<b><i>Project Name</i></b>	<b><i>Description</i></b>	<b><i>Watershed</i></b>
Blanche Drive	Provided flood mitigation to an areaway adjacent to residential property.	Cameron Run
Overly Drive	Provided flood mitigation to a neighborhood prone to frequent flooding by constructing a channel using natural channel design techniques.	Cameron Run
Luton Place	Provided flood mitigation to residential property that existed adjacent to county storm drainage system.	Dogue Creek
Woodacre Drive	Provided native plantings for flood mitigation and improved water quality.	Pimmit Run
Clover Leaf Drive	Added additional flow openings to minimize flooding.	Difficult Run
Kilmarnock Drive	Added additional flow opening to minimize flooding.	Accotink Creek
Plymouth Road	Converted a manhole to a grate inlet to improve efficiency and minimize flooding.	Little Hunting Creek
Camp Alger Avenue	Converted two grate inlets to yard inlets to improve flow efficiency and minimize flooding.	Cameron Run
Curtis Farm Drive	Converted a grate inlet to a yard inlet to minimize flooding.	Dogue Creek

## Retrofit of Existing Stormwater Management Facilities

Stormwater management facility retrofits are intended to improve water quality and quantity control beyond their original designs. Water quality retrofits enhance nutrient uptake and increase the infiltration, uptake and transpiration of stormwater; while water quantity retrofits help reduce downstream flooding and erosion. Table 3-2 describes selected retrofit projects completed by DPWES in 2013.

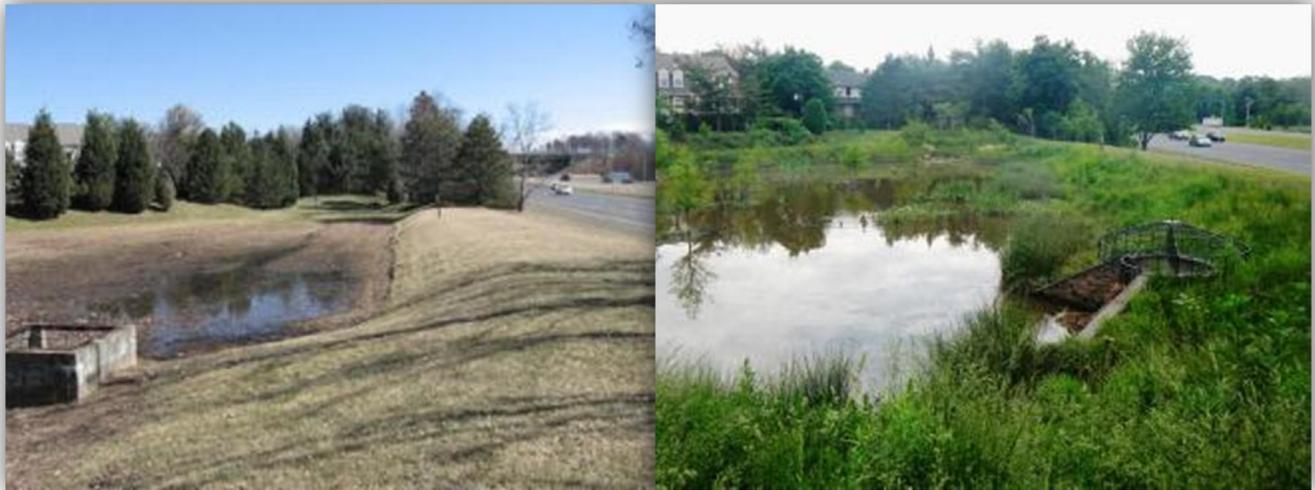


Figure 3-1: Fair Woods pond before (left) and after (right) retrofit. Photos by Fairfax County.

**Table 3-2: Retrofit projects completed in 2013.**

<b>Project Name</b>	<b>Description</b>	<b>Watershed</b>
Autumnwood Park Regional Pond	Retrofitted an existing detention basin for improved water quality benefits by adding constructed wetlands, native woody plantings, and wetland seeding.	Sugarland Run
Brentwood West	Retrofitted an existing detention basin for water quality benefits by adding constructed wetlands, native woody plantings, wetland seeding and a permanent access road.	Popes Head Creek
Fairfax County Landbay C, Pond 4	Retrofitted an existing detention basin for water quality benefits by increasing the storage volume with micropools, sub-surface gravel gallery, native woody planting, and wetland seeding.	Difficult Run
Fair Woods Section 9, Pond 2	Retrofitted an existing extended detention basin for water quality benefits by adding constructed wetlands, native woody plantings, wetland seeding, and a permanent access road.	Cub Run

<b><i>Project Name</i></b>	<b><i>Description</i></b>	<b><i>Watershed</i></b>
Marymead, Section 1 & 2	Retrofitted an existing detention basin for water quality benefits by adding constructed wetlands, native woody plantings and wetland seeding.	Popes Head Creek
Old Gate Court	Repaired approximately 300 feet of an eroded outfall and retrofitted an existing detention basin with a gravel gallery, native woody planting, and wetland seeding for water quality benefits.	Scotts Run
Regional Pond D-31	Retrofitted an existing detention pond for water quality benefits by increasing the storage volume with micro pools, native woody plantings and wetland seeding.	Difficult Run
Royal Court	Detention basin retrofit for water quality benefits by increasing the storage volume with micro pools, native woody plantings, wetland seeding and a permanent access road.	Cameron Run

### **Low Impact Development**

Fairfax County promotes the use of low impact development (LID) practices that provide onsite infiltration, groundwater recharge, and filtration of pollutants. These practices help protect streams and other natural resources by improving hydrologic conditions so as to mimic a natural state. LID projects are used to help the county meet multiple stormwater management goals and provide the following benefits:

- A variety of LID techniques can be used to meet stormwater requirements for new developments or to retrofit developed areas.
- LID projects are often a more viable solution to address stormwater needs if space is limited.
- The visibility and accessibility of certain projects provide opportunities to educate the public on the benefits of LID and can increase awareness of stormwater management.
- Innovative projects provide opportunities for scientific research.
- Residents may often implement and maintain some LID practices on their properties.
- Certain LID practices provide aesthetically pleasing alternatives for stormwater management.

The latest Virginia Stormwater Management Program regulations and the county Stormwater Management Ordinance (Chapter 124) encourage the use of LID practices by crediting the reduction in stormwater volume towards water quality requirements.

### Summary of 2013 Low Impact Development Projects

DPWES, FCPA, various non-profit organizations and individual volunteers contributed to the design and implementation of five projects within the county that incorporated one or more LID practices (Table 3-3).

**Table 3-3: LID projects constructed in 2013**

<b>Project Name</b>	<b>Description</b>	<b>Watershed</b>	<b>Partners</b>
Freds Oak	Constructed a large rain garden and converted parking islands to a series of small rain gardens.	Pohick Creek	DPWES - Wastewater
Glen Forest Replanting	Replanted the Resource Protection Area (RPA) buffer to infiltrate stormwater runoff.	Four Mile Run	NVSWCD
Kings Park West	Dedicated land to the Rabbit Branch Park for environmental and natural resource restoration. Included the removal of impervious area and restoration with native vegetation.	Difficult Run	Community and FCPA
Noman Cole	Retrofitted impervious area with a bio-retention facility.	Pohick Creek	DPWES – Wastewater
South Run Park	Installed pervious pavement and underground detention to an existing parking lot and to a parking lot expansion.	Pohick Creek	FCPA



Figure 3-2: South Run Park permeable pavers. Photo by Fairfax County.

## LID Monitoring Efforts

New LID monitoring efforts began in the fall of 2012 at the recently retrofitted Cinnamon Oaks stormwater facility. The retrofit of this facility is characteristic of the county retrofit methods for older stormwater facilities and can be used to assess the effectiveness of this overall design approach. A regenerative step pool conveyance (RSPC) technique was used at an inlet of the pond to pre-filter stormwater that runs off the streets and yards. The RSPC system consists of a series of basins with different elevations with energy -dissipating rock weirs between the pools and a stone or sand gallery beneath them. The step pool conveyance system is designed to slow incoming stormwater, minimize the physical impact to the retrofitted facility and cool the water by allowing it to travel underground. In addition the stormwater facility itself is designed to slow the movement of the water to the outlet by replacing the straight concrete trickle ditch conveyance path with a series of micro-pools and low dam embankments that meander from the bottom of the step pool conveyance system to the outlet of the facility. The entire area is planted in native plants.

In 2013, Fairfax County continued to collect data at three monitoring stations at Cinnamon Oaks located at both of the inlets to the facility and at the outlet. Each station monitors depth and velocity and is equipped with an automated sampler which collects water samples during rain events. A rain gage is installed in the middle of the stormwater facility on one of the low dam embankments.

The data gathered is used to determine the volume of water entering and leaving the facility. Water quality analysis is performed on the stormwater samples retrieved by the automated samplers at the two inlets and the outlet. The monitoring will assist in determining the percentage of the water retained by the combination of the step pool conveyance system and the series of micro-pools in the facility, and the reduction in the nutrient and TSS (Total Suspended Solids) loads leaving the facility.

Monitoring has concluded at the Fairfax County Government Center facilities; Providence District Supervisor's Office/Fire Station 30 in Merrifield; Cub Run RECenter; and the Herrity Government Center building. Final analyses results are expected in 2014.



Figure 3-3: Cinnamon Oaks stormwater facility before



Figure 3-4: Cinnamon Oaks stormwater facility after

## Stream Restoration and Stabilization

In 2013 the county completed five stream restoration and stream stabilization projects. These are summarized in Table 3-4.

**Table 3-4: 2013 stream restoration and stream stabilization projects**

<b>Project Name</b>	<b>Description</b>	<b>Watershed</b>
Beach Mill	Improvements to stabilize an eroded channel to prevent future flooding and eliminate steep channel banks with a step pool system.	Pond Branch
Loft Ridge	Repaired 176 feet of a severely incised, eroded channel with a step pool system for improved water quality and safety. Included native plants and seeding.	Cameron Run
Sandy Run	Repaired the eroded stream channel with natural channel design.	Sandy Run
Tripps Run	Restored 1,430 feet using natural channel design techniques and native plantings. Erosion was addressed at two outfalls and a tributary to the stream was stabilized.	Cameron Run
Wolftrap Creek	Restored 2,089 feet of stream using natural channel design techniques which included reconnecting the stream-bed to its floodplain.	Difficult Run



*Figure 3-5: Wolftrap Creek stream restoration before (left) and after (right). Photos by Fairfax County.*

## 4. Operations

Fairfax County's stormwater management program is designed to prevent harmful pollutants from entering the municipal separate storm sewer system (MS4) and being discharged into local water bodies. Controlling and managing sources of stormwater pollutants are vital components of the program, and specific actions the county took in 2013 are described in this section

### Inspection and Maintenance of Stormwater Management Facilities

The county's stormwater management facility inventory is valued at more than \$0.5 billion. The Maintenance and Stormwater Management Division (MSMD) of DPWES inspects and maintains all county-owned and operated stormwater management (SWM) facilities and Best Management Practice (BMP) facilities and infrastructure. This includes stormwater dry ponds located in residential subdivisions. MSMD inspects and oversees private maintenance agreements for privately-owned stormwater management facilities. In 2013, MSMD inspected 1,459 of 1,668 county-maintained SWM and BMP facilities and 736 of 3,720 privately-maintained facilities.

Also in 2013, MSMD continued its maintenance program for county stormwater facilities by cleaning and/or mowing 1,364 facilities, 52 of which are regional ponds. Cleaning involves removing trash, sediment and debris from the trash rack, control structure and inflow channels leading to the control structure. At each stormwater management facility, deposited sediment is removed from the trickle ditch upstream from the control structure and deposited offsite. The cleaning helps keep the facility functioning as designed. The county completed 2,760 maintenance work orders on publicly maintained stormwater/BMP facilities. The overall number of work orders in 2013 increased from 2012 due to an increase in maintenance of LID facilities and additional preventative maintenance on county maintained ponds.

MSMD continued a partnership with the Fairfax County Sheriff's Office to use Community Labor Force (CLF) crews to help maintain public low impact development (LID) stormwater facilities. In 2013 The CLF work crews maintained 36 public LID facilities. MSMD staff trained the CLF crews on maintenance techniques. This successful partnership was expanded to include trash removal from public stormwater ponds.

To ensure that dams meet state safety requirements, county staff with expertise in dam design and construction perform annual inspections of 19 state regulated dams that are operated by DPWES. Critical items such as the stability of the dam embankment and the function of the water control structures are addressed on a priority basis. Routine items such as mowing are scheduled five times per year.

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), Northern Virginia Soil and Water Conservation District (NVSWCD) and Fairfax County have worked together to rehabilitate four flood control dams that were constructed in the Pohick Creek watershed during the 1970s and 1980s. New federal and Virginia dam safety regulations required the rehabilitation projects. Three of the four projects have been completed while the last dam (Huntsman Lake) remains under construction. In addition, Stormwater Planning Division (SWPD) staff completed rehabilitative work on one dam (Table 4-1) which is not regulated by the state.

**Table 4-1: 2013 dam rehabilitation and safety projects**

<b>Project Name</b>	<b>Description</b>	<b>Watershed</b>
Reston, Section 24	Rehabilitated the dam. Replaced the principal spillway riser and pipe, repaired a failed emergency spillway, and installed a permanent access road.	Difficult Run

### **Storm Drainage Infrastructure Management**

Fairfax County maintains an inventory of its storm drainage infrastructure as required by its MS4 permit. MSMD implemented an infrastructure management plan in 2002 to verify stormwater management facilities, infrastructure, and associated easements on 436 tax map grids. The effort resulted in geographic information system (GIS) databases of storm sewer pipes, outfalls and associated appurtenant structures.

