"Protecting our land and our water."

2008 Fairfax County
Stormwater Status Report

County of Fairfax, Virginia

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Photos on cover: Green roof plants atop the Herrity Building parking garage (top right); Barnyard Run stream restoration in Huntley Meadows Park (bottom right); Stormy the Raindrop and friends at Fall for Fairfax (bottom left); Sequoia Lea stormwater pond (top left). All photos by Fairfax County.

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July 2009

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Private organizations
Earth Sangha
Fairfax ReLeaf
Northern Virginia Regional Commission
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Reston Association

State agencies
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
Fire and Rescue Department, Hazardous Materials Investigative Services Section
Health Department
Park Authority
Planning and Zoning Department
Public Schools

Department of Public Works and Environmental Services divisions
Code Services Division
Construction Management Division
Environmental and Facilities Inspections Division
Environmental and Site Review Division
Land Acquisition Division
Maintenance and Stormwater Management Division
Planning and Design Division
Solid Waste Collection and Recycling Division
Solid Waste Disposal and Resource Recovery Division
Wastewater Collection Division
Wastewater Planning and Monitoring Division
Wastewater Treatment Division

Introduction

This report highlights the accomplishments of Fairfax County's stormwater management program in 2008 and describes the challenges it faces as well as the partnerships forged to meet those challenges. The stormwater management program supports the water quality theme of the Board of Supervisors' Environmental Agenda, which is organized into six major themes: growth and land use; air quality and transportation; water quality; solid waste; parks, trails and open space; and environmental stewardship. The agenda centers on two principles: conservation of limited natural resources must be interwoven into all government decisions; and the county must be committed to providing the necessary resources to protect the environment.

Stormwater discharges are generated by rainfall and/or snowmelt running off the land and impervious areas such as paved streets, parking lots and building rooftops. Stormwater picks up and carries away sediments, nutrients, toxic substances, pathogens and other pollutants, depositing them into lakes, streams, rivers, wetlands and coastal waters. These pollutants have potentially harmful effects on drinking water supplies, recreation and aquatic life. In addition, pavement and other hard surfaces prevent water from infiltrating into the ground, causing high volumes of stormwater to accumulate and surge into storm drains at high speeds. When quickly flowing runoff empties into receiving waters, it can severely erode stream banks and damage sensitive stream valley ecosystems. The county is proactive in the mission of environmentally friendly stormwater management and control through the following ongoing activities:

- Developing watershed management plans
- Implementing improvements to stormwater management infrastructure
- Conducting inspection and maintenance programs for stormwater control systems and structures to ensure their effectiveness
- Conducting stream monitoring and evaluation programs
- Sharing resources and information for the purposes of educating residents and developing strategies to promote good water quality practices
- Developing strategic initiatives to further reduce stormwater runoff volume and the negative environmental effects of the continual increase in impervious area

Although 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, including private organizations, state agencies, other county agencies and many divisions in the DPWES. The report highlights specific contributions of these organizations to stormwater management.

The subsequent pages summarize stormwater management in Fairfax County under the following categories:

1. *Watershed Management Planning*. The county has completed and is implementing six watershed management plans which cover more than 50 percent of the land area in the county. Plan development was initiated in 2007 for the remaining land area, and all of the watershed plans are expected to be completed in 2010. These plans will provide an assessment of

stormwater conditions, recommend protection strategies and improvement projects and encourage public involvement.

2. *Stormwater Capital Projects*. In 2008, the county and its partners continued to implement stormwater management-related capital projects, including 13 flood mitigation projects, a signalization system to enhance emergency response, one regional stormwater management facility, six stormwater management facility retrofit projects (one of which included placing trash racks on twelve stormwater management facilities throughout the county), 18 low impact development (LID) projects, and five stream restoration and stream stabilization projects.

3. *Operations*. The county operates its facilities in a manner consistent with the requirements of its Virginia Stormwater Management Program (VSMP) permit, which regulates discharges of stormwater from the county's municipal separate storm sewer system (MS4). As required by the permit, the county continues to inspect and maintain (as needed) more than 1,200 public stormwater management facilities and annually inspect one-fifth of the more than 3,000 privately-maintained facilities in the county. The county continues to implement a storm sewer infrastructure management program. The county addresses the permit requirements for the operation of county roadways; use of pesticides, herbicides and fertilizers on the county's public rights-of-way, parks, and other public properties; and operation of facilities characterized by regulation as high risk sources of stormwater pollutants, including county landfills. In order to reduce the possibility of pollutants reaching the county's stormwater infrastructure and streams, the county implements programs to detect and eliminate sources of illegal discharges such as cross-connections with sanitary sewer systems and responds to incidents of hazardous material releases, spills and illegal dumping.

4. *Monitoring and Assessment*. The county conducts watershed water quality monitoring, dry weather screening, wet weather industrial high risk monitoring, bacteria monitoring, physical habitat evaluations and biological assessment of fish and aquatic macroinvertebrates. County partners help to train and mobilize residents to track stream conditions at approximately 20 sites located around the county through a volunteer monitoring program.

A summary of the Virginia Department of Environmental Quality's (VDEQ) Final 2008 Water Quality Assessment and Impaired Waters Integrated Report is included in this chapter. VDEQ identifies streams, lakes and estuarine waters as impaired when monitoring data show that they do not meet the commonwealth's water quality standards and are not suitable for their intended uses such as swimming, fishing or aquatic life. The 2008 final report listed 68 waters (segments) in the county with 92 impairments within or bordering Fairfax County. Many of these water bodies are 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).

5. *Public Outreach and Education*. The county conducted presentations and staffed booths at community meetings and events to raise awareness of non-point source pollution and the actions residents can take to help protect streams. In 2008, the county partnered with numerous local agencies to promote environmental stewardship events (such as stream cleanups, storm drain marking events, rain barrel building workshops and invasive species removals) that mobilized thousands of volunteers. The county partnered with various organizations to host a high school

science program, stream buffer restoration projects and a regional pollution prevention radio campaign.

6. *Strategic Initiatives*. The county and its partners are actively involved in protecting watersheds and improving the quality of stormwater that enters the streams through initiatives to control runoff and reduce the negative effects of the continual increase in impervious area. In 2008, the DPWES and its partners collaborated on numerous efforts to improve the county's stormwater management program, meet state and federal guidelines to control stormwater runoff close to the source, protect the environmental quality of streams and reservoirs and prevent flooding.

1. Watershed Management Planning

Fairfax County is developing comprehensive watershed management plans as part of the Fairfax County Board of Supervisors' Environmental Agenda and in support of Virginia's commitment under the Chesapeake 2000 Agreement. The plans review and synthesize previous stormwater studies and compile available data. This information is used to evaluate watershed conditions and to project stormwater runoff from ultimate development conditions, allowing a thorough characterization of each watershed. The characterization is used to identify candidate sites for development of structural and non-structural projects designed to address problem areas or to preserve high quality areas in each watershed. Preliminary cost estimates are then developed for proposed projects, and a cost/benefit analysis is used to help prioritize projects and develop an implementation plan.