The infrastructure inventory is continuously updated including routine maintenance of the GIS-based stormwater easement database. During 2013 the GIS database was updated with new as-built plans and field verification of system components within identified easements. More than 115 as-built construction plans were digitized, while continuing efforts to review the inventory's completeness and spatial accuracy resulted in updates to 197 tax map grids.

The county's stormwater conveyance system, valued at more than \$1 billion, includes pipes and storm structures in excess of 80 years old. Based on a pilot study, it is estimated that five percent of the county's storm drain conveyance system is failing and another ten percent exhibits signs of failure. In 2011 DPWES began development of a comprehensive condition assessment program that will eventually support a sustainable rehabilitation program for the county's stormwater infrastructure. In 2013 MSMD continued implementation of its infrastructure inspection and rehabilitation program. Staff inspected more than 13,000 pipe segments and more than 12,000 storm structures with ground surface inspections, video or photo documentation. This effort resulted in 2.3 million linear feet, or one-third of the county's storm drainage network, being photographed or screened for deficiencies in 2013. Of these 2.3 million linear feet, 950,400 linear feet of pipe were videotaped, documenting the existing interior structural and service conditions while the remaining 1,349,600 linear feet were screened by walking the storm system to identify defects from the ground surface. In addition, 19,387 linear feet of storm pipe in the county's inventory were rehabilitated or repaired through replacement or by lining entire pipe segments using cured-in place pipe lining methods (Table 4-2).

### **Roadways**

The Virginia Department of Transportation (VDOT) maintains and operates public roads (interstate, primary, secondary, residential) in Fairfax County. However, the county maintains several miles of discontinuous road segments, many of which are unpaved. A significant component of Fairfax County's roadways program is sweeping parking lots associated with county facilities such as government centers, libraries, public schools, fire stations, police stations, health centers, bus transit facilities, park-and-ride lots, commuter rail stations, public housing facilities and staffed park locations.

To limit the discharge of pollutants from parking lots into streams, the county provides sand and chemical treatment only when dictated by safety concerns. The county sweeps material from each treated parking area once annually during the spring. As part of a continued effort to limit the discharge of pollutants from county facilities, the county developed and finalized Standard Operating Procedures (SOPs) for both Snow Removal Operations and Street Sweeping in 2013. These SOPs are intended to be used county-wide by Fairfax County agencies.

The county's parking lot sweeping program is carried out by three organizations: Department of Public Works and Environmental Services, Department of Housing and Community Development (DHCD), and the Park Authority. DPWES sweeps parking lots at county government and public school sites and paved county road segments. DHCD sweeps parking lots at residential developments such as apartment complexes, townhouse developments, group homes and senior facilities that are owned and operated by DHCD. FCPA plows and/or treats essential use parking areas at staffed park locations and commuter parking lots. In 2013 more than 1,167 cubic yards of material was removed from 140 county government facilities, 182 public school sites, 41 residential sites, 26 essential use areas at parks and 30 county-maintained road segments through sweeper trucks and hand sweeping.

### **Pesticide, Herbicide and Fertilizer Application Program**

County agencies involved in the administration of public rights-of-way, parks and other municipal properties have various forms of nutrient and pest management plans. These are either implemented or put into practice through contractors. County personnel and private contractors follow the Virginia Department of Conservation and Recreation's nutrient management guidelines, the Virginia Department of Agriculture's guidelines, and the Virginia Pesticide Control Act.

Fairfax County Park Authority continued to maintain and monitor riparian buffer enhancement projects installed during the last five years. To date there are 37 projects on parkland throughout the county that are converted from mowed grass to areas of native trees and shrubs typical of riparian areas.

The Park Authority has two Virginia state-certified nutrient management planners on staff, one for parks and a recently certified planner for golf courses. Two nutrient management plans were completed for golf courses in 2013, while five plans are under development. To date FCPA has nutrient management plans for approximately 515 acres of golf courses and 252 acres of natural turf athletic fields with an additional 31 acres managed under an integrated pest management plan. An additional 872 acres of FCPA managed turf do not receive any fertilization or pesticide application, and 188 acres of parkland are operated under nutrient management plans prepared by a Virginia state-certified nutrient management planner from NVSWCD.

The federal and state pesticide laws and regulations require pesticide applicators to be certified for application of restricted-use pesticides. In addition, Virginia law requires all commercial applicators to be certified to use any pesticide. Applicators must renew their pesticide licenses through continuing education every two years. In 2013, Agriculture and Natural Resource Extension agents for the Virginia Cooperative Extension (VCE) conducted programs in pesticide safety and integrated pest management (IPM) throughout Northern Virginia. The program assisted agricultural producers, commercial landscapers and licensed pesticide applicators to comply with the law and protect the environment and human health through the safe and efficient use of pesticides and alternative pest control tactics.

In 2013 VCE trained 542 commercial pesticide applicators for re-certification in Northern Virginia. The trainees provided the following feedback about the experience:

- 96% of participants responding to the survey reported, “I know what I need to do to comply with state and federal laws and regulations.”
- 91% stated, “I’ve learned more about proper use of application equipment (calibration, drift minimization).”
- 97% stated, “I read pesticide labels and use the personal protective equipment (PPE) they require.”
- 85% have gained new knowledge for identifying and controlling ticks and mosquitoes.
- 85% understand how timing affects weeds control options.
- 91% have gained new knowledge to make safe and informed decisions about pesticide use.
- 87% have gained new knowledge for identifying and controlling nuisance mammals.
- 87% have a better understanding of invasive plants and how to manage them.
- 85% understand the legal changes affecting pesticide applicators through the legal update

### **Industrial and High Risk Runoff Facilities**

Staff of the Stormwater Planning Division drafted a standard operating procedure (SOP) to identify and control pollutants in stormwater discharges to the MS4 from Industrial and High Risk Runoff (IHRR) facilities. In 2013 SWPD hired two code specialists and continued program development by conducting preliminary site visits as a test-run of the draft SOP. The preliminary site assessments provided valuable information for the continuing development of the IHRR program and results are being used to further refine the draft SOP.

New educational materials were developed to assist businesses with identifying and controlling stormwater runoff. This information will be provided to facilities managers during inspections.

In 2013, staff of SWPD updated the list of facilities holding Virginia Pollutant Discharge Elimination System (VPDES) permits. There are 40 facilities that are covered under a VPDES general permit and seven facilities covered under a VPDES individual permit that drain to Fairfax County’s MS4.

As part of the process initiated to improve the IHRR inspection program, the county developed a database of all facilities that have the potential to discharge to the MS4. The database of potential dischargers is used and refined to identify those industrial and high-risk facilities that have the potential to contribute a significant pollutant loading to the county’s MS4.

### **Hazardous Materials Spill Prevention and Response**

The Fire and Rescue Department (FRD) Hazardous Materials Response Team (HMRT), when requested by Fire Department first responders, 911 dispatch protocols or the Fire Marshal’s Office, responds to reported incidents of hazardous material releases, spills and discharges in the county (regardless of whether the material has potential to enter the county-operated MS4 or another system, such as VDOT’s). The department maintains and tracks firefighter training/certification under OSHA 29 CFR 1910.120 (q) and NFPA 472. The department’s Fire and Hazardous Materials Investigative Services (FHMIS) personnel receive regular training in pollution prevention and are equipped to initiate spill control measures to reduce the possibility of hazardous materials reaching the storm drainage system. Resources available include personal protective equipment, technical tools and equipment for spill control, and absorbent products such as pads and booms for spill containment. HMIS maintains a contract with a major commercial hazardous materials response company to provide additional containment and clean-up support for large-scale incidents.

In 2013 FHMIS received 579 complaints. Approximately 264 of the complaints involved the actual release of various petroleum or chemical substances. Of the 264 releases, most involved the release of petroleum products including diesel fuel (37), home heating fuel oil (30), gasoline (18), motor oil (28), or hydraulic oil (21). Other releases investigated involved antifreeze, paint, sewage, wastewater discharges, water treatment chemicals and mercury. Storm drains or water ways were involved in 31 of the releases. Documentation of individual releases and the county's responses is maintained by FHMIS.

In both emergency and non-emergency spills that reach the MS4, FHMIS enforces appropriate codes and ordinances to ensure that responsible parties take appropriate spill control and cleanup actions to protect and restore the environment.

Fire and Hazardous Materials Investigative Services section of FRD monitors contaminated sites that have a potential for the contaminant coming in contact with surface waters or stormwater management facilities. As a part of the oversight program, FHMIS, as an agent of the Director of DPWES, accepts, reviews and processes requests to discharge treated groundwater from remedial activities at contaminated sites into county storm sewers. FHMIS then monitors the discharge for the duration of the agreement. In 2013 the Hazardous Materials Technical Support Branch of FHMIS monitored eight oversight cases. Most of these oversight files involve contaminated underground storage tank sites.

The Fire and Rescue Department continued to maintain membership in the Fairfax Joint Local Emergency Planning Committee (FJLEPC), which includes representatives of Fairfax County, the City of Fairfax, and the towns of Vienna and Herndon. FRD periodically updates its Hazardous Material Emergency Response Plan.

### **Illicit Discharge and Improper Disposal**

Inspection and maintenance of the county's sanitary sewers help prevent sewage leaks to the MS4 and waterways. Rehabilitation and repair includes dig-up repairs, manhole rehabilitation and trenchless pipe repair, which uses technologies such as robotic, cured-in-place and fold-and-reformed pipe rehabilitation processes. Programs that help prevent, detect and eliminate illicit entry of sanitary wastes into the MS4 are implemented and documented in the Wastewater Management and Capital Facilities business areas of DPWES.

The Sanitary Sewer Infiltration Abatement Program conducts wastewater flow measurements and analysis to identify areas of the wastewater collection system with excessive inflow/infiltration problems. Additionally the program uses closed circuit television (CCTV) to inspect trunk sewer mains in an effort to specifically identify defective sewer lines for repair and rehabilitation. In 2013, 1,227,280 linear feet of old sewer lines and 46,780 linear feet of new sewer lines were inspected, resulting in the identification of repair and rehabilitation locations. In 2013, 147,307 linear feet of sanitary sewer lines were rehabilitated, bringing the total length of sewer lines repaired since the MS4 permit was issued in 2002 to 1,275,960 linear feet.

The Sanitary Sewer Extension and Improvement Program addresses pollution abatement, public health considerations and provides sanitary sewer services to areas identified by the Health Department as having non-repairable or malfunctioning septic systems. In 2013, four extension and improvement projects were completed: 8,200 linear feet of gravity sanitary sewer; 1,320 feet of low-pressure sanitary sewer including 11 individual grinder pumps; and sanitary sewer connections for 97 existing homes and seven vacant properties.

The Health Department sends flow diversion valve reminder notices to homeowners on the anniversary of the installation of their septic system to remind them to turn their flow diversion valve once a year. The Health Department mailed 14,963 notices in 2013. The notice also reminds homeowners to pump out their septic tank every three to five years. In 2013 the Health Department mailed 1,471 non-compliance letters to owners of homes that had not pumped out their septic tank during the five-year period required in Chapter 68.1 of the Fairfax County Code and the Chesapeake Bay Preservation Area Designation and Management Regulations. If a homeowner fails to comply, a follow-up letter is mailed to them informing them that action will be taken under the regulations to insure their septic tank is pumped out as required.

### **New Development and Significant Redevelopment**

The Comprehensive Plan, as amended through 2013, provides explicit support for better site design and low impact development (LID) measures, and opportunities to implement such measures are explored during the zoning process. A 2010 Area Plan amendment for the Tysons Corner Urban Center included recommendations for attainment of LEED stormwater design credits and retention of at least the first inch of rainfall on-site for zoning applications proposing significant increases in development density/intensity. Plan amendments for the Annandale and Baileys Crossroads Community Business Centers also included recommendations for attainment of the LEED stormwater design credits for some or all development and redevelopment proposals. A more recent Plan amendment for the transit station area near Dulles Airport was adopted in 2013 and included guidelines for optimization of stormwater management for development proposals exceeding a specific threshold of intensity. This Comprehensive Plan guidance helps staff to negotiate for measures such as reductions in proposed impervious cover and LID measures that will serve to reduce stormwater discharges.

The Department of Planning and Zoning (DPZ) provides a full range of environmental reviews, but does not track stormwater efforts independently from other environmental efforts. DPZ accepted and reviewed 68 rezoning and related applications (e.g., amendments), 38 special exceptions and amendments, and 124 special permits and amendments in 2013 for environmental considerations. These zoning processes provide opportunities for negotiations with developers to commitments related to stormwater management and other environmental efforts that go beyond ordinance requirements. Numerous commitments to low impact development practices emphasizing stormwater volume reduction (e.g., stormwater reuse and infiltration of stormwater runoff) have been received through the zoning process.

### **Construction Site Erosion and Sediment Control**

Through the plan review process, DPWES staff enforces the Public Facilities Manual and Subdivision Ordinance criteria related to stormwater for new development and redevelopment. DPWES Land Development Services staff review erosion and sediment control (E&S) plans for compliance with county and state requirements.

In 2013, 856 erosion and sediment (E&S) control plans for projects that would disturb a land area of 2,500 square feet or more were submitted and approved. Written monthly reports listing these individual sites were submitted to the Virginia Department of Environmental Quality (DEQ).

Fairfax County's E&S control program is fully approved by DCR and is implemented by Land Development Services (LDS). In 2013, 23,619 E&S inspections were performed through the county's Alternative Inspection Program on all sites under construction. Those E&S inspections represent 54.5

percent of the 43,305 site inspections that were performed by Site Development and Inspection Division (SDID) personnel. The site inspections total also includes 2,110 projects that were inspected for purposes other than strictly E&S control (e.g., pre-construction, streets, sanitary sewer, storm sewer, and project release).

In 2013, SDID wrote 514 “20/30” E&S control reports, which identify the E&S control deficiencies developers must correct within five days. Failure to comply within the specified time frame can result in issuance of a violation to the developer. SDID issued 68 violations in 2013, 58 of which were later cleared. SDID is working to resolve the remaining ten violations through implementation of required corrections or initiation of court action. SDID held 202 escrows for landscaping or stabilization issues.

Staff of the Land Disturbance and Post Occupancy Branch of LDS investigates complaints of alleged violations of Fairfax County’s Erosion and Sediment Control Ordinance (Chapter 104). Staff also investigates complaints alleging violations of the county’s Chesapeake Bay Preservation Ordinance (Chapter 118). In 2013, there were 250 complaints. In most instances, there was either no violation or there was timely compliance if a violation was cited. Staff issued 23 Resource Protection Area (RPA) violations and 44 land disturbance violations. There were four criminal proceedings to ensure compliance. Ten RPA violations and 27 land disturbance violations are being resolved, while the remaining 26 violations (both RPA and land disturbance) have been addressed.

Residents may report complaints and concerns about erosion and sedimentation to the county by phone or through email. Residents can visit the following web page to find contacts for specific land development issues: [http://www.fairfaxcounty.gov/dpwes/sitedevelopment/land\\_dev\\_concerns.htm](http://www.fairfaxcounty.gov/dpwes/sitedevelopment/land_dev_concerns.htm).

### **Land Conservation Awards Program**

The county sponsors an annual Land Conservation and Tree Preservation Awards program to recognize developers, designers, site superintendents, and contractors whose projects demonstrate an exemplary effort in E&S control and a commitment to tree preservation and planting in Fairfax County. The 2013 program gave awards to seven of twelve project sites nominated in the following categories: large commercial, small commercial, large single family residential, small single family residential, special project and linear project. In addition, two sites were recognized as the best protected environmentally sensitive site of the year, and six sites received awards for tree planting and preservation. An outstanding developer, engineering firm, contractor and superintendent were recognized. County employees were recognized with awards for outstanding E&S county inspectors and outstanding E&S county reviewers.

## Trail Improvements to Address Erosion Issues

Park Authority staff continued to work with partners to minimize water quality impacts from trails in the Resource Protection Areas as described below.

**Table 4-2: 2013 trail improvement projects**

<b>Project Name</b>	<b>Description</b>
Canterbury Woods Bridge Replacement	Replaced a pedestrian bridge in Long Branch Stream Valley that was washed out in flooding caused by Tropical Storm Lee. Restored 50 linear feet of Long Branch stream bank that was severely eroded.
Loop Trail at Lake Mercer in South Run Stream Valley Park	Paved 2,100 linear feet of natural surface trail around Lake Mercer in South Run Stream Valley Park with asphalt, installed a fiberglass bridge, and provided three culvert crossings. The project will stabilize erosion and correct significant drainage problems on this connection from residential neighborhoods to the South Run RECenter.
Wakefield Park Cross County Trail	Improved the cross county trail in Wakefield Park including installation of two new fiberglass bridges over tributaries to Accotink Creek, upgrades to existing eroding sections of a gravel trail, and other drainage improvements that will help stabilize the floodplain and reduce erosion.

## Agricultural Land

Horse-keeping operations are the predominant type of agricultural land use in the county. These are located in the northern, western and southern areas of the county, and range from five to more than 100 acres. Fairfax County's Chesapeake Bay Preservation Ordinance along with the Agricultural and Forestal District Ordinance require land in agricultural use to have a soil and water quality conservation plan. Plans include best management practices to reduce erosion and sediment pollution from pastures and stables, manage excess nutrients from animal waste or fertilizers and address the misuse of pesticides and herbicides. The plans prescribe vegetated riparian buffers for streams known as Resource Protection Areas (RPAs). In 2013, NVSWCD developed soil and water quality conservation plans for 907 acres which included instructions for 1,815 linear feet of new vegetated buffer and 41,458 linear feet of re-planted buffer.

NVSWCD provided technical assistance to four landowners cited for violation of county code and one horse owner cited for violation of the Agricultural Stewardship Act. Technical assistance included stabilization plans for restoring sites that had imported "fill material" (soil) without an approved rough-grading plan. Such stabilization plans included the use of appropriate vegetation, riprap and erosion control blankets.

NVSWCD's *Earth Friendly Suburban Horse Farming* publication, which contains detailed information about site planning, pasture management, non-vegetated heavy use areas, and animal waste

management, was distributed to the horse-keeping community directly, at events and online. The online version of the guide and related articles received more than 15,000 page views in 2013.

The Virginia Department of Forestry (VDOF) assists Fairfax County with the Agricultural and Forestal District Program, which provides tax incentives for landowners with 20 acres or more of land in agricultural and forest management. In 2013, VDOF completed nine agricultural and forestal management plans. Stream management zones were particularly noted on these plans, and efforts were made to include forested riparian buffers between the agricultural lands and streams. The protection of forest cover and water quality were promoted in the plans.

VDOF also writes stewardship plans for forestland owners and neighborhood forest management plans for homeowners and civic associations. These plans include an assessment of water quality issues such as erosion, pet waste and fertilizer use. The Department of Forestry wrote one Forest Stewardship Plan.

## 5. Monitoring and Assessment

Fairfax County oversees a comprehensive monitoring program that includes activities designed to characterize water bodies, identify problems and assess the effectiveness of stormwater controls. This section discusses ongoing monitoring and watershed assessment programs in water quality and stream health administered by the Fairfax County Department of Public Works and Environmental Services (DPWES) and other regional partners.

### Water Quality Monitoring

#### Watershed Monitoring

Two long-term monitoring stations were established in 2005; Station VNA is in a medium to high density residential area in the Accotink Creek watershed and Station OQN is in a low density residential area in the Sandy Run watershed. Station VNA drains 152 acres, and the drainage area has an estimated imperviousness of 25 percent. Station OQN drains 415 acres, and the drainage area has an estimated imperviousness of 10 percent. Automated sampling equipment is used to collect stormwater for water quality analysis. Sampling devices record rainfall amount, flow levels, pH and temperature at timed intervals.

In 2013, storm event sampling continued at the two monitoring sites, Henderson Road in Occoquan (OQN) and Kingsley Avenue in Vienna (VNA), in accordance with Fairfax County's Watershed Water Quality Monitoring Program (2003). Samples were tested for concentrations of nine constituents identified in Attachment A of the permit. Table 5-1 contains the median, high and low concentrations of each of the nine constituents during the eight-year period from 2005 to 2013.

Statistical analyses using the Mann-Whitney 2-sample test were performed to determine if there were significant differences between constituent concentrations at the two stations. In 2013, as in 2012, 2011 and 2010, the analysis found significant statistical differences for concentrations of all of the nine constituents measured at the two sites. In addition, seasonal and annual unit-area constituent loadings for 2013 were calculated and are presented in Table 5-2.

**Table 5-1: Results of statistical analysis to determine if there is a significant difference between observed constituent concentrations at Stations VNA and OQN for 2005 to 2013**

Constituent*	VNA Median	VNA High	VNA Low	OQN Median	OQN High	OQN Low	Differences Statically Significant? **
NH <sub>3</sub> -N	0.18	0.73	0.00	0.00	0.27	0.00	YES
COD	55	292	22	23	122	0	YES
<i>E. Coli</i>	1214	200000	0	583	59100	20	YES
Fecal Strep	6700	129000	100	925	51000	18	YES
NO <sub>3</sub> +NO <sub>2</sub> -N	0.73	1.64	0.16	0.42	0.73	0.10	YES
TDS	122	836	51	100	160	71	YES
TKN	1.73	11.30	0.48	0.60	2.41	0.00	YES
TP	0.30	1.61	0.06	0.06	0.80	0.00	YES
TSS	53	1207	4.9	18	485	1.40	YES

\*All constituent units are mg/l, other than *E. coli* and Fecal Strep which are in colonies per 100 ml.

\*\*Statistical significance was based on a Mann-Whitney 2-sample test at a 0.1 significance level.

**Table 5-2: Computed seasonal and annual unit area constituent loadings at monitored locations for 2013**

Constituent	VNA Winter	OQN Winter	VNA Spring	OQN Spring	VNA Summer	OQN Summer	VNA Fall	OQN Fall	VNA Annual	OQN Annual
NH <sub>3</sub> -N	0.150	0.002	0.155	0.032	0.106	0.007	0.109	0.009	0.519	0.050
COD	42	5	47	20	31	4	96	12	215	41
<i>E. Coli</i>	0.51	0.11	25.06	13.75	92.25	13.33	28.59	7.82	146.41	35.05
Fecal Strep	2.97	0.61	34.77	11.94	69.21	23.76	82.06	7.65	189.01	43.96
NO <sub>3</sub> +NO <sub>2</sub> -N	0.41	0.09	0.54	0.16	0.39	0.10	0.48	0.14	1.83	0.49
TDS	119	25	95	36	45	25	109	40	368	126
TKN	0.99	0.09	2.18	0.46	0.89	0.18	1.07	0.23	5.13	0.96
TP	0.15	0.01	0.18	0.12	0.17	0.02	0.46	0.06	0.96	0.20
TSS	55	3	67	70	62	12	146	29	330	114

\*All loadings are expressed in pounds per acre, except for *E. coli* and Fecal Strep which are in billions of colonies per acre. To compute total loads in pounds or billion colonies, unit-area loading was multiplied by the drainage area of monitoring station in acres

### Dry Weather Screening

In 2013, the county selected 108 MS4 outfalls for dry weather screening in accordance with the general protocol outlined in "Fairfax County Dry Weather Screening Program: Site Selection and Screening Plan," (September 2012). Physical parameters were recorded at each outfall. Water was found to be flowing at 58 of the outfalls, and was tested for a range of pollutants (conductivity, surfactants, fluoride, pH, phenol, copper, and temperature) using field test kits. Of the outfalls tested, ten required follow-up investigations because they exceeded the allowable limit for at least one pollutant. Upon retesting these sites, five continued to exceed the screening criteria, and further testing was conducted in an attempt to track down the source. This track-down procedure used the county's GIS mapping system. A map of the county's storm drainage system was printed from GIS and used to track the storm network upstream of each site. Staff recorded observations of flowing water and surrounding land use, and tested the water where flow was found. This procedure was followed up the network of storm sewer pipes until the source was found or flowing water was no longer found.



Figure 5-1: Sampling a flowing outfall during dry weather screening. Photo by Fairfax County.

Three of the track-downs are being investigated with Fairfax Water as potential water line leaks. One of the leaks has been located while the other two are still under investigation. A fourth track-down identified an illicit connection of the sanitary line serving a set of townhomes to the storm sewer network. The connection was eliminated with the help of Fairfax County's Department of Code Compliance. The fifth track-down was initiated due to high chlorine readings. The source was identified as water line cleaning associated with construction activities at a VPDES permitted construction site. The county's MS4 permit authorizes discharges regulated by a separate VPDES permit. The activity was complete upon arrival to the site and no action was taken.

### **Wet Weather Screening**

Wet Weather Screening was conducted during 2013 using the "Wet Weather Site Selection and Screening Plan" (2006). Two sites were monitored over two storm events. Samples were analyzed for total suspended solids (TSS), turbidity, ortho-phosphorous, total phosphorous, total Kjeldahl nitrogen, nitrate-nitrite, ammonia, chemical oxygen demand (COD), hardness, and total petroleum hydrocarbons. Also the sites were tested for the metals copper, cadmium, lead, zinc, nickel and chromium. These two sites were part of a larger suite of ten targeted sites that were monitored during 12 storm events during an 18-month period between 2011 and 2013. These sites were primarily identified in industrial and commercial areas and were ranked according to their county land use code and potential to contribute pollutants to the MS4.

The water quality analysis indicates that the runoff from the 2013 sites is not a significant source of pollutants to the MS4. Levels of two pollutants, copper and zinc, were elevated in the majority of storms at most of the ten sites throughout the study period. Elevated copper and zinc concentrations are common in urban and suburban runoff (Davis, Shokouhian and Ni, 2001).<sup>1</sup>

### **Biological Monitoring**

#### **Approach**

The Fairfax County biological stream monitoring program includes an annual sampling of fish and macroinvertebrate communities in wadeable, non-tidal freshwater streams. Benthic macroinvertebrates are organisms lacking a backbone, which inhabit the stream bottom and are large enough to be seen with the naked eye. These organisms include aquatic snails, water mites, worms, leeches, crustaceans and many types of insects (both larval and adult forms). These creatures are an integral and critical part of a healthy stream ecosystem and serve many important functions, including forming the core diet of most fishes.

A probability-based site selection sampling methodology was used to identify randomly-selected stream bioassessment locations throughout Fairfax County. These sites were stratified and proportionally distributed throughout the county based on Strahler stream order applied to all perennially flowing streams in Fairfax County. Using this "stratified-random" methodology (probabilistic monitoring) eliminates any site selection bias and is commonly used as a cost-effective way of obtaining a statistically defensible determination of stream conditions at a countywide scale.

<sup>1</sup> Davis, Allen P., Shokouhian M., and Ni, S. 2001. Loading estimates of lead, copper, cadmium, and zinc in urban runoff from specific sources. *Chemosphere, Volume 44, Issue 5, August 2001, Pages 997-1009*

Fifty-two sites were sampled for benthic macroinvertebrates in 2013: 40 sites randomly selected within Fairfax County as part of the annual probabilistic monitoring program; 11 Piedmont reference locations in Prince William National Forest Park; and one Coastal Plain reference site in the Kane Creek watershed of Fairfax County. Of the 40 randomly selected sites, 16 sites were sampled for fish. Multi-metric Indices of Biological Integrity (IBIs) were developed previously for both the aquatic benthic macroinvertebrate and fish communities within Fairfax County.