In 2003, Fairfax County initiated a process to develop comprehensive watershed management plans starting with the Little Hunting Creek Watershed. Between 2003 and 2007, six watershed management plans were adopted by the Fairfax County Board of Supervisors that covered 11 of the county's 30 watersheds, or a little less than half of the county's land area. Work was initiated in 2007 for the remaining land area, and all of the watershed plans are anticipated to be completed in 2010. The status of watershed planning is presented in more detail in Table 1.1.

Table 1.1. Status of Fairfax County watershed planning process

Watershed Planning Group	***Watershed Name***	***Total Area (sq. mi.)***	***Fairfax Co. Area (sq. mi.)***	***Plan Status***
Little Hunting Creek*	Little Hunting Creek	11.0	11.2	Adopted 02/2005
Popes Head Creek*	Popes Head Creek	18.9	18.2	Adopted 01/2006
Cub Run and Bull Run*	Bull Run	9.7	8.4	Adopted 02/2007
	Cub Run	55.3	39.1	
Difficult Run*	Difficult Run	57.7	55.3	Adopted 02/2007
Cameron Run*	Cameron Run	42.0	32.6	Adopted 08/2007
Middle Potomac Watersheds*	Bull Neck Run	2.3	2.3	Adopted 05/2008
	Dead Run	3.1	3.1	
	Pimmit Run	12.6	10.3	
	Scotts Run	6.0	6.0	
	Turkey Run	2.0	2.0	
Little Rocky Run and Johnny Moore Creek**	Johnny Moore Creek	5.3	5.3	Initiated 2007
	Little Rocky Run	7.4	7.4	
Accotink Creek**	Accotink Creek	51.1	37.8	Initiated 2007
Pohick Creek**	Pohick Creek	36.5	34.3	Initiated 2007
Sugarland Run and Horsepen Creek**	Horsepen Creek	23.5	8.8	Initiated 2007
	Sugarland Run	22.5	10.5	
Dogue Creek, Belle Haven and Four Mile Run	Dogue Creek	19.4	13.3	Initiated 2007
	Belle Haven	2.8	2.8	
	Four Mile Run	30.1	2.0	
Lower Occoquan	High Point	6.3	6.3	Initiated 2007

Table 1.1. Status of Fairfax County watershed planning process

Watershed Planning Group	***Watershed Name***	***Total Area (sq. mi.)***	***Fairfax Co. Area (sq. mi.)***	***Plan Status***
Watersheds**	Kane Creek	4.8	4.8	
	Mill Branch	8.8	8.8	
	Occoquan	3.4	3.4	
	Old Mill Branch	4.4	4.4	
	Ryans Dam	3.6	3.6	
	Sandy Run	8.2	8.2	
	Wolf Run	5.9	5.9	
Nichol Run and Pond Branch**	Nichol Run	7.7	7.7	Initiated 2007
	Pond Branch	8.4	8.4	

*Copies of final approved plans may be found on the specific watershed Web site at www.fairfaxcounty.gov/dpwes/watersheds
** The status of these plans may be found at the above Web site

Seven plans which encompass the remaining 19 watersheds in the county are in the development process. Community involvement is a vital component in developing and implementing a successful plan. The process includes two public meetings for each plan to provide education on watershed issues and seek resident input on issues confronting each watershed.

- *Introductory and Issues Scoping Forum:* This forum is designed to present the planning process to the community, develop an initial list of watershed issues and concerns and prepare the community for informed input on development of the plan.
- *Draft Plan Review Workshop:* The second meeting provides the community with an opportunity to review the first draft of the watershed plan and provide input.

Additionally, for each plan, the county invites a group of 20 to 30 local residents to be part of the Watershed Advisory Group (WAG). These groups assist in the creation of the plans by advising the county about community outreach opportunities and key issues affecting their watershed, providing suggestions on the topics and formats for public education materials and reviewing and commenting on initial and final drafts of the watershed management plan. In 2008 and early 2009, Fairfax County hosted introductory and issues scoping forums for the remaining plans and extended invitations to the public to participate in the advisory groups.

2. Stormwater Capital Projects

Fairfax County continues to manage an extensive inventory of stormwater structures which receive and transport stormwater runoff and facilities designed to affect the quantity and quality of stormwater discharged to streams. The Department of Public Works and Environmental Services (DPWES) Stormwater Management business area operates and maintains Fairfax County's municipal separate storm sewer system (MS4). Public stormwater management facilities are constructed and existing public facilities are retrofitted by multiple county organizations and through partnerships with local and regional organizations. Among the entities that helped to build or make improvements to stormwater management facilities in 2008 were DPWES, the Fairfax County Park Authority (FCPA), the Northern Virginia Soil and Water Conservation District (NVSWCD) and the Northern Virginia Regional Commission (NVRC). The Maintenance and Stormwater Management Division (MSMD) inspects and maintains public stormwater management facilities and inspects other stormwater management facilities maintained by private entities according to private maintenance agreements.

This section summarizes the capital projects, by type, completed during calendar year 2008.

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 2008, DPWES finished 13 projects under the county's ongoing flood mitigation program (Table 2.1).

Table 2.1. 2008 Flood mitigation projects

Project Location	***Project Description***
Bell Lane	Raised two brick window wells and installed drains at the bottom of window well to increase protection against house flooding.
Blanche Drive	Constructed an areaway, installed a sump pump, graded and restored the site.
Corland Court	Constructed an areaway and four window wells, replaced two drainage structures and graded the yard for overland relief.
Fallstaff Road	Constructed an areaway, three window wells and 50 linear feet of timber retaining wall; replaced two drainage structures; and graded the yard.
Glenbrook Road	Created a swale to divert pooled water from the back to the front of the property for improved drainage.
Kilbourne Drive	Constructed concrete retaining wall and drainage structures, replaced driveway replacement, graded for positive drainage and restored site for floodproofing.
Kirby Road	Constructed a gabion retaining wall and completed 200 linear feet of streambank stabilization using bio-engineering techniques to reestablish the stream buffer and improve water quality
Leewood Drive	Constructed an areaway, installed a sump pump and yard inlet, graded and restored the site.

Table 2.1. 2008 Flood mitigation projects

Project Location	***Project Description***
Macarthur Drive	Installed a yard inlet at an existing manhole, graded and reseeded the area to mitigate house flooding.
McFarland Drive	Modified two yard inlets by adding extra throat openings and lowering to allow for a greater rate of surface flow into the yard inlets. Constructed a berm to keep surface water in the county storm drain easement and direct it into the retrofitted yard inlets.
Sleepy Hollow Road	Constructed an areaway with sump pump and three window wells, graded for positive drainage and provided overland relief.
Stoneleigh Court	Constructed areaways with sump pumps, yard grading and site restoration.
Sugarstone Court	Reinstalled a fallen headwall that had exposed several sections of pipe, repaired the eroded area and installed riprap.