Countywide biological monitoring is conducted annually using a probabilistic design approach. Using this approach, statistically valid inferences may be made about the condition of the county's streams. Each year, all potential sampling sites are stratified by stream order (first through fifth order) and sites are selected randomly for monitoring. At these sites, samples are collected for both benthic macroinvertebrates and fish (once annually). Water quality and stream habitat characteristics are also evaluated. As more data are collected and compiled, meaningful trends can be inferred with greater confidence. The previous year's annual stream reports are available online at <http://www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm>. Figure 5-2 shows the locations of the 2013 monitoring sites and their respective stream orders.

The biological health of the benthic macroinvertebrate and fish communities is quantified using a multi-metric Index of Biological Integrity (IBI), which numerically rates various functions of the biological assemblage such as pollution tolerance, community diversity, active ecological functions and other characteristics versus reference conditions. An IBI has been developed for macroinvertebrate and fish communities. The macroinvertebrate IBI is applied to all randomly selected sites, while the fish IBI is applied to sites with drainage areas greater than 300 acres (approximately half of the sites). Headwater streams with small drainage areas typically harbor very few fish.

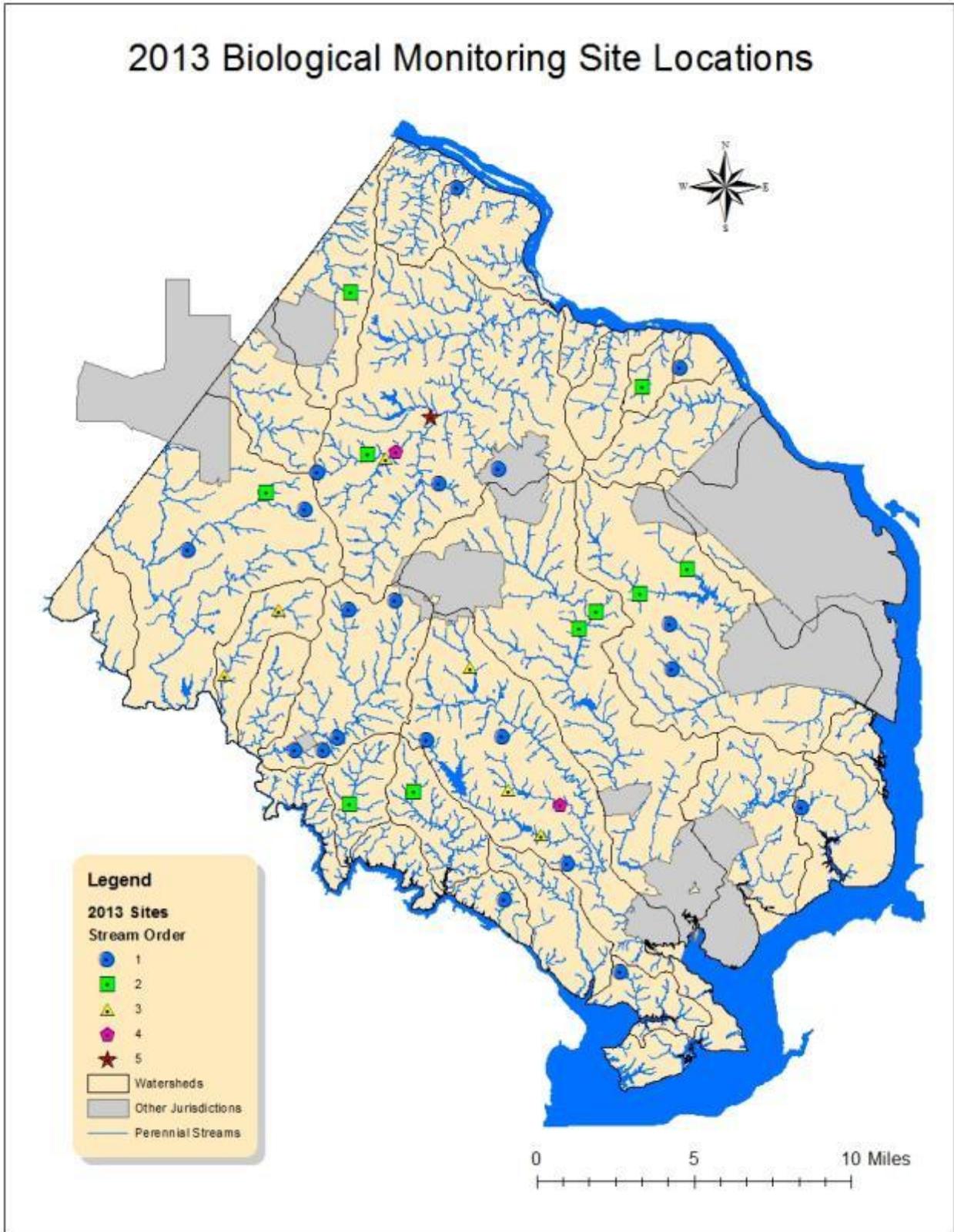


Figure 5-2: Location of 2013 biological monitoring sites

**Results**

Figure 5-3 shows the results of the countywide distribution of macroinvertebrate and fish IBI scores, respectively.

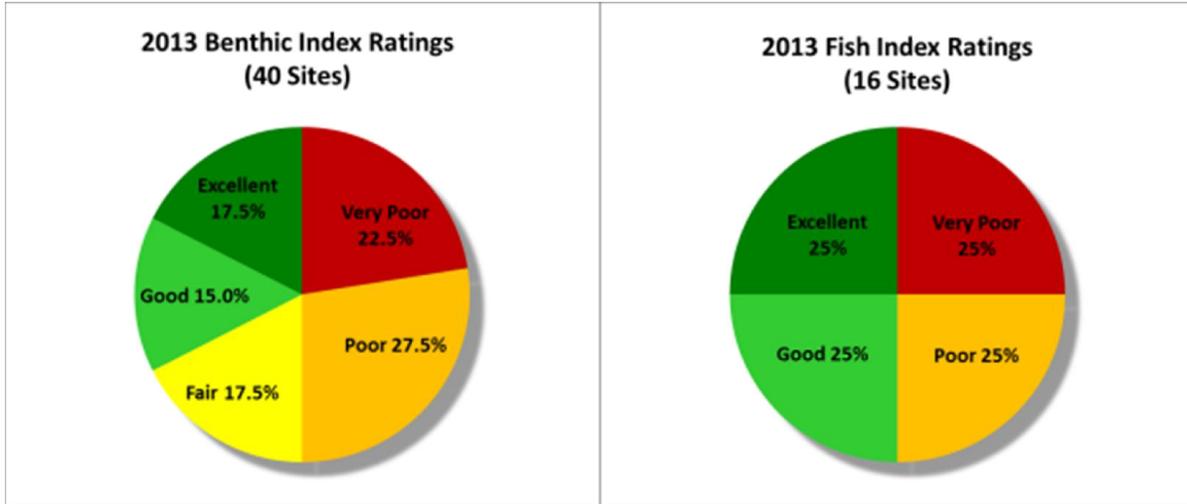


Figure 5-3: Countywide distribution of benthic macroinvertebrate and fish IBI ratings.

IBI results from the 40 randomly selected macroinvertebrate sites suggest that approximately 32.5 percent of the county’s waterways are classified as being in “excellent” or “good” condition while 67.5 percent are classified as “fair,” “poor” or “very poor” based on a decrease in biological integrity of the streams. Of the 16 sites sampled for fish, 50 percent were classified as having fish communities that are in “poor” or “very poor” condition. Over the past ten years, a small increase in the benthic IBI scores has emerged. As future sampling results are added, a trend in biological integrity should begin to emerge. The countywide stream quality index, described in the following sub-section, is a way of tracking and evaluating these conditions over time.

Table 5-3 shows a breakdown (stratified by stream order) of the 2013 biological monitoring results for benthic macroinvertebrates and the scoring ranges for the rating categories. Table 4-4 shows the monitoring results at individual sites.

**Table 5-3: 2013 benthic macroinvertebrate sampling results by stream order**

Stream Order	Number of Samples	Minimum Score	Maximum Score	Standard Deviation	Mean IBI Score	Rating
1	20	12.0	100.0	29.5	52.3	Fair
2	10	16.2	96.4	30.0	41.0	Fair
3	7	8.0	78.6	30.0	40.1	Fair
4 & 5	3	18.7	60.7	21.0	40.3	Fair
ALL	40	8.0	100.0	27.6	47.6	Fair

Rating Category	Score Range
Excellent	80 - 100
Good	60 - 79.9
Fair	40 - 59.9
Poor	20 - 39.9
Very Poor	0 - 19.9

**Table 5-4: 2013 biological sampling results for individual monitoring sites**

Site ID	Watershed	Physiographic Province	Stream Order	Drainage Area in Acres	Drainage area in Miles <sup>2</sup>	Benthic IBI*	Benthic Rating	Fish IBI*	Fish Rating
AC1301	Accotink Creek	Piedmont	2	279.5	0.44	16.2	Very Poor	N/A	N/A
AC1302	Accotink Creek	Piedmont	2	341.4	0.53	16.9	Very Poor	21.4	Poor
CA1301	Cameron Run	Piedmont	1	66.9	0.10	25.2	Poor	N/A	N/A
CA1302	Cameron Run	Piedmont	2	340.9	0.53	19.7	Very Poor	0.0	Very Poor
CA1303	Cub Run	Triassic Basin	2	3182.8	4.97	27.2	Poor	0.0	Very Poor
CA1304	Cub Run	Triassic Basin	1	196.8	0.31	12.0	Very Poor	N/A	N/A
CU1301	Cub Run	Triassic Basin	1	56.7	0.09	22.4	Poor	N/A	N/A
CU1302	Cub Run	Triassic Basin	2	865.0	1.35	23.6	Poor	64.3	Good
CU1303	Cub Run	Triassic Basin	1	32.6	0.05	14.5	Very Poor	N/A	N/A
DE1301	Dead Run	Piedmont	2	445.2	0.70	32.9	Poor	7.1	Very Poor
DF1301	Difficult Run	Piedmont	3	1917.2	3.00	65.1	Good	78.6	Excellent
DF1302	Difficult Run	Piedmont	4	3826.1	5.98	60.7	Good	71.4	Good
DF1303	Difficult Run	Piedmont	1	92.6	0.14	59.3	Fair	N/A	N/A
DF1304	Difficult Run	Piedmont	2	156.3	0.24	29.2	Poor	N/A	N/A
DF1305	Difficult Run	Piedmont	1	106.0	0.17	29.1	Poor	N/A	N/A
DF1306	Difficult Run	Piedmont	1	107.9	0.17	29.5	Poor	N/A	N/A
DF1307	Difficult Run	Piedmont	5	11957.9	18.68	41.6	Fair	64.3	Good
KC1301	Kane Creek	Coastal Plain	1	133.4	0.21	85.7	Excellent	N/A	N/A
LH1301	Little Hunting Creek	Coastal Plain	1	105.7	0.17	100.0	Excellent	N/A	N/A
LR1301	Little Rocky Run	Piedmont	3	1346.3	2.10	55.7	Fair	21.4	Poor
LR1302	Little Rocky Run	Piedmont	3	3635.4	5.68	17.6	Very Poor	92.8	Excellent
OC1301	Occoquan	Piedmont	3	382.3	0.60	78.6	Good	21.4	Poor
OC1302	Occoquan	Piedmont	1	58.7	0.09	76.2	Good	N/A	N/A
PC1301	Pohick Creek	Piedmont	3	1476.2	2.31	8.0	Very Poor	35.7	Poor
PC1302	Pohick Creek	Piedmont	1	39.7	0.06	63.5	Good	N/A	N/A
PC1303	Pohick Creek	Piedmont	1	82.1	0.13	32.0	Poor	N/A	N/A
PC1304	Pohick Creek	Piedmont	3	326.5	0.51	15.3	Very Poor	0.0	Very Poor
PC1305	Pohick Creek	Piedmont	4	2158.4	3.37	18.7	Very Poor	78.6	Excellent
PC1306	Pohick Creek	Piedmont	3	4259.0	6.65	44.2	Fair	85.7	Excellent
PC1307	Pohick Creek	Piedmont	1	175.5	0.27	46.8	Fair	N/A	N/A
PH1301	Popes Head Creek	Piedmont	1	123.7	0.19	34.3	Poor	N/A	N/A
PH1302	Popes Head Creek	Piedmont	1	250.4	0.39	66.6	Good	N/A	N/A
PH1303	Popes Head Creek	Piedmont	1	55.6	0.09	27.1	Poor	N/A	N/A
PH1304	Popes Head Creek	Piedmont	1	67.2	0.11	88.3	Excellent	N/A	N/A
PH1305	Popes Head Creek	Piedmont	1	155.6	0.24	100.0	Excellent	N/A	N/A
PN1301	Pond Branch	Piedmont	1	92.0	0.14	89.4	Excellent	N/A	N/A
SA1301	Sandy Run	Piedmont	2	897.1	1.40	90.0	Excellent	71.4	Good
SU1301	Sugarland Run	Triassic Basin	2	155.7	0.24	57.7	Fair	N/A	N/A
TU1301	Turkey Run	Piedmont	1	70.1	0.11	44.5	Fair	N/A	N/A
WR1301	Wolf Run	Piedmont	2	365.2	0.57	96.4	Excellent	N/A	N/A

\* Benthic and Fish IBI's have a maximum score of 100: Sites with benthic IBI's of N/A had samples that did not produce enough macroinvertebrates to calculate an IBI score. They were automatically given a Very Poor rating. Fish surveys were only conducted at sites with drainage areas greater than 300 acres.

### Stream Quality Index

A number of key indicators have been developed to support the Fairfax County Board of Supervisors' Environmental Agenda. One is used to measure watershed and stream quality. This is known as the Stream Quality Index (SQI). Benthic macroinvertebrate IBI data from the biological monitoring program (based on the probabilistic design approach which began in 2004) were used to develop this indicator.