In addition to site-specific flood mitigation projects, Fairfax County and its partners are addressing community-level flooding concerns. The NVSWCD, NVRC and DPWES partnered to assist homeowners in the Falls Hill and Poplar Heights subdivisions to find solutions to severe flooding, erosion and drainage problems. A $12,000 grant from the Chesapeake Bay Restoration Fund was used to create a community demonstration project on a private property. Several stormwater control measures were installed, including a rain garden, grading and vegetation, a compost blanket, a French drain, rain barrels, an infiltration trench and an infiltration facility. (These controls are described in greater detail below under the Low Impact Development section). A Low Impact Development Handbook for homeowners was developed and distributed at two neighborhood workshops. Technical assistance on ways to better manage drainage problems was provided to homeowners during 20 visits to individual sites. The grant also funded mini-grants, along with additional technical assistance, as incentives to help homeowners implement solutions and improve stormwater management.

Figure 2.1. Water level gage at Woodglen Lake. Photo by Fairfax County.

When Tropical Storm Hanna hit Fairfax County on September 6, 2008, the DPWES stormwater management program utilized a newly created Signalization System to help guide the management of emergency response efforts. The signalization system was created out of concerns for the safety of facility monitoring staff during high wind situations. This system consists of automated water level gages at nine locations throughout the county, which provides real-time water level and rainfall data (Figure 2.1). Gage readings are relayed to the Fairfax

County Government Center for use by DPWES and Office of Emergency Management (OEM) staff to improve flood potential forecasting, efforts to monitor facilities and evacuation recommendations, with the overall goal of improved decision-making capability. The benefits of the system include enhanced decision-making capability for recommending the evacuation of residents during storm events. This added capability contributes toward the protection of the lives and property of county residents while helping to avoid unnecessary evacuations. With an increasing inventory of state-regulated dams coupled with several known flood prone areas, it would take approximately 80 county staff to monitor facilities in the county for a 24-hour period during a significant storm event. With the addition of the signalization system, the number of DPWES emergency response monitoring staff has been reduced to about 30. This alone results in a cost savings to the county of approximately $50,000 per major storm event. Implementation of this project involved a multi-agency team that consisted of personnel from DPWES, OEM, Department of Information Technology and the Department of Purchasing and Supply Management.

New Construction of Stormwater Management Ponds

One regional stormwater management pond was substantially completed in 2008 under Fairfax County's Regional Pond Program (Figure 2.2). Regional Pond D-46 provides water quality control for 344 acres of land. To date, 51 regional ponds from the Regional Watershed Management Plan have been constructed.

Figure 2.2. Regional Pond D-46. Photo by Fairfax County.

Retrofit of Existing Stormwater Management Facilities

Stormwater management facility retrofits are intended to improve the capacity of ponds beyond their original designs for better water quality and/or quantity control. Water quality retrofits enhance nutrient uptake and increase the infiltration, uptake and transpiration of stormwater. Table 2.2 describes selected pond retrofit projects completed by the DPWES and the FCPA in 2008.

Table 2.2. 2008 Retrofit of existing stormwater management facilities

Project Name	*Description*	*Partners*
Cardinal Glen Section 2 Pond Phase I	Phase I was completed in September 2008 and included repairing the failed dam embankment by installing a new principal spillway pipe and riser.	DPWES

Table 2.2. 2008 Retrofit of existing stormwater management facilities

Project Name	*Description*	*Partners*
Countywide Trash Racks and BMP Plates Installation	Fabricated and installed 12 new galvanized trash racks and BMP plates for increased water quality control. Installed wing walls and concrete aprons at certain locations to minimize erosion and facilitate maintenance.	DPWES
Poplar Tree Sec 2 Trash Rack Retrofit	Designed and installed a new trash rack for the outfall pipe to discourage future blockage and prevent flooding of adjacent residential yards.	DPWES
North Twin Lake Dam Reconstruction	Design was initiated to renovate the North Twin Lake dam and outlet structure to reduce peak flow and bring the dam into conformance with state and local standards. Construction is scheduled to begin in late 2010.	FCPA
South Run RECenter Expansion	Repaired and expanded a non-functioning storm water management pond to improve storm water quality by reducing peak flows during large storm events. The renovated pond will improve storm water quality by reducing peak flows and phosphorus during storm events. Renovation work was completed in September 2008.	FCPA
Lake Accotink Park Dredging Project	Completed dredging with removal of approximately 195,000 cubic yards of material in 2008. Since dredging began in 2006, 204,000 cubic yards of material have been dredged from Lake Accotink to increase storage volume and reduce peak flows. The project included the enhancement of existing wetlands, creation of more than one acre of additional wetland, creation of an in-lake forebay and the addition of an access channel from the marina.	FCPA, DPWES
Pinecrest Golf Course Pond Renovation	The project will replace two pond embankments that failed in 2006. Embankments and outfall structures will be reconstructed to meet State/county dam standards, increase storage capacity and reduce peak flows. This project will increase storage capacity and reduce peak outflows. A feasibility study was completed in September 2008 and the Park Authority Board approved the project scope on December 10, 2008. Design work is scheduled to begin in 2009 with construction tentatively scheduled for 2012 and 2013.	FCPA

Low Impact Development

Fairfax County promotes the use of environmentally sensitive site design and low impact development (LID) practices that minimize impervious cover and replicate natural hydrologic conditions as a means of protecting streams and other natural resources. LID projects are used to help the county meet multiple stormwater management goals and provide the following benefits:

- A variety of LID concepts and techniques can be applied to development of new residential and commercial areas or to retrofitting established areas

- LID projects can be selected to meet space constraints
- 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 issues
- These innovative projects provide opportunities for scientific research
- With adequate training, residents can implement and maintain some LID practices on their properties
- Certain LID practices provide aesthetically pleasing alternatives for stormwater management.

In 2001, the Capital Facilities (CAP) business area of DPWES initiated two pilot projects under the Leadership in Energy and Environmental Design (LEED) Green Building Program. With the support of the Facilities Management Department (FMD) and the Fire and Rescue Department (FRD), CAP began its green building program with the Fairfax Center Fire Station and the Crosspointe Fire Station projects. These projects helped CAP better understand the environmentally sensitive design concepts promoted by the LEED Green Building Program and to educate other county agencies on the benefits of the program. Since then, CAP has extended the green building program to include several other projects in the county, including the Burke Centre VRE Parking Structure completed in 2008. Lessons learned through the CAP effort supported the eventual adoption of the Sustainable Development Policy for Capital Projects by the Fairfax County Board of Supervisors in February 2008. The policy furthers the County's environmental stewardship goals as defined by the Environmental Agenda, the County Vision Element for Environmental Stewardship, and the Comprehensive Plan goals for Environmental Protection and Energy Conservation. While the county anticipates that application of environmentally sensitive design generally will increase the costs of construction projects by three to four percent, green buildings are expected to provide an energy savings of 15 to 25 percent per year over traditional construction and reduce water consumption by 20 percent, potentially saving the county thousands of dollars per project per year.

Featured Project: Falls Hill Residential LID Demonstration Project

The Falls Hill-Poplar Heights neighborhood in the Providence District and Cameron Run Watershed has been experiencing drainage and flooding problems. In response to the concerns raised by residents, county and NVSWCD staff participated in a series of professionally facilitated neighborhood meetings. The implementation of LID measures was one of the needs identified by the community. Working with NVRC and DPWES, the NVSWCD developed a project to educate the community, demonstrate LID practices, and assist homeowners who want to implement these practices on their properties. The NVSWCD applied for and received a $12,000 grant from the Chesapeake Bay Restoration Fund to support the effort.