The number of sites placed in each of five rating categories ("excellent," "good," "fair," "poor," or "very poor" based on the benthic macroinvertebrate monitoring data) was used to develop a stream quality

index value of overall stream conditions countywide. This index value is computed by multiplying the number of sites rated “excellent” by five, those rated “good” by four, those rated “fair” by three, those rated “poor” by two and those rated “very poor” by one, and then taking each of those numbers and dividing it by the number of sites. The values are then summed, resulting in a single numeric index ranging from one to five with a higher value indicating better stream biological conditions. Thus, an SQI value of five would correspond to all streams countywide as being rated “excellent.” An index of 2.5 would indicate that conditions are intermediate between “poor” and “fair” and an index score of one corresponds to “very poor”.

Table 5-5 and Figure 5-4 shows the SQI for all years probabilistic monitoring has been employed. The 2013 SQI shows an increase in overall stream quality from 2012. This index will be reported annually to evaluate long-term trends in the overall health of streams. Over the past nine years of sampling, a very small increase in the SQI has emerged. As more data are reported annually, emerging trends can be identified with greater certainty.

**Table 5-5: Countywide SQI for sampling years 2004-2013 showing percentage of sites in each rating**

Sampling Year	Very Poor	Poor	Fair	Good	Excellent	Index Value
2004	40	30	17	13	0	<b>2.03</b>
2005	15	32.5	32.5	7.5	12.5	<b>2.70</b>
2006	36.4	34	15.9	11.4	2.3	<b>2.09</b>
2007	17.5	32.5	15	20	15	<b>2.83</b>
2008	35	25	17.5	15	7.5	<b>2.35</b>
2009	38	35	15	8	5	<b>2.08</b>
2010	15	40	22	15	8	<b>2.63</b>
2011	17.5	27.5	22.5	20	12.5	<b>2.83</b>
2012	31	31	23	5	10	<b>2.33</b>
2013	23	28	18	15	18	<b>2.80</b>

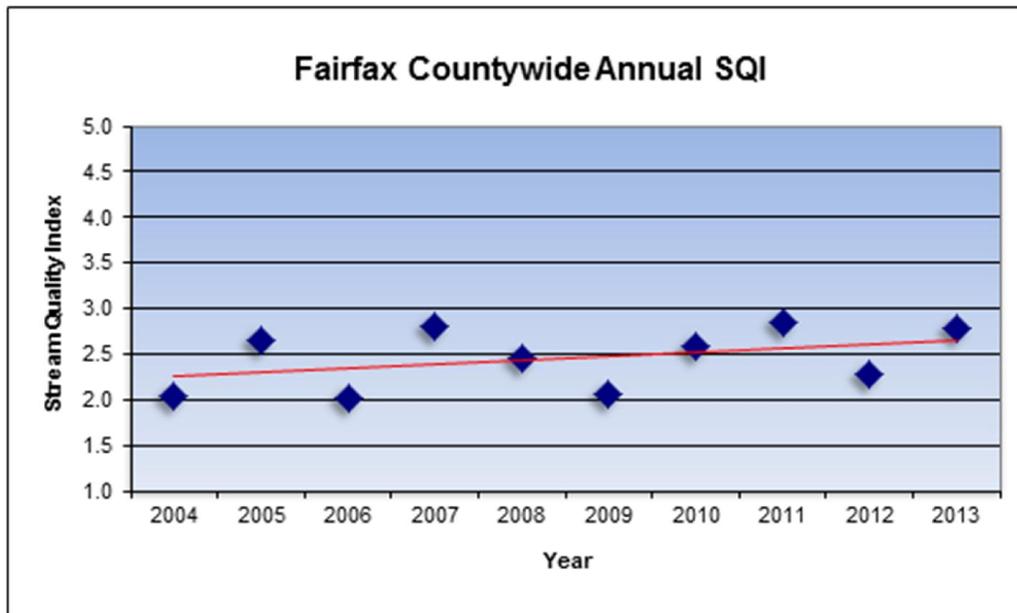


Figure 5-4: Trends in the countywide stream quality index

The benthic IBI was calculated from 2004 to 2007 by comparing data collected in the county against the reference data collected that same year. From 2008 to 2012, the IBI was calculated comparing the cumulative reference data from 2004-2008. With ten years of reference data available, the Benthic IBI is calculated using the cumulative reference data collected over the past ten years. This process will reduce the variability in the IBI created by yearly disturbances to the reference sites (i.e. drought). This change is the reason previous years' reports show different SQIs than the ones shown in Table 5-5.

Table 5-6 presents a summary of biological monitoring data collected countywide since 2004. Results are presented to give a general indication of stream conditions within each watershed. Due to the random site selection methodology employed, some watersheds have not been sampled for benthic macroinvertebrates and/or fish. For general conditions of these particular watersheds, see the 2001 Stream Protection Strategy (SPS) Baseline Study at [http://www.fairfaxcounty.gov/dpwes/environmental/sps\\_main.htm](http://www.fairfaxcounty.gov/dpwes/environmental/sps_main.htm). The data reported in the SPS study were collected in 1999 and watershed conditions may have changed significantly since that time. Additionally, section four of the 2006 annual stream report has detailed watershed condition maps showing the results of county and resident volunteer monitoring data from 1999 through 2005 and can be found at <http://www.fairfaxcounty.gov/dpwes/stormwater/reports.htm>.

**Table 5-6: Overall watershed conditions for sampling years 2004-2013 combined**

Watershed	Number of Benthic Sites	Average IBI	Rating	Number of Fish Sites	Average IBI	Rating
Accotink Creek	30	23.9	Poor	19	31.6	Poor
Belle Haven	4	24.4	Poor	1	7.1	Very Poor
Bull Run	3	50.8	Fair			
Cameron Run	27	28.1	Poor	15	12.9	Very Poor
Cub Run	25	28.7	Poor	18	42.9	Fair
Dead Run	5	28.5	Poor	2	10.7	Very Poor
Difficult Run	89	40.4	Fair	43	51.2	Fair
Dogue Creek	8	30.8	Poor	5	42.9	Fair
Horsepen Creek	6	28.8	Poor	2	21.4	Poor
Johnny Moore Creek	5	46.4	Fair	2	39.3	Poor
Kane Creek	5	67.8	Good	1	42.9	Fair
Little Hunting Creek	8	33.3	Poor	6	22.6	Poor
Little Rocky Run	10	23.1	Poor	4	59.5	Fair
Mill Branch	8	48.6	Fair	3	21.4	Poor
Nichol Run	9	59.3	Fair	1	57.1	Fair
Occoquan	6	83.6	Excellent	1	21.4	Poor
Old Mill Branch	1	74.9	Good			
Pimmit Run	10	16.1	Very Poor	4	5.4	Very Poor
Pohick Creek	61	30.9	Poor	24	55.9	Fair
Pond Branch	7	60.9	Good	2	50	Fair
Popes Head Creek	26	58.1	Fair	11	64.3	Good
Ryans Dam	3	77.2	Good			
Sandy Run	11	68.2	Good	2	67.9	Good
Scotts Run	3	18.4	Very Poor	2	0	Very Poor
Sugarland Run	9	42.5	Fair	5	51.4	Fair
Turkey Run	2	35.7	Poor			
Wolf Run	11	81.4	Excellent	4	37.5	Poor
Fairfax County	392	39.6	Poor	176	42.1	Fair

### Bacteria Monitoring

The Fairfax County Stormwater Planning Division (SWPD) continued its bacteria monitoring program while ensuring that it is consistent with current standards and practices, and uses the most effective procedures. In 2013, SWPD completed its tenth year of the bacteria monitoring program since acquiring it from the Fairfax County Health Department. This monitoring provides information on the general

levels of bacteria in streams, but also is used as a screening tool that can identify areas of concern for further, more intensive investigations of potential sources (e.g. sewer leaks).

As recommended by the U.S. Environmental Protection Agency, the bacterium *Escherichia coli* (*E. coli*) is used by Fairfax County as the water quality indicator for fecal contamination in surface water. To determine levels of *E. coli* in county streams, grab samples of stream water were taken at 40 sites in 16 watersheds throughout the county. Staff collected samples four times during the year.

According to the Virginia Department of Environmental Quality (VDEQ), the following standard now applies for recreational contact with all surface water:

- *E. coli* shall not exceed a geometric mean of 126 per 100 mL of water or exceed an instantaneous value of 235 per 100 mL of water.

The county's analysis is based on the frequency that the level of *E. coli* exceeded the instantaneous threshold of 235. Because there are several methodologies to determine the level of *E. coli* in surface water, each with its own unit (i.e., MPN, CFU), all discussion of *E. coli* concentration will remain unitless at a state level. *E. coli* samples are processed at the Fairfax County Health Department laboratory, using the Colilert® Quanti Tray/2000 by IDEXX and Skalar San++ Analyzer. The upper limit of detection for the Quanti Tray/2000 yields a most probable number (MPN) of 2420. The remaining chemical parameters are recorded in the field using a handheld multi-probe water quality meter.

In 2013, 31 percent of Fairfax County's bacteria monitoring locations were consistently below VDEQ's standard of 235 units per 100 mL of water (Figure 5-5). Fairfax County concurs with officials from the VDEQ and the Virginia Department of Health, who caution that it is impossible to guarantee that any natural body of water is free of risk from disease-causing organisms or injury.

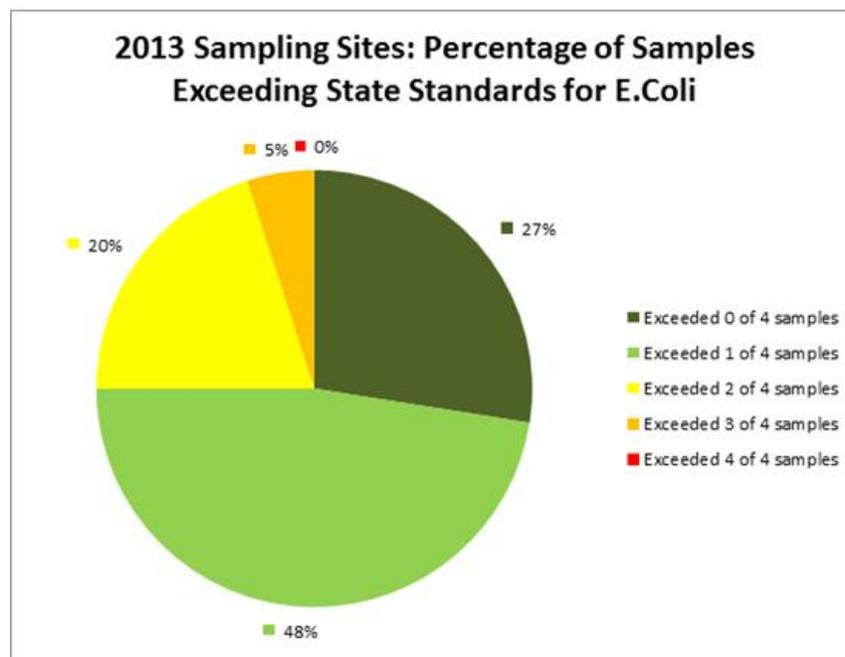


Figure 5-5: Percentage of sites exceeding Virginia's instantaneous water quality standard for *E. coli*.

Based on historical and ongoing bacteria monitoring data, the Fairfax County Health Department issues the following statement related to the use of streams for contact recreation:

- “[A]ny open, unprotected body of water is subject to pollution from indiscriminate dumping of litter and waste products, sewer line breaks and contamination from runoff of pesticides, herbicides and waste from domestic and wildlife animals. Therefore, the use of streams for contact recreational purposes such as swimming, wading, etc., - which could cause ingestion of stream water or possible contamination of an open wound by stream water, should be avoided.”

Past annual reports on Fairfax County Streams and monitoring methods are available on the Stream Quality Assessment Program page located at [www.fairfaxcounty.gov/dpwes/stormwater/streams/assessment.htm](http://www.fairfaxcounty.gov/dpwes/stormwater/streams/assessment.htm).

### USGS Monitoring Network

In June 2007, a joint funding agreement between the SWPD and the United States Geological Survey (USGS) was signed by the Board of Supervisors (BOS). This agreement established a study designed to be an ongoing, long-term (five to ten year) monitoring effort to describe countywide conditions and trends in water quality (e.g. nutrients and sediment) and water quantity. Ultimately, the information gathered will be used to evaluate the benefits of projects implemented under the watershed planning and stormwater management programs.

In July 2012, the BOS approved the expansion of this network to provide wider coverage across the county. Under this scheme, the monitoring network is maximized spatially and established within watersheds having the greatest potential for implementation of watershed improvement projects. The expansion included one automated station and five less-intensely monitored sites.

The monitoring network, designed to fulfill the objectives of the study, will consist of five automated continuous water resources monitoring stations and fifteen less-intensely monitored sites. The first four automated stations were constructed in 2007 and achieved full operational capability in 2008. The fifth station became fully operational in the second quarter of 2013. Instruments at these stations collect stream flow data every five minutes and water quality (water temperature, pH, dissolved oxygen, specific conductance, and turbidity) data every 15 minutes; data are then transmitted via satellite and posted to a USGS web page hourly. These automated stations also capture storm event samples to be analyzed for sediment and nutrient concentrations. Additionally, samples are collected monthly at all twenty sites under various hydrologic conditions and analyzed for the same suite of constituents.

### Water Chemistry Results

#### Temperature (°C)

Minimum.....3.3  
Maximum.....26.6  
Average .....12.1

#### Dissolved Oxygen (mg/L)

Minimum.....3.4  
Maximum.....16.8  
Average .....10.4 -

#### pH (unitless) -

Minimum.....5.4 -  
Maximum.....8.4  
Average .....7.0

#### Specific Conductance (µs/cm)

Minimum.....42  
Maximum.....4,678  
Average .....339

Figure 5-6: Water chemistry results associated with the bacteria monitoring program

Nutrient analyses are conducted by the Fairfax County Environmental Services Laboratory and the suspended sediment analyses are conducted by the USGS Eastern Region Sediment Laboratory.

Data for this study is compiled based on the USGS 'Water Year', which for 2013 runs from October 1, 2012 through September 30, 2013. Samples from the expanded network began on October 9, 2012.

### Continuous Data Collection

- Continuous water quality and stream flow data were collected at the five intensive monitoring stations throughout the water year with no significant interruptions in data collection.
- Stream flow data were collected at five minute intervals, resulting in as many as 105,000 measurements per year.
- Continuous water quality data (water temperature, specific conductance, pH, and turbidity) were collected at 15-minute intervals, resulting in as many as 35,000 measurements per year.
- All data collected can be accessed online at <http://va.water.usgs.gov/projects/goog/fairfax.htm>.

### Discrete Data Collection

- Grab samples were collected monthly at all 20 monitoring stations, resulting in 264 samples collected and analyzed (including QA samples). Water level and water quality parameters were measured at the time of sampling. Samples were further analyzed for nutrients and suspended sediment concentration.
- Storm event samples were collected using automated samplers at the five intensive monitoring stations. These samples were collected in response to elevated turbidity and stream flow conditions during storms, resulting in the collection of 114 samples that were analyzed for the same suite of nutrients and suspended sediment concentration as the monthly grab samples.
- Sixty-five manual stream flow measurements were made across the 20 sites to support the maintenance of the stream flow rating curve for each site.

A report summarizing the data collected at the original 14 station network through the first five years of the study (2007-2012) will be published by the USGS in early 2014. This can be found at: <http://pubs.usgs.gov/sir/2014/5073/>. This report includes calculations of annual nutrient and sediment loads (lbs/year) and yields (lbs/acre/year) from the four watershed stations equipped with fully automated (continuous monitoring) gages. Interpretation of long term water quality trends requires multiple years of data for statistically rigorous evaluation (5-10 years); thus, these analyses are not yet available for this study.

This cooperative study is a progressive and unique effort to characterize conditions in urban and suburban streams. This study is expected to facilitate an understanding of watershed scale responses to management practices, which has yet to be accomplished by other studies in small, urban watersheds.

### Volunteer monitoring

Northern Virginia Soil and Water Conservation District (NVSWCD) continued its volunteer stream monitoring program in 2013. This program supplements the county's stream bio-assessment program. The data collected support the findings of the county's program and help provide trend data. The data alert staff to emerging problems. The program builds awareness of watershed issues among participants. Trained volunteers assess the ecological health of streams using the enhanced Virginia Save Our Streams (SOS) protocol. Monitoring includes biological and chemical aspects and a physical habitat assessment. NVSWCD provides training, equipment, support, data processing and quality control. Data

collected by volunteers are shared with Fairfax County, the VDEQ, Virginia Save Our Streams, and other interested organizations or individuals. The data help confirm findings of biological monitoring performed by county staff, provide information on trends, and may serve as a first alert in areas where the county may monitor only once in five years. Approximately 30 volunteers collected data at 25 sites four times during 2013. Four hundred and thirty five county residents attended stream monitoring workshops and field trips held throughout the county. At each workshop or field trip, biological monitoring was performed and information was presented on stream ecology, stormwater runoff, urban hydrology and watersheds. A monthly *Watershed Calendar*, listing training and other events of interest, was emailed to more than one thousand residents.

Volunteer monitors and monitoring sites that had been part of the former Audubon Naturalist Society's Water Quality Monitoring Program have been integrated into the Volunteer Stream Monitoring Program coordinated by NVSWCD.

Reston Association (RA) is among the organizations that participate in the monitoring program using the SOS protocol, and they submit data on Reston streams to NVSWCD. Ten volunteers, along with RA staff, monitor eleven sites.

Staff of several FCPA resource management sites participates in the county stream quality monitoring program. They train and sponsor citizen volunteer monitors at Riverbend Park and Ellanor C. Lawrence Park. Five nature centers and an imbedded naturalist at Cub Run RECenter provide water quality and environmental education to park visitors each year.

### **Virginia Department of Environmental Quality List of Impaired Waters in Fairfax County**

In early 2012 the Virginia Department of Environmental Quality (VDEQ) released its draft summary of water quality conditions in Virginia from January 1, 2005 to December 31, 2010. This report is released on a bi-annual basis and was approved by EPA in December 2013. The goals of Virginia's water quality assessment program are to determine whether water bodies meet water quality standards, and then develop and implement a plan to restore waters identified as impaired. Water quality standards designate uses for waters and define the water quality needed to support each use. There are six designated uses for surface waters in Virginia: aquatic life; fish consumption; public water supplies (where applicable); shellfish consumption; swimming; and wildlife. Several subcategories of the aquatic life use have been adopted for the Chesapeake Bay and its tidal tributaries. If a water body contains more pollutants than allowed by water quality standards, it will not support one or more of its designated uses. Such waters have "impaired" water quality and are listed on Virginia's 303(d) list, as required under the Clean Water Act.

The VDEQ's draft 2012 Water Quality Assessment Integrated Report can be found at [http://www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2012305\(b\)303\(d\)IntegratedReport.aspx](http://www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2012305(b)303(d)IntegratedReport.aspx). This website contains the most up to date listing of impaired waters in Virginia. Water bodies are often listed for multiple impairments based on elevated levels of pollutants, high levels of contaminants in fish or reduced numbers of aquatic organisms (macroinvertebrates and/or fish). The commonwealth identifies fish impairments based on fish tissue data, for which there are numeric criteria that set the threshold for impairment. Benthic impairments are identified based on the Virginia Stream Condition Index and anything below 60 is considered impaired. This impaired condition is analogous to "very poor," "poor" and many of the "fair" streams as rated by the county's benthic macroinvertebrate IBI described above.

Once a water body has been listed as impaired, a Total Maximum Daily Load (TMDL) report identifying the sources causing the water quality problem and the reductions needed to resolve it must be developed by the VDEQ and submitted to the U. S. Environmental Protection Agency for approval. The TMDL consists of a waste load allocation, or point source contribution, a load allocation, or non-point source contribution, and a margin of safety.

To date, the following TMDLs have been established in Fairfax County and have assigned reductions to the county's MS4:

- Bacteria (Fecal Coliform and/or *E. coli*):
  - Accotink Creek
  - Four Mile Run
  - Bull Run (includes Cub, Johnny Moore and Little Rocky Runs)
  - Pope's Head Creek
  - Difficult Run
  - Hunting Creek (includes Cameron Run and Holmes Run)
  - Sugarland, Mine and Pimmit Run watersheds -
- Sediment (Benthic Impairment): -
  - Bull Run (includes Cub, Johnny Moore and Little Rocky Runs)
  - Pope's Head Creek
  - Difficult Run
- PCBs: Tidal Potomac (includes Accotink Creek, Belmont Bay, Dogue Creek, Four Mile Run, Gunston Cove, Hunting Creek, Little Hunting Creek, Occoquan River and Pohick Creek)

In December 2010, the EPA published the final TMDL for the Chesapeake Bay watershed, in which Fairfax County is the most populous local jurisdiction. This multi-state initiative set restrictions on nitrogen, phosphorus and sediment pollution throughout the 64,000-square-mile watershed. Virginia submitted its final Phase II Watershed Implementation Plan (WIP) to EPA in March 2012. The WIP identified these initiatives to provide significant progress in meeting nutrient reduction goals:

- Nutrient credit expansion.
- Agricultural resource management plans.
- Revised stormwater management regulations.
- Stormwater program improvements and MS4 permitting.
- Urban nutrient management.

Upon approval of a TMDL, Virginia law requires the development of an implementation plan (IP). The IP should describe actions (best management practices) to implement the allocations contained in the TMDL. Non-point sources are not regulated and reductions are generally achieved through incentive and cost-share programs. Point source allocations are addressed through any Virginia Pollutant Discharge Elimination System (VPDES) or Virginia Stormwater Management Program (VSMP) permits identified as contributing to the water quality impairment. These permits are issued by the commonwealth and are used to regulate the inputs of pollutants into receiving waters. The county holds a Municipal Separate Storm Sewer System (MS4) permit, which regulates the discharge of stormwater to receiving water bodies through the county's storm drainage (stormwater conveyance) system. Once specific controls are incorporated into a permit, these controls become mandatory. Additional information on the VDEQ water quality and TMDL programs is available at

<http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL.aspx>.

## 6. Public Outreach and Education

Fairfax County partners with several organizations to enhance public outreach and education campaigns - with the goal of improving and protecting the environment. In 2013, the following organizations - contributed to the county's outreach efforts: -

- Alice Ferguson Foundation: organizes the Potomac River Watershed Cleanup. -
- Clean Fairfax Council: assists with watershed cleanups; organizes the annual Springfest event. -
- Clean Virginia Waterways: coordinates the annual Virginia Waterways Cleanup as part of Ocean - Conservancy's International Coastal Cleanup.
- Earth Sangha: assists and provides volunteers for tree plantings.
- Fairfax County Public Schools.
- Fairfax ReLeaf: assists with tree planting.
- Metropolitan Washington Council of Governments (MWCOG): annual regional stormwater public education campaign.
- Northern Virginia Soil and Water Conservation District (NVSWCD): provides support for outreach activities.
- Northern Virginia Regional Commission (NVRC): through the efforts of the Clean Water Partners which includes Fairfax County and neighboring jurisdictions, the commission coordinates regional pollution prevention public education campaigns through radio public service announcements (PSAs), web pages, banner ads on Google and follow-up surveys of residents.
- Reston Association: provides support for outreach activities.
- Virginia Department of Forestry: assists with tree plantings.

Numerous methods are used to inform, engage and educate the public. These include: news releases; news media stories that are seen on television, heard on radio and read in newspapers; public service announcements that air on Fairfax County Channel 16 and on other regional public access television stations, and on You Tube; interviews with subject matter experts on the "County Conversation" that airs on Fairfax County Radio; pod casts; Facebook postings; Flickr picture postings; SlideShare PowerPoint postings; county web pages; publications such as fact sheets, brochures and booklets; and special events such as Celebrate Fairfax, Fall for Fairfax and Springfest.

The county implements a public education program with the goal of providing information to its residents and encouraging public involvement in the following areas related to stormwater management:

### **Illicit Discharges and Improper Disposal**

The county's MS4 is designed to collect and transport stormwater to local water bodies. The MS4 is not intended to receive any other substances unless they are specifically permitted by the Commonwealth of Virginia. The county's education program is designed to help residents recognize discharges that are not allowed in the MS4 and report them to the appropriate county or state authority.

Fairfax County's Stormwater website includes a page entitled "What's that Stuff in the Stream?" which provides descriptions and pictures of various stream conditions to help residents distinguish between what is a natural occurrence and what may be an illicit discharge.

### Local Water Quality Improvement Initiatives

Fairfax County offers educational opportunities promoting individual and group involvement in local restoration and cleanup efforts. Residents are encouraged to consider best management practices, such as rain gardens and other low impact development practices, to retrofit residential areas that do not have adequate stormwater controls.

SWPD posted numerous messages on the county's environmental Facebook page on such topics as water quality, trash in streams, "Friends of Trees", water reuse, rain barrels and stream restoration. Several stream restoration and other completed projects were posted to SlideShare and received 10,908 views.

### Watershed Cleanups

Staff from the Stormwater Planning Division (SWPD), Solid Waste Management Program (SWMP), Wastewater Management (WWM), Fairfax County Park Authority (FCPA) and the Northern Virginia Soil and Water Conservation District (NVSWCD) continued to support large and small-scale volunteer cleanups coordinated by the Alice Ferguson Foundation, Clean Virginia Waterways and Clean Fairfax Council.



*Figure 6-1: Solid Waste Management Cleanup.  
Photo by Fairfax County.*

In the spring of 2013, approximately 86 sites were established throughout the county for the Alice Ferguson Foundation's annual Potomac River Watershed Cleanup. Cleanups were conducted at numerous state, county and local parks, schools, the county wastewater treatment plant and other locations. These cleanups were advertised in publications such as SWM's SCRAPBook and FCPA's Parktakes Magazine, as well as on the internet. Staff from SWPD, SWM, WWM, FCPA and NVSWCD participated in these cleanups. More than 2,211 volunteers removed 89,508 pounds of loose litter and bulk trash from county streams.

According to Clean Virginia Waterways, 959 volunteers participated in the International Coastal Cleanup in Fairfax County during September and October 2013. Nearly 13,000 pounds of trash and marine debris were removed from beaches and shorelines. Plastic bags, beverage bottles, food wrappers and containers, and litter from recreational activities and fast food consumption (i.e. cups, plates, etc.) were the most commonly collected trash items in the county.

Clean Fairfax Council documented the following metrics regarding litter and clean-up activities for 2013:

- “Report a Litterer” by anonymous fill-in form at Clean Fairfax website or the “Report a Litterer” hotline – 125
- Number of clean up events either planned or supported – 85
- Number of volunteers at clean up events – 1,223
- Number of volunteer hours – 6,620
- Pounds of garbage collected – 66,829

Clean Fairfax Council received 75,000 impressions (i.e., web hits, tweets, Facebook) with its online content about litter and the environment.

Fairfax County Park Authority organized or assisted with a number of stream cleanups in 2013:

- Sugarland Run Stream Valley Park: Residents organized a stream clean up in April 2013 and removed 25 bags of trash.
- Lake Accotink Park: Staff organized two watershed clean up days on April 6 and October 19, 2013 that attracted 220 volunteers and removed nearly 2,000 pounds of trash from the Accotink Creek watershed. Friends of Accotink Creek organized multiple clean-ups at twelve points along Accotink Creek. Throughout the year, the park supported numerous volunteer groups and individuals who collected trash.
- County-wide clean up days were also held on April 6 and October 19, 2013. Participating FCPA sites included: Frying Pan Farm Park, Hidden Oaks Nature Center, Roundtree Park (Holmes Run), Hidden Pond Nature Center (Pohick Creek), Huntley Meadows Park (Little Hunting Creek), Riverbend Visitor Center (Potomac River), Sully Historic Site (Cain’s Branch), and Walney Visitor Center in Ellanor C. Lawrence Park (Flatlick Branch, Big Rocky Run, Cub Run and Frog Branch).