Part of the grant was used for constructing a demonstration site on a homeowner's property to show innovative ways to control stormwater. The engineering firm, Angler Environmental, demonstrated a series of practices at the site with the assistance of NVSWCD and DPWES staff. An infiltration trench was constructed in the back yard to collect runoff via a yard inlet and carry it to an infiltration facility four feet square and four feet deep and covered with sod. Two rain barrels were installed at the downspouts, one of which is piped to the infiltration facility. The slope on the side yard was terraced, covered with a compost blanket and planted with native trees

and shrubs. A French drain was constructed under a path of stepping stones at the base of the slope. The French drain leads to a rain garden in the front yard. The neighborhood was invited to visit the site several weeks after construction was completed.

The grant was also used to publish a handbook, "Residential Low Impact Landscaping," for homeowners as well as to fund several mini-grants to help homeowners implement projects. The handbook was distributed at two workshops. An on-site field day was held to educate the community. NVSWCD staff provides technical assistance through site visits to homeowners who want to improve stormwater control on their properties and mini-grants are available to help them get started. Seventeen sites have been visited so far. In many cases, homeowners need information on better ways to direct runoff, how to establish vegetation and general environmental advice.

Summary of 2008 Low Impact Development Projects

In addition to the Falls Hill Demonstration Project, DPWES, NVSWCD, FCPA, various non-profit organizations and individual volunteers contributed to the design and implementation of 16 other projects within the county that incorporated one or more LID practices (Table 2.3).

Table 2.3. LID practices constructed in 2008

Project	***Description***	***Partners***
Audrey Moore RECenter Rain Garden	Installed a rain garden retrofit next to the entrance of the RECenter in a depression with a drop inlet that previously directed stormwater runoff directly to a storm drainage system. The new rain garden has 1,600 square feet of surface area and receives 1.8 acres of drainage, including the surrounding grassed and fertilized area and .25 acres of parking lot.	FCPA, NVSWCD
Beach Mill Road Storm Drain Improvement Project	Installed approximately 200 linear feet of streambank stabilization using bio-engineering techniques to establish the stream buffer and improve water quality	DPWES
Braddock Park Field Renovation	Renovated an existing adult-sized natural turf soccer field into a synthetic turf[1] field with a supporting open-graded aggregate base providing storage capacity to reduce peak flows during large storm events and eliminate need for fertilizer and pesticides.	FCPA
Bryant Center School Site Field Renovation	Renovated an existing adult-sized natural turf soccer field into a synthetic turf field with a supporting open-graded aggregate base providing storage capacity to reduce peak flows during large storm events and eliminate need for fertilizer and pesticides.	FCPA
Fire Station 26 Bio-filtration Facility Project	Retrofitted existing infiltration trench as a bio-filtration facility.	DPWES

[1] The phosphorous removal efficiency rate for synthetic turf systems is a conservative 15 percent.

Table 2.3. LID practices constructed in 2008

Project	***Description***	***Partners***
Fort Hunt Elementary School BMP Retrofit Project	Constructed two biofilters that collect runoff from southern part of school building and the parking lots located next to the building in the south. The biofilters will improve water quality as well as attenuate flows before discharging to a nearby outfall.	DPWES
Franconia District Park Field Renovation	Renovated an existing adult-sized natural turf soccer field into a synthetic turf field with a supporting open-graded aggregate base providing storage capacity to reduce peak flows during large storm events and eliminate need for fertilizer and pesticides.	FCPA
Hutchinson School Site	Renovated an existing adult-sized natural turf soccer field into a synthetic turf field, which included replacing a proposed dry pond with several low impact design stormwater management facilities to provide quantity and quality control of stormwater.	FCPA
Hybla Valley Elementary School BMP Retrofit Project	Constructed a biofilter west of the school building to collect runoff from the parking lot to the front and west of the school building, and a bioswale to the east of school building to collect runoff from the parking lot east of the building. These structures will improve water quality as well as attenuate flows before discharging to nearby outfalls.	DPWES
Lake Fairfax Core Area Phase II Improvements	Constructed a new administration building, restroom and kiosk buildings, parking lot, stormwater quality facilities and trails. Water quality control is provided by ten rain gardens constructed within the islands of the new parking lot. The project reached substantial completion in December 2008.	FCPA
Mount Vernon RECenter Rain Garden	A vegetated swale and rain garden were constructed in 2007. In 2008, warranty work included the replacement of shrubs from a local nursery.	FCPA, NVSWCD, DPWES
Nottoway Park Field Renovation	Renovated an existing adult-sized natural turf baseball diamond field into a synthetic turf field with a supporting open-graded aggregate base providing storage capacity to reduce peak flows during large storm events and eliminate need for fertilizer and pesticides.	FCPA
Spring Hill Park Renovations	Renovated an existing adult-sized natural turf soccer field into a synthetic turf field with a supporting open-graded aggregate base providing storage capacity to reduce peak flows during large storm events and eliminate need for fertilizer and pesticides.	FCPA

Table 2.3. LID practices constructed in 2008

Project	***Description***	***Partners***
Wakefield Park Rain Garden	Renovated an existing SWM pond to install a rain garden in 2007. It controls runoff from 2.43 acres, including a 0.22 acre parking area. Planting was completed and an interpretive sign was installed in 2008. Additional maintenance is planned for spring and summer 2009.	FCPA
Walt Whitman Middle School Retrofit Project	Constructed a biofilter in the northeast corner of the parcel that collects parking lot runoff, four bioswales in the east of parcel that collect parking lot runoff, and a bioswale and a biofilter in the southeast corner of the parcel that collects runoff from the offsite building located next to the school. The structures will improve water quality and attenuate flows before discharging to nearby outfalls.	DPWES
Wessynton	Construction of a bioretention basin, two drainage structures, 20 linear feet of concrete channel retrofit and extensive plantings to restore stream buffer and improve water quality.	DPWES

In addition to the projects summarized in Table 2.3, several other projects are in the design phase or the first stages of construction. DPWES expects construction starts or completions for the following projects in 2009:

- Construction will begin on the Dolley Madison Library renovation to include reforestation, pervious pavement, raised planter boxes, deep root tree boxes and vegetated swales
- Retrofit of the Fairfax County Government Center parking lot
- The Laurel Hill project at the former site of Lorton Prison is in the design stage. The project will feature right-of-way LID practices for the new Lorton Road and a full suite of LID practices (including soil amendment, bioretention facilities, vegetated swales, wetlands) for the remaining land footprint
- Renovation of the Martha Washington Library, including naturalized landscaping and a bioretention basin, is underway
- Completion of a stormwater pond retrofit, soil amendment and naturalized landscaping at McLean Community Center is anticipated for 2009
- Completion of Sherwood Library stormwater retrofit (including pervious pavement, two bioretention basins, three tree box filters and vegetated swale) is anticipated for 2009
- Phases I and II of the Shrevewood Elementary School LID project
- Waples Mill Elementary School Phase I and II will amend soil, convert approximately one acre of turf to native meadow and retrofit the parking lot for improved stormwater detention and water quality.

In 2008, the Park Authority planned the following LID-related projects:

- Spring Hill RECenter parking lot expansion, which may feature pervious pavement and other LID practices

- Lee District Park family recreation area, which may incorporate pervious pavement and other LID practices
- Renovation of existing natural turf soccer fields to synthetic fields at Baileys Elementary School, Greenbriar Park and Lee District Park in 2009

In 2008, the county completed installation of a green roof on the top deck of the county Government Center's Herrity Building parking garage, and interpretive signs were installed. A ribbon cutting ceremony was held on August 4, 2008 (Figure 2.3). The project is easily accessible for observation by industry professionals, county staff, residents and students. In addition to being an educational tool, the green roof provides an important research opportunity. Monitoring equipment was installed at the site, and the county began to measure performance differences between the vegetated area and an identical, un-vegetated area of the garage roof during storm events. The amount of rain, soil moisture level and volume of water leaving the green roof continues to be monitored and will provide a plethora of rain and runoff data. These data will be used to analyze rainfall-runoff characteristics of the green roof and its performance as a best management practice (BMP).

Figure 2.3. Ribbon cutting ceremony at the Herrity green roof. Left to right: Supervisor Smyth, Supervisor Gross, Supervisor Herrity, former Chairman (now Congressman) Connelly and present Chairman Bulova. Photo by Fairfax County.

DPWES installed a monitoring system at the Cub Run RECenter site to monitor the performance of LID features (a vegetated swale and rain garden) constructed in 2007 by NVSWCD and DPWES as part of the Fairfax County Board of Supervisors Environmental Improvement Program. The monitoring equipment measures incoming and outgoing water quality and on-site weather conditions.

In 2008, NVSWCD provided recommendations to the Department of Planning and Zoning on 125 rezoning and special exception applications. Recommendations addressed better site design techniques, LID practices and stormwater management measures that would lessen impacts on streams. Comments were provided to DPWES-Land Development Services on the erosion and sediment control and stormwater management aspects of 16 site plans. NVSWCD works directly with developers to advise them on ways to develop sites that protect environmentally sensitive areas and with less adverse impact on streams and other natural resources.

Stream Restoration and Stabilization

In 2008, the county completed five stream restoration projects with the assistance of a number of non-profit organizations and volunteers. These projects are summarized in Table 2.4.

Table 2.4. 2008 Stream Restoration and Stream Stabilization Projects

Project Name	***Description***	***Partners***
Beach Mill Road Storm Drain Improvement Project	Installed approximately 200 linear feet of streambank stabilization using bio-engineering techniques to establish the stream buffer and improve water quality	DPWES
Green Spring Gardens Stream Stabilization	Completed construction in summer 2008 to restore approximately 1,000 liner feet of Turkeycock Run within the park. The project involved the construction of rock cross vanes, j-hook weirs, rock walls and step pools, protection of two sanitary sewer lines and replanting with native vegetation (Figure 2.4). The project was awarded a 2008 DPWES Land Conservation Award for tree planting	FCPA, NVSWCD
Hollington Place	Provided 730 linear feet of streambank stabilization to alleviate sever erosion, re-establish stream buffer and improve water quality	DPWES
McLean Central Park	Final planning underway to stabilize over 1,000 linear feet of Dead Run, with construction to begin in spring 2009	FCPA, DPWES

Figure 2.4. Portion of the Green Spring Gardens stream restoration before (left) and after (right) creation of step pools. Photo by Fairfax County.

Planning and design is underway for restoration of the central wetland at Huntley Meadows Park. Design and permitting should be completed in 2009 with construction occurring in 2010 or 2011. The project will be completed in several phases over three or four years.

3. Operations

Fairfax County's stormwater management program is designed to prevent harmful pollutants from being dumped or washed by runoff into the municipal separate storm sewer system (MS4) and discharged into local water bodies. Controlling and managing sources of stormwater pollutants are vital components of the plan. The plan addresses how the county manages materials used to treat county roadways and parking lots; applies pesticides, herbicides and fertilizers; takes measures to prevent sanitary sewer system leaks; controls discharges from high priority and industrial facilities like county landfills; and responds to spills of hazardous materials. These actions reduce the possibility of materials reaching the county's stormwater infrastructure and streams.

Inspection and Maintenance of Stormwater Management Facilities

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, including stormwater dry ponds located in residential subdivisions. MSMD inspects and implements private maintenance agreements for privately maintained stormwater management facilities. In 2008, MSMD inspected 1,193 county-maintained SWM and BMP facilities at least once, which represents approximately 96 percent of the 1,237 existing facilities in the inventory at the start of 2008. For practical maintenance considerations, MSMD has inspected these facilities annually in recent years. This complies with the MS4 permit requirement to inspect all county-maintained facilities once during the term of the permit. MSMD inspected 585 of the 3,164 privately-maintained facilities in 2008 with the goal of inspecting all privately-maintained facilities at least once during the permit cycle as required.

In 2008, MSMD continued its maintenance program for county stormwater management facilities. Maintenance can include repairs to stormwater management facility structures and removal of sediment. During 2008, the county cleaned and/or mowed 1,027 dam embankments, including 35 regional ponds which were maintained four times each during the calendar year. Cleaning involves removing trash, sediment and debris from the trash rack, control structure and all 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 keeps the facility functioning properly by conveying water and performing the BMP function as designed. The county completed 314 maintenance work orders to correct deficiencies in publicly maintained SWM/BMP facilities. Table 3.1 provides a sampling of the pond maintenance projects that were completed in 2008.

Table 3.1. 2008 Stormwater management facility maintenance projects

Project Name	***Description***
Chantilly Library Pond Sediment Removal	Removed 148 cubic yards of sediment and vegetation to restore the original pond capacity.
Compton Heights Circle Pond Sediment Removal	Removed 300 cubic yards of sediment from the pond floor and adjacent micropools to restore pond capacity.

Table 3.1. 2008 Stormwater management facility maintenance projects

Project Name	*Description*
Huntsman Lake Pipe Repair	Repaired a 9x18-inch hole in the principle spillway pipe to prevent degradation of the dam and relined affected pipe section using hardened resins to extend the life of the pipe.
Little Rocky Run Pond F2 (Sec 54) Sediment Removal	Removed accumulated sediment from the trickle ditch and repaired the erosion next to the riser in order to address flooding and standing water and return the pond to its intended state.
McNair Farms Pond E Sediment Removal	Removed sediment from a pond at the intersection of Centreville Road and Old Centreville Road, repaired erosion, eliminated graffiti, and removed sediment from the trash rack and ditches in order to return the pond's performance to its original design.