Members of the Reston Association coordinated four major stream cleanups during 2013 with 192 volunteers collecting 216 bags of trash. They sponsored two lake cleanups during which 51 volunteers removed 460 pounds of trash and debris from five miles of shoreline along Lake Thoreau and Lake Audubon.

In 2013, SWPD began to develop a logical model to organize and analyze data collected using the Trash Assessment for Improved Environments (TAFIE) stream condition assessment protocols and data forms. When completed, this will enable TAFIE data collected by the county as well as by volunteer groups to be integrated and compared with stream cleanup data collected using similar methodologies (particularly the Alice Ferguson Foundation’s Visible Trash Survey and the International Coastal Cleanup), as well as allow cleanup data to be merged with other permit-related information (for example, stream cleanup results and stream biomonitoring data).

TAFIE forms and guidance were provided to elementary schools and to individuals seeking volunteer services for the Virginia Master Naturalist certification program.

The county continued to promote the voluntary Virginia Adopt-a-Stream Program implemented by the Virginia Department of Conservation and Recreation. Links to information about the program are included on the county’s web pages dedicated to litter and volunteer stream cleanups.

### Stream Buffer Restoration

Fairfax County continued its countywide riparian buffer restoration project in collaboration with various partners to mitigate stormwater runoff into local streams and to support the Board of Supervisors' adopted Environmental Agenda.

NVSWCD's 2013 seedling sale promoted urban reforestation, habitat enhancement and water quality protection. More than 6,600 native tree and shrub seedlings were sold.

As part of the county's buffer restoration program, Earth Sangha donated or installed more than 1,200 native woody plants, native grass and wildflower plants and 12 pounds of meadow seed mix in 2013. Table 6-1 includes examples of restoration projects.

**Table 6-1: 2013 Earth Sangha buffer restoration activities**

<b>Site</b>	<b>Number of Plants</b>
Eakin Park	90 native grasses and wildflowers
ECLP	30 woody plants & 500 native grasses and wildflowers (these seedlings were paid for)
Hidden Pond Nature Center	80 woody plants
Mason Neck State Park	100 woody plants (these were paid for)
Reston Association	136 woody plants & 243 native grasses and wildflowers (these seedlings were paid for)
Riverbend Park	12 woody plants
Rutherford Park	20 woody & 255 native grasses and wildflowers

The FCPA, Fairfax ReLeaf and the Virginia Department of Forestry (VDOF) hosted independent stream buffer restorations in the county in 2013. The Park Authority continues to maintain and monitor the previous riparian buffer enhancement projects installed in the last five years. There are 37 projects on parkland throughout the county. These projects have focused on the conversion of mowed grass to areas of native trees and shrubs typical of riparian areas. Park Authority staff completed additional planting projects in the RPA unrelated to the county's buffer planting program. Examples of such projects in 2013 include restoring half an acre at Ellanor C. Lawrence Park with native seed and planting 500 shrubs, grasses and forbs, and restoring a quarter acre at Old Colchester Park and Preserve with native seed.

The VDOF continues to plant riparian buffers in watersheds throughout Fairfax County in support of the county's riparian buffer initiative. In 2013, VDOF worked with volunteers from organizations such as Fairfax ReLeaf, Eagle Scouts, homeowner associations and school groups and planted 4,100 seedlings in the county. The tree stewards program, initiated in 2011, is designed to create a cadre of trained volunteers to lead community tree plantings and provide information on the benefits and care of trees. Eleven tree stewards were trained in 2013.



Figure 6-2: Volunteerfest® invasives removal event in Pohick Stream Valley Park. Photo by FCPA.

The FCPA, with strong volunteer support, continued the aggressive management of invasive, non-native plants on 50 acres of parkland as part of the Invasive Management Area (IMA) program. More than half of the management sites are within the Resource Protection Area, where the invasive species interfere with the function of critical riparian buffer vegetation. More than 1,000 trees, shrubs and ground covers were planted at nine IMA sites in 2013. The Park Authority contracts for herbicide removal of invasive species at selected sites. In 2013, approximately 500 acres were treated with selective herbicide for the support of invasive species eradication.

Reston Association managed an invasive species program at Lake Thoreau including the treatment of Eurasian water milfoil, yellow floating heart, and floating pondweed. Removal of purple loosestrife continued on all RA lakes and white water lilies were removed from Lake Newport.

#### **Community Low Impact Development**

NVSWCD provides information to residents to help them manage their land and protect water quality by controlling stormwater, preventing erosion and encouraging native vegetation. An online resource, *You and Your Land-A Homeowner's Guide for the Potomac Watershed*, provides comprehensive information to aid homeowners in the economical care and maintenance of their property. NVSWCD published a *Residential LID Landscaping Guide* for homeowners, which provides design and installation information for several low impact development practices appropriate for solving common drainage problems. It includes sources for supplies and plant materials and is available in hard copy and electronic formats. NVSWCD, partnering with the Park Authority, continued to distribute copies of their manual *Rain Garden Design and Construction: A Northern Virginia Homeowner's Guide*. It has all the instructions and calculations needed for a homeowner to build a rain garden on his or her own property. The manual is available in hard copy and electronic formats. In 2013, NVSWCD published *Solving Drainage and Erosion Problems: A Guide for Homeowners*, which encourages county residents to choose low impact development as a practical tool in caring for their landscape.

NVSWCD presented two rain garden workshops during 2013. The workshops covered rain garden function, design, location, costs, construction, maintenance, planting and materials. The workshops were attended by 57 county residents and industry professionals.

NVSWCD coordinated a regional rain barrel initiative for Northern Virginia with neighboring jurisdictions. Fourteen "build-your-own" rain barrel workshops attracted a total of 309 county residents and resulted in the distribution of 388 barrels. NVSWCD continued to partner in an artistic rain barrel program to renew interest in rain barrels and other best management practices. Twenty five teams of students painted rain barrels, which were auctioned at an Earth Day event.

NVSWCD coordinated a “build-your-own” composter workshop using surplus barrels from the rain barrel program. Twenty participants constructed fifteen tumbler-style composters.

NVSWCD organized the Watershed Friendly Garden Tour in June 2013 at eight sites showcasing low impact development practices including green roofs, porous pavers, rain gardens, composting, rain barrels, native species, and wildlife habitat. The goal of the workshop was to inspire visitors to adopt these practices in their own yards and schools. The tour attracted more than 100 participants.

In 2013, the storm drain marking program continued to facilitate environmental stewardship and educate the public about non-point source pollution prevention. Staffed by NVSWCD and funded by Fairfax County, the program costs approximately \$12,000 per year for plastic markers and glue. During each storm drain marking project, volunteers place a pre-printed label with a “no dumping” message on the storm drains in their neighborhoods. In 2013, the storm drain marking program coordinated 27 projects that placed markers on 3,478 storm drains and educated more than 17,000 households on ways they could take action to protect water quality. Each household received a flier about the causes and prevention of non-point source pollution and how to properly dispose of used motor oil, pet waste, paint, fertilizer, yard debris and other pollutants. In 2013, 550 volunteers contributed more than 2,000 hours to the program.

In 2013, NVSWCD disseminated information on county environmental programs through two email lists, the *Green Breakfast* groups (650 recipients) and the *Watershed Calendar* group (1,000 recipients). NVSWCD continued to publish *Conservation Currents* which featured articles on rain gardens, stream restoration and stewardship. NVSWCD sent 2,500 copies per issue, mainly to homeowner

associations who are encouraged to reprint articles in their newsletters. Many articles are posted on the NVSWCD website and there is a growing list of e-subscribers.

Reston Association (RA) provides watershed education opportunities for the public at its Walker Nature Center. The nature center conducts programs for all ages that promote watershed appreciation and conservation, including stream and lake explorations, rain barrel workshops and fishing programs. RA’s activities in 2013 were:

- Distributed printed watershed education materials at the center and at community events, including “Helping Our Watersheds: Living in the Potomac and Chesapeake Bay Watershed,” “Understanding, Preserving and Enjoying Reston’s Lakes and Streams” and “Rain Barrels”.



Figure 6-3: Enviroscope watershed model presentation. Photo by NVSWCD.

- Held a rain barrel workshop in May where 23 barrels were made. -
- Continued with the third annual Kids' Trout Fishing Day with 222 kids fishing. -
- Worked with Lake Anne Elementary School Bayscapers Club on water quality monitoring. -
- Assessed the Snakeden Branch stream restoration with the South Lakes High School students -
- Included watershed education, stream and lake exploration, and fishing and boating activities at - eight of its summer camp programs for children ages three to 16. These programs engaged 1,240 campers
- Conducted three stream monitoring workshops with 34 volunteers becoming certified as stream monitors in 2013.

Every Reston Lake has a permanent wayside exhibit with information about the lake's watershed and the flora and fauna that is supported by the lake. There is also a permanent wayside exhibit at the nature center at Snakeden Branch that includes watershed and stream restoration information. A stormwater trail at Brown's Chapel also has educational signs explaining rain gardens, native plant gardens, rain barrels and permeable pavement sidewalks as part of the demonstration project. These interpretive signs are for all ages.

VDOF works regularly with Fairfax County to conduct watershed and water quality presentations for students, homeowners, professionals and organizations. Rain garden presentations and workshops are given for garden clubs, homeowner associations and professionals. Brochures and exhibits have been developed for public outreach at festivals, Arbor Day and other environmental celebrations. There were 53 such activities presented by VDOF in 2013.

### **Pesticides, Herbicides and Fertilizers**

Residential lawns in Virginia comprise nearly 62 percent of the 1.7 million acres of managed turf grass in the state and account for \$1.7 billion in annual expenditures. Many homeowners apply chemical fertilizers and pesticides to keep their lawns healthy and green. Without proper training, it is easy to over apply or inappropriately apply chemical inputs leading to run-off into local streams and waterways. Excessive use and misapplication of chemical fertilizer can lead to excess nitrogen and phosphorous which may reach storm drains or sewers and ultimately compromise ground or surface waters. This trend, paired with high levels of residential development, dramatically increases the potential overall impact on water quality. Ultimately, the water quality of the Chesapeake Bay is compromised.

In 2008, the Virginia Cooperative Extension (VCE) Fairfax County Unit started a master gardener program to provide educational and technical services to homeowners with regard to residential lawn management. Fairfax County created the Home Turf Nutrient Management program to bring awareness to local water quality as it relates to residential lawn care practices. In 2013, VCE master gardeners received 40 hours of training on turf best management practices. Local master gardener volunteers, under the guidance of the local extension agent began the program by using master gardener interns as their first clients. VCE extension specialists trained volunteers on turf nutrient management practices.

As a result of this effort, 65 homeowners had their lawns measured, 75 soil tests were submitted, and 65 urban nutrient management plans were written and given to the respective homeowner. Since 2009, a VCE master gardener volunteer has lead this program and helped develop nutrient management plans which promote best practices. The volunteers continue to lead the way with this program. They have developed a survey of garden centers and the lawn care products they have for homeowner purchase. They have measured and developed more than one million square feet of turf for nutrient management plans.

### **Proper Disposal of Used Oil, Household Hazardous Waste and Household Yard Waste**

The Fairfax County Solid Waste Management Program (SWMP) plays an important role in protecting surface water resources through outreach efforts to promote responsible waste management practices. The SWMP educates residents and business owners about reducing the volume of waste they generate, and how to dispose of and recycle waste properly.

Putting hazardous household wastes in the trash or down the drain contributes to the pollution of surface waters. The Fairfax County SWMP is responsible for the county's Household Hazardous Waste (HHW) Management Program. In this program county residents learn to dispose of hazardous waste such as used motor oil, antifreeze, and other automotive fluids. Disposal is free to county residents. The program is supported by funding generated by the SWMP at a cost of about \$650,000 each year. The SWMP has two permanent HHW facilities that are open seven days a week. The Fairfax County HHW program accepts fluorescent lamps for disposal from county residents. SWMP staff continues to distribute educational brochures describing the energy-saving benefits of using these lamps and how to dispose of them properly at the end of their useful life. The information is also made available on the county's recycling website.

The SWMP continued to collaborate with the Rechargeable Battery Recycling Corporation to make collection of rechargeable batteries available at offices of all members of the Fairfax County Board of Supervisors and at major county buildings. Rechargeable batteries are also accepted at the county's HHW facilities. SWMP continued to maintain the Know Toxics website in partnership with NVRC and the Northern Virginia Waste Management Board. This is part of a regional public information program to educate business owners about federal and state regulations that require proper disposal or recycling of spent fluorescent lamps, rechargeable batteries and computers and related electronics. The Know Toxics website provides a resource where businesses can learn how to legally and appropriately dispose of these materials.

In 2013, the SWMP continued its monthly electronics recycling program for county residents known as *Electric Sunday*. The SWMP dedicates one Sunday per month whereby residents may drop off used computers and televisions for recycling. During 2013, about 1.2 million pounds of electronic waste were prevented from entering the environment, significantly reducing the opportunity to negatively impact stormwater runoff.

SWMP partnered with the Metropolitan Washington Council of Governments (MWCOG) on its annual *Go Recycle* radio campaign. This campaign provides two weeks of intensive announcements on five major Washington DC radio stations to address recycling issues.

SWMP staff continued a significant public outreach program concerning recycling and solid waste management with more than 85 events (including tours, speaking engagements and exhibits).