In addition to routine maintenance inspections, county staff with expertise in dam design and construction continue to perform biennial inspections of 16 state-regulated dams in the county to identify any safety or operational items in need of corrective action and to ensure that the dams satisfy state requirements for safety are met. A work program was established and implemented to correct deficiencies and address maintenance items discovered during inspections. 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 are working together to rehabilitate four flood control dams that were constructed in the Pohick Creek watershed during the 1970s and 1980s. Improvements in geologic modeling technology, newer federal and Virginia safety standards and more recent residential development necessitated the rehabilitation projects. In 2007, several public meetings were held to discuss the first rehabilitation project at Lake Royal and ensure that resident concerns were addressed during the project design. The adopted Lake Royal dam rehabilitation option includes realigning the auxiliary spillway to direct water away from townhomes that were built after the dam was completed, armoring the auxiliary spillway with articulated concrete blocks, which are then covered with soil and seeded, and increasing the height of the auxiliary's dikes, which are grass-covered earthen embankments on either side of the spillway that constrain the flow. The cost of the improvements is shared by NRCS and Fairfax County, with NRCS providing up to 65 percent of the estimated cost of $3.1 million. Construction began in spring 2008.

Storm Drainage Infrastructure Management

As required by its VPDES MS4 permit, Fairfax County must maintain an accurate inventory of its MS4. MSMD implements an infrastructure management plan to track Fairfax County's stormwater management facilities, stormwater infrastructure and associated easements using the county's geographic information system (GIS) databases. The infrastructure management plan encompasses Fairfax County's 399 square miles as identified on 436 tax map grids. Over a five-year cycle completed in 2005, MSMD field-verified the storm drainage conveyance system on

each tax map grid, identified storm drainage pipes, outfalls and associated appurtenances and created a GIS-based data layer. The GIS inventory continued to be updated in 2008 by digitizing more than 400 as-built construction plans across 90 tax map grids. An additional 500 as-built plans are scheduled to be completed in early 2009. The GIS database of stormwater-related easements, which was initiated in 2005, was 90 percent complete at the end of 2008. The remaining 40 tax map grids will be completed within the first quarter of 2009. The inspection management schedule is summarized below (Figure 3.1).

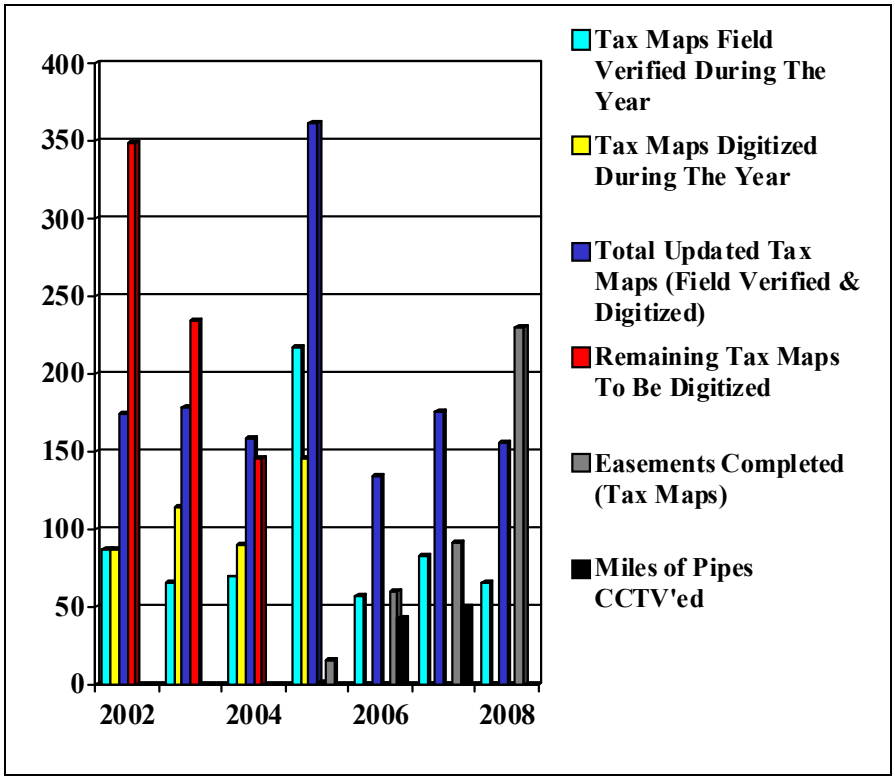

Figure 3.1. Infrastructure Management Schedule

There are more than 10,000 structures and 1,400 miles of pipe associated with the county's MS4. In 2008, the county inspected 338 miles of county-maintained MS4 (pipes) for deficiencies and wrote 362 orders to correct deficiencies, all of which were completed. The number of work orders written (for other MS4 structures as well as pipes) was 771, of which 677 were completed.

MSMD implemented an infrastructure reinvestment and rehabilitation program in 2006. Infrastructure reinvestment includes clearing channels and removing vegetation that can affect the integrity or performance of the storm drainage system. In 2008, MSMD completed reinvestment projects throughout the county, including several in the Dranesville, Mason and Providence magisterial districts (Table 3.2). Under the program, MSMD inspected 70 miles of pipe and 4,600 structures using closed-circuit television (CCTV) in addition to inspecting five miles of channels through other methods. MSMD designed repairs for three miles of pipe and 370 structures. MSMD has completed approximately 75 percent of the construction of 60 rehabilitation projects. The budget for these projects is about $4 million.

Table 3.2. 2008 MS4 Infrastructure Repairs and Channel Clearing Projects

Project Location	***Project Description***
Dranesville/Providence District Line Repair	Repaired approximately 1,800 feet of storm drain pipe using cured-in-place liner techniques
Dranesville/Providence District Point Rehabilitation	Rehabilitated approximately 1,655 feet of storm drain pipe to extend the service life by using cured-in-place point repair techniques
Evers Drive	Removed and replaced an existing pipe with a new 36-inch concrete pipe in response to complaints about chronic sinkholes. Constructed a new outfall structure to improve drainage around adjacent properties (Figure 3.2)
Mason District Line Rehabilitation	Repaired approximately 1,000 feet of storm drain pipe using cured-in-place liner techniques
Mason District Point Rehabilitation	Rehabilitated approximately 5,122 feet of storm drain pipe to extend the service life by using cured-in-place point repair techniques
Preston White Channel Stabilization	Relocated 250 feet of storm channel 20 feet away from the parking lot and stabilized an embankment; installed 600 cubic yards of rip rap; reset a fallen storm drain outlet and inlet; and replaced 115 feet of damaged curb and gutter
Providence District Line Rehabilitation	Repaired approximately 200 feet of storm drain pipe using cured-in-place liner techniques
Providence District Point Rehabilitation	Rehabilitated approximately 4,013 feet of storm drain pipe to extend the service life by using cured-in-place point repair techniques
Shadwell Court	Repaired and regraded 550 feet of storm drain channel and cleared storm drain pipes beneath Shadwell Court
Valon Court	Realigned 500 linear feet of storm pipe, installed four new storm structures and reconstructed a section of Valon Court including new curbs, sidewalk and pavement overlay

Figure 3.2. Construction site on Evers Drive before (left) and after (right) the new outfall was completed. Photo by Fairfax County.

Roadways

The county maintains approximately five miles of road segments and 159 acres of parking lots at public facilities such as government centers, libraries, fire stations, police stations, health centers, bus transit facilities, park-and-ride lots and commuter rail stations. To limit the discharge of sand and de-icing materials into the county's streams, sand and chemical treatments are provided only when dictated by safety concerns. The DPWES swept 159 acres of parking lots that were treated during the winter of 2008. As a result, 177 cubic yards of material was removed and disposed.

Pesticide, Herbicide and Fertilizer Application Program

As part of the continued collaboration among county agencies to implement nutrient and integrated pest management practices, the county has developed and distributed a draft document containing Fairfax County Nutrient and Pesticide Management Plans to agencies that are involved in the administration of public rights-of-way, parks and other municipal properties. The Nutrient Management Plan (NMP), the Site Specific Nutrient Management Plan Content document and the Integrated Pest Management (IPM) Plan are intended to meet Fairfax County's Virginia Stormwater Management Program (VSMP) Phase I MS4 permit requirement to "Implement controls to reduce the discharge of pollutants related to the storage and application of pesticides, herbicides, and fertilizers applied to public right of ways, parks and other municipal property." These plans provide a basis for site-specific NMP and pest-specific IPM plans.

The plans were developed using the previously developed "Guidelines for Nutrient Management" (2006) and "Guidelines for Integrated Pest Management" (2006) as well as a summary document entitled "Summary of Pesticide, Herbicide, and Fertilizer Use in Fairfax County and Recommendations for Alternatives" (2006). These guidelines and the summary document provide the following: 1) information on how much and what type of pesticides, herbicides and fertilizers are applied by the county to public right of ways, parks and other municipal property; 2) information on how to reduce the discharge of pollutants related to the storage and application of pesticides, herbicides and fertilizers applied in the county; 3) recommendations for nutrient management; 4) guidelines and information on the specific practices appropriate for developed landscapes, lawns and turf, and pesticide handling; and 5) discussion of and examples for the IPM approach.

Many county agencies have some form of nutrient and pest management plans and either implement the plans themselves or have contractors implement them. County personnel and private contractors follow the Virginia Department of Conservation and Recreation's nutrient management training and certification guidelines, the Virginia Department of Agriculture's guidelines for certification and training of pesticide applicators and the 2006 Virginia Pesticide Control Act. In addition, many agencies collect information on the application rates and total annual usage of pesticides, herbicides and fertilizers.

The county conducts site inspections and soil tests prior to any application of pesticides, herbicides or fertilizers. In addition the county uses natural landscaping wherever possible.

Staff of the NVSWCD review nutrient and integrated pest management plans for private golf courses and plant nurseries, and provide comments and recommendations to the Department of Planning and Zoning. NVSWCD staff review and comment on the implementation and monitoring reports received from golf courses, and make conservation information related to pesticide, herbicide and fertilizer application publicly available through their Web site: www.fairfaxcounty.gov/nvswcd.

The federal and state pesticide laws and regulations require pesticide applicators to be certified to use 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 2008, Agriculture and Natural Resource Extension agents for the Virginia Cooperative Extension (VCE) conducted programs in pesticide safety and IPM throughout Northern Virginia. The program assisted agricultural producers 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 2008, VCE trained 670 commercial pesticide applicators for re-certification in Northern Virginia. The trainees provided the following feedback about the experience:

- 98 percent of surveyed respondents stated that as a result of re-certification programs, they know how to comply with state and federal laws and regulations
- 98 percent of surveyed respondents learned more about the proper use of application equipment (calibration, drift minimization)
- 97 percent of surveyed respondents stated they read pesticide labels and use the required personal protective equipment

County Landfills

The Fairfax County Division of Solid Waste Disposal and Resource Recovery (DSWDRR) operates two landfills on county property that are covered under a VPDES General Permit. They are the I-95 Landfill located at 9850 Furnace Road in Lorton (registration number VAR051076) and the I-66 Transfer Station/Closed Landfill located at 4618 West Ox Road in Fairfax (registration number VAR051074). Both permits expired on June 30, 2009.

The final phase of the I-95 Closure Project was completed during the summer of 2007 and certified by the Virginia Department of Environmental Quality. This completes a ten-year process to place an engineered cap over 250 acres of the portion of the landfill containing municipal solid waste. Stormwater is managed more efficiently and infiltration is reduced significantly, in turn providing for less generation of leachate. The final cover system also minimizes the need for post-closure maintenance.

Phase IIB of the Area Three Lined Landfill (ATLL) project has a disposal capacity of 375,000 tons and continues to accept ash from the Energy/Resource Recovery Facility (E/RRF) located at the I-95 Complex and a similar facility in Alexandria. This phase has a service life of four years with filling likely to be completed in 2009. The 7.5-acre cell consists of a bottom lining system that includes two feet of low-permeability soil, a double synthetic liner (60-mil HDPE) system, and a leachate collection and detection system. In 2009, an intermediate protective cover will be

placed over significant portions of the filled areas to minimize leachate production, and design work on additional final cap for portions of Phase IIB will begin.

A new cell, Phase IIIA, was opened in September 2008. This 7-acre cell consists of three different liner systems, each featuring low-permeability soil, a 60-mil HDPE liner, geosynthetic clay liner and a composite drainage network that will transport leachate. The new cell is covered with a rain cap laid over a protective soil layer (protecting the liner system). In 2008, approximately one acre of rain cap was removed to allow for placement of ash on a full time basis. Leachate from the new ash filling area is collected by drainage standpipes in the ash fill area that tie directly into the leachate collection trench. Stormwater is separated from leachate by soil berms and rain cap.

Stormwater improvements at the I-66 Transfer Station (Figure 3.3) continued in 2008 with the ongoing construction of the new Citizen's Disposal Facility (CDF). Stormwater coming into contact with disposal activity associated with the CDF is being collected by numerous new stormwater inlets and a new drainage network built into the asphalt pad. The stormwater retention pond constructed in 2007 is tied into the new drainage system and is fully functional. Final tie-ins of the new drainage system with the existing drainage system will be completed in 2009.

Figure 3.3. I-66 Transfer Station. Photo by Fairfax County.

Staff performs quarterly visual inspections of the stormwater outfalls located at the I-95 Landfill and the I-66 Transfer Station/Closed Landfill. Annual benchmark sampling is performed during the July 1 through June 30 monitoring year. Water quality test results conducted to satisfy VPDES permit conditions have been satisfactory. Test results and inspection reports are maintained on file at the facility's administration offices. The costs for the required VPDES monitoring, testing and other related activities are included as part of the operating budget for each facility and are not funded separately. This is because most of the activities required by the VPDES permit are also required under the operating permits granted by Virginia Department of Environmental Quality (VDEQ).

Training in pollution prevention for facility staff is provided and is a part of the I-95 Landfill and I-66 Transfer Station/Closed Landfill waste disposal permits. Pollution prevention plans are maintained at each facility and are updated when conditions change. In addition, spill kits are readily available at each location.

DSWDRR incurs other costs not directly associated with stormwater management but of importance to the stream environment. Annual VPDES expenditures are estimated to be $180,000 for the I-95 facility and $90,000 for the now-closed I-66 facility.