SWMP continued updating and revising the "Recycling and Trash" portion of the county website to provide the most up-to-date information for county residents.

Fairfax County's Solid Waste Management Program continues to provide support and education in the community regarding litter prevention and support for recycling. In 2013, the program staff:

- Continued to maintain SCRAPmail (Schools/County Recycling Action Partnership). This e-mail subscription allows interested teachers, students and school administrators to receive periodic news

items, event announcements, and updates and reviews on environmental education resources available to county schools.

- Gave 15 presentations to schools throughout the county reaching more than 2,000 students
- Awarded Johnnie Forte environmental grants to eight schools to fund school environmental projects involving litter prevention, litter control or recycling
- Produced and placed “Trash Free Potomac” advertisements on the tailgates of 20 metro buses, five backlit dioramas and 200 interior bus signs in collaboration with the Alice Ferguson Foundation. These were produced at a reduced cost as Public Service Announcements through the Washington Metro Area Transit Authority.
- Partnered with NVRC to create a “train-the-trainer” event to educate solid waste managers in the Northern Virginia area about the proper management of universal waste. Sixty attendees completed the course.

### **Clean Water Partners**

As a member of the multi-jurisdictional Northern Virginia Clean Water Partners, Fairfax County has supported several efforts tailored to stormwater specific messages. In 2013, the Northern Virginia Clean Water Partners used television, print, internet advertising and the Only Rain Down the Storm Drain website ([www.onlyrain.org](http://www.onlyrain.org)) to distribute messages linked to specific stormwater problems, such as proper pet waste disposal, over fertilization of lawns and gardens and proper disposal of motor oil. In addition to the multi-channel media campaign, educational events hosted throughout the Northern Virginia region also raised awareness and encouraged positive behavior changes in residents. The television and internet ads featured the well-known national symbol of non-point source pollution: the rubber ducky.

From April 2013 through August 2013, four commercials featuring messages on the importance of picking up pet waste and general household stormwater pollution reduction measures aired on twelve cable TV channels, including three Spanish-speaking channels, 1530 times. These TV ads reached four million Northern Virginia residents and resulted in more than 400 visits to the [www.onlyrain.org](http://www.onlyrain.org) website. Two online banner ads also ran more than 400,000 times.

Following the ad campaign, an online survey of 500 Northern Virginia residents was conducted to help determine the effectiveness of the ads, reveal changes in behavior, and aid in directing the future efforts of the campaign. Findings in the 2013 survey include:

- 20 percent of the respondents recalled hearing or seeing advertisements on the internet or on TV about reducing water pollution.
- Of those who recalled the ads, three percent state they now pick up their pet waste more often, four percent state that they are more careful with motor oil, and 13 percent state they fertilize fewer times per year.
- Almost 80 percent of people surveyed reported that they always pick up after their pet, as compared with 30 percent in previous surveys.

### Educational Opportunities for Students

Fairfax County provides educational opportunities for students throughout the year, including science honor society meetings and high school science fairs.

### Sewer Science

The Sewer Science Program teaches county high school students about municipal wastewater treatment and stormwater management using specially designed tanks, analytical equipment, presentations and a custom student workbook. The program is a collaborative effort of three DPWES programs: Solid Waste Management, Stormwater Management, and Wastewater Management. The stormwater component of the program promotes an understanding of stormwater, its relationship with wastewater, how the water and the land are connected and how each individual can make a difference in the health of the environment. The Sewer Science Program was presented to 45 classes at 15 high schools in the county and reached more than 1,200 students.

### Stormy the Raindrop Educational Campaign

Stormwater Planning Division continued the award-winning Stormy the Raindrop campaign. The program was designed to appeal to children in elementary school and younger with messages about local streams and watersheds and pollution prevention. Over the past several years, the program has used public appearances by a costumed raindrop character, puppet shows, coloring and activity books and a web page to reach young audiences. In 2013, the program accomplished the following:

- The county distributed 1,500 copies of the Stormy the Raindrop activity books at various libraries, district offices and events. The activity books are available on stormwater management's website at <http://www.fairfaxcounty.gov/dpwes/stormwater>
- The county distributed 700 reusable bags with the Stormy the Raindrop image and "Preventing litter in streams one bag at a time," printed at the top of the bag. The county continued an educational public service announcement (PSA) on "Stormy the Raindrop" watershed education. The program aired on Fairfax County channel 16 and is posted to the county web page and YouTube.



Figure 6-4: Stormy at a holiday event. Photo by Fairfax County.

**Field Guide**

In 2013, SWPD distributed a booklet entitled *A Field Guide to Fairfax County Plants and Animals* to children and teachers through several programs including Fairfax County Public Schools, scout troops, and home school groups. The guide includes general information on plant (vascular and non-vascular) and animal (invertebrate and vertebrate) species found in Fairfax County and educational activities related to watersheds and stormwater management. The guide was distributed to 13,800 5<sup>th</sup> graders and teachers as part of the new *Fields of Science* curriculum.

**Reston Association's Watershed Education Programs for Students**

Reston Association (RA) offers a watershed field trip program for students in grades four through seven. Students learn about watersheds and explore an area of the Difficult Run watershed. They conduct biological inventories and perform water quality tests at Lake Audubon, The Glade and Snakeden Branch. Students discuss ways that residents can protect the watershed. In 2013, Reston Association conducted the elementary watershed field trip for 114 students.

At the secondary level, Reston Association partnered with the United States Geological Survey (USGS) to conduct watershed education field trips for seventh grade students from Langston Hughes Middle School. Approximately 483 students participated in a Reston Association organized Meaningful Watershed Experience field trip to the restored Snakeden Branch stream near their school or to the Glade Beaver Pond with USGS volunteers. Students were able to go to stations including: exploring a watershed model, chemistry, pebble count, invasive species, plant bio-density, tree wars, stream habitat and functions, stream restoration, beavers and macroinvertebrates.

RA continued the water quality monitoring group four program with South Lakes High School students and conducted water sampling experiments in Snakeden Branch with three smaller groups. One hundred and four South Lakes High School students participated.

Reston Association lends a traveling watershed education trunk to area schools that includes an interactive watershed model. In 2013, the trunk was loaned to Reston elementary schools for use with 350 students.

**Envirothon**

Envirothon is a hands-on natural resources competition for high school teams. Training takes place throughout the year and competitions are held at the local, regional, state and national levels. In 2013, NVSWCD sponsored the Hidden Pond Nature Center team with members from Woodson High School, Robinson High School, West Springfield High School, Rising Junior High School and one home school graduate which earned first place in the Virginia State Envirothon.

**Urban Forest Management Division**

Urban Forest Management Division (UMFD) contacted 2000 students through their school programs, Trees Please and Alien Invaders. In these programs, tree stewardship is highlighted as well as the benefits that trees provide to our environment (including water quality and stormwater). Planting trees is a message that is highlighted along with promoting native species. Six hundred of those students were contacted from the Meaningful Watershed Experience program at Hidden Oaks Nature Center. There, Urban Foresters explained the importance of an urban forest and how it impacts stormwater runoff.

UFMD organized two tree planting events. At Fairfax Springfest, 31 trees were planted by Fairfax County employees and volunteers at the Lorton Workhouse and Occoquan Regional Park. UFMD also lead tree planting and tree care demonstrations to attendees of Fairfax Springfest. As a precursor to Fall for Fairfax, 26 trees were planted at the Government Center by county employees from varying agencies.

### Other Educational Activities

Fairfax County's public education program raises awareness about stormwater challenges throughout the county, educates residents about watersheds and the need for stormwater management, and offers opportunities for residents to become involved in efforts to restore and protect Fairfax County's waterways. Educational presentations help residents to recognize connections between water quality problems in local streams and impacts on the Occoquan Reservoir, the Potomac River and the Chesapeake Bay. In 2013, the county gave presentations to homeowner's associations, school groups (teachers and students), civic associations, Fairfax Master Naturalist trainees, Board of Supervisor's town hall meetings, resource fairs and various environmental events.



*Figure 6-5: Stormwater presentation to an Elementary School class.  
Photo by Fairfax County.*

In 2013, Fairfax County participated as an exhibitor or environmental educator at 20 public events, including: Fall for Fairfax, Fairfax Springfest, Vienna Green Expo, resource fairs and environmental fairs. The county distributed educational fact sheets on such topics as rain gardens and rain barrels, reforestation plots, tree planting, tree care, car washing, detention basins, pervious pavement and pavers, water quality swales and cigarette butt litter.

The county created educational public service announcements (PSA) in 2013 on topics such as plastic bags in streams, "Stormy the Raindrop" watershed education, cigarette butts and flood prevention. These programs air on Fairfax County channel 16 and are posted to YouTube. Seventeen thousand people watched the YouTube public service announcements.

Staff contributed several proposed projects and environmental benefits articles to homeowners' association and Supervisors' offices newsletters and websites.

Stormwater, wastewater and urban forestry staff provided approximately 30 media interviews for print, television and radio news. Topics included: the stormwater tax district, water quality, solar power, snow plowing, stream restorations, flood mitigations, sanitary sewers, Wolftrap Creek, wet naps causing sanitary sewer problems, employee safety, water reuse, sewage in streams, the wastewater treatment

process and costs, dredging at Royal Lake, cankerworms, cicadas, the tree canopy, Springfest, resource protection areas, the Holmes Run sewer project, the laboratory at Noman Cole, Chesapeake Bay TMDLs, the MS4 permit, illicit discharges, industrial/high risk runoff, trash and litter, completed projects, rain barrels, hazardous trees and more.

Podcast messages were aired through the county's website for a weekly audience of about 350 listeners on topics such as fats, oil and grease (FOG), pet waste, litter, fertilizers, tree care and pests, rain gardens and rain barrels, native plants, swimming pools, flood and sanitary sewer backup insurance, flood protection, stream restorations, pollinators and back yard composting.

#### **Northern Virginia Soil and Water Conservation District**

In 2013, NVSWCD provided displays and publications about environmental landscaping, stream restoration, volunteer monitoring, soils, storm drain marking, rain barrels and other environmental topics at five events. NVSWCD distributed 3,974 brochures, publications and other information to colleagues and the public.

NVSWCD gave 77 presentations to audiences in industry, government, youth and the general public, during which 2,464 people learned about rain gardens and other low impact development techniques, water conservation, best management practices for horse-keeping operations, soil concepts, art with soils, stream cleanups, water quality monitoring, erosion and sediment controls on construction sites, ecological concepts and nonpoint source pollution. Two of the workshops and presentations focused on the design and installation of rain gardens.

NVSWCD demonstrated the Enviroscape watershed model 45 times to 821 students in schools and scout programs.

#### **Fairfax County Park Authority**

Five FCPA nature centers and an imbedded naturalist at Cub Run RECenter provide water quality and environmental education to hundreds of thousands of park visitors each year. For example, Huntley Meadows Park staff held the annual Wetlands Awareness Day in May to educate citizens on the importance of maintaining healthy wetlands.

The Meaningful Watershed Educational Experience (MWEE) outreach program covered topics such as runoff, water quality, potable water, streams, soils, benthic macroinvertebrates, healthy watersheds, nonpoint and point source pollution, and stewardship. More than 6,000 students and adults attended the MWEE programs.

FCPA assisted in the following watershed programs in 2013:

- Earth and Sky School Program for 5<sup>th</sup> graders reached 3,400 students and 300 adults.
- The Wetlanders summer camp included 62 children who participated in watershed activities for several hours each day.
- Presented the "Secrets of Soil" class at Green Spring Gardens to 600 students.
- Stream water quality monitoring training for the general public at several resource management sites.
- Green Springs Gardens symposiums and workshops about sustainability, water conservation and water quality reached 150 attendees, 270 children and 19 teachers.

## **Technical Support and Training**

### ***Land Development Services***

- Conducted a training course on erosion and sediment controls for the Engineering and Surveyors Institute.
- Participated in a stormwater pond inspection training session.

### ***Northern Virginia Soil and Water Conservation District***

- Provided technical advice on solving drainage and erosion problems to homeowners and homeowner associations during 119 site visits.
- Provided soils information to 134 consultants, realtors and homeowners. Technical assistance was provided to county agencies 99 times to solve problems and assist with projects.
- Responded to 1,022 information inquiries by telephone, email and through office visits.

## 7. Flood Response

Stormwater Management proactively responds to flooding threats using the guidance provided by the county's flood response plan. The county annually reviews and updates this plan to incorporate operational changes, communications strategies and other actions. Electronic devices installed at 19 dams and in the Huntington and Belle View communities are also used to closely monitor the potential for flooding. Training, monitoring information and instructions, inundation flood maps and safety equipment are provided to staff involved in field monitoring.

The Fire and Rescue Department invited staff from Stormwater Planning and the Maintenance and Stormwater Management Divisions to join them in flood response training at Fire Station 9 in Alexandria.

Flooding in the Huntington and Belle View communities was discussed. The training helps both organizations determine when to take key actions during a flooding event. Some of the actions discussed included when residents should move vehicles, shelter in place or evacuate. They discussed how to provide information to residents. Flood response training was provided by SWPD and MSMD staff to the Fairfax County Police Department (Mount Vernon District Station).



*Figure 7-1: Joint training of Fire and Rescue Department and Stormwater Management employees for flood response at the Huntington and Belleview communities. Photo by Fairfax County.*

A FEMA-required newsletter that included information about the natural and beneficial functions of floodplains specific to Fairfax County was mailed to 20,000 county residents who live in or adjacent to county floodplains. The county website was updated to provide relevant information on floodplains, flood insurance, flood preparedness and flood safety.

## 8. Literature Cited

Fairfax County Department of Public Works and Environmental Services (DPWES). 2007. Fairfax County Dry Weather Screening Program: Site Selection and Screening Plan. Fairfax County Department of Public Works and Environmental Services, Stormwater Planning Division. Fairfax, Virginia. September.

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