Hazardous Materials Spill Prevention and Response

The Fire and Rescue Department responds to all reported incidents of hazardous material releases, spills and discharges. Fire and Rescue's Hazardous Materials and Investigative Services (HMIS) staff receive training in pollution prevention measures and proper response procedures when pollutants or spills reach storm drains. HMIS staff are trained in the proper handling of hazardous wastes as part of the household hazardous waste collection program. The department maintains a contract with a major commercial hazardous materials response company to provide additional containment and clean-up support for large scale incidents.

In 2008, HMIS received 415 complaints. Approximately 340 of the complaints involved the actual release of various petroleum or chemical substances. Of the 340 releases, 243 involved the release of either diesel fuel (45), home heating fuel oil (63), gasoline (48), motor oil (42), or hydraulic oil (45). Other releases investigated involved antifreeze, paint, sewage, mineral oil and mercury. Storm drains were involved in 43 of the releases.

In both emergency and non-emergency spills that reach the MS4, HMIS works with the DPWES and the Department of Planning and Zoning to ensure that the appropriate persons take responsibility for spill control and cleanup by enforcing codes and ordinances. HMIS issues criminal citations during investigations of hazardous materials incidents and utilizes enforcement action to protect and restore the environment, as well as to recover costs incurred by the county.

The HMIS conducts long-term monitoring of contaminated sites that may contact surface waters or stormwater management facilities. As a part of the oversight program, the HMIS accepts, reviews and processes requests to discharge treated groundwater from remedial activities at contaminated sites into the county MS4. HMIS then monitors the discharge for the duration of the agreement. At the start of 2008, the Hazardous Materials Technical Support Branch of HMIS began with 50 oversights files. During the year, 49 new oversight files were opened and 42 were closed. Most of these oversights involve contaminated underground storage tanks. A few of the oversights are long term and have been monitored for more than 15 years. Fifty-seven oversight files will be carried into 2009.

The Fire and Rescue Department plays an important role in illicit discharge detection and elimination. FRD's Hazardous Materials and Investigative Services section aggressively enforces County Code Chapters 62, 105 and 106 in conjunction with the Department of Public Works and Environmental Services (DPWES) and the Department of Planning and Zoning, and issues criminal citations during the investigations of hazardous materials incidents. Chapters 105 and 106 contain provisions that address illicit discharges to state waters and the county's storm drainage system. Procedural Memorandum No. 71-01, "Illegal Dump Site Investigation, Response, and Cleanup," outlines the process of follow-up action for non-emergency incidents of illegal dumping; establishes action under County Code Chapter 46, Health or Safety Menaces; and provides referrals for action on complaints that are neither public health hazards nor regulated.

Sanitary Sewer Inspection and Maintenance

Inspection and maintenance of the county's sanitary sewers help eliminate sewage leaks to the MS4 and waterways. Rehabilitation and repairs include dig-up repairs, manhole rehabilitation and trenchless pipe repair using 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 business area 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. CCTV is used to inspect trunk sewer mains to identify defective sewer lines for repair and rehabilitation. In 2008, 251 miles of old sewer lines and 11 miles of new sewer lines were inspected, resulting in the identification of sanitary sewer lines and manholes needing repair and rehabilitation. In 2008, 69,804 feet of sanitary sewer lines were rehabilitated, bringing the total length of sewer lines repaired during the past ten years to 1,262,329 feet (252 miles).

The Sanitary Sewer Extension and Improvement Program addresses pollution abatement and public health considerations by providing sanitary sewer service to areas the Department of Health has identified as having non-repairable or malfunctioning septic systems. In 2008, one extension and improvement project was completed consisting of 3,266 linear feet of eight inch sanitary sewer, 73 grinder pumps and 19,500 linear feet of force main. The project provided sanitary sewer connections to 112 homes. A summary of these programs is shown in Table 3.3.

Table 3.3. 2008 Sanitary sewer maintenance and inspection summary

Activity	***Old sanitary sewer lines***	***New sanitary sewer lines***	***Total after nine years***	***Dig ups***	***Manholes***	***Trench-less pipe repair***
Inspections by CCTV	251 miles	11 miles	N/A	N/A	N/A	N/A
Rehabilitation and Repairs	69,804 feet	N/A	252 miles	42	1053	142
Constructed to replace failing septic system	N/A	3,266 feet (112 homes)	N/A	N/A	N/A	N/A

Construction Site Erosion and Sediment Control

Through its plan review process, DPWES staff enforce the Public Facility Manual and the Zoning Ordinance 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 Virginia Department of Conservation and Recreation (DCR) requirements.

In 2008, 670 E&S plans were submitted and approved for projects that would disturb a land area of 2,500 square feet or more. Written reports were provided to DCR staff informing them of these individual sites on a monthly basis.

Fairfax County's Alternative Inspection Program, established in cooperation with the DCR, resulted in 32,168 E&S inspections in 2008 on all sites under construction. Staff issued 670 "notices to comply with the approved plans" indicating the deficiency found in each case and the respective corrective action required. There were 188 notices of violation given to developers who failed to take the required corrective action. Criminal proceedings were started in 16 cases. The county's E&S program is fully approved by DCR.

In conjunction with the Heavy Construction Contractors Association, the county conducted an Erosion and Sediment Control Forum for developers, contractors and engineers in April 2008. The focus of the forum was to update participants with current and new E&S regulations on land development projects.

Several E&S control training sessions for citizen and homeowner association groups were conducted by county staff. In 2008, a class for the Engineers and Surveyors Institute was held on E&S control design, installation, inspection and maintenance considerations. This class was conducted for practicing engineers and local municipal agencies working in land development.

A 24-hour hotline established by DPWES continues to be a means for citizens to report complaints about erosion and sedimentation. More information is available with regard to reporting environmental concerns or possible violations of Fairfax County Environmental Regulations at DPWES' Web site (www.fairfaxcounty.gov/dpwes/publications/urbanfor.htm).

The Department of Planning and Zoning coordinates with staff from other county agencies to review rezoning, special exceptions, and special permit applications for environmental considerations including stormwater management. They also investigate complaints of possible Zoning Ordinance violation issues that may have potential stormwater impacts.

Land Conservation Awards Program

Fairfax County sponsors an annual Land Conservation Awards program that recognizes the construction community for excellence in installing and maintaining E&S control measures on construction projects. Each year, the NVSWCD fields a team of judges to inspect sites that are nominated in the spring and fall. In 2008, they inspected 17 sites. Awards were presented in several categories (including outstanding single family residential, commercial, infill, linear and special development projects, as well as for best protected environmentally sensitive area) to developers and contractors during the 2008 Land Conservation Awards ceremony held in January 2009. Site superintendents and site inspectors also were recognized for their work. Six of the nominated projects received awards; one of the six received awards in two categories. Seven individuals and one engineering firm were recognized for their work. The Tree Commission judged awards for outstanding examples of saving trees, as well as implementation of beneficial and innovative vegetative measures, which were presented at the January ceremony. These awards are valued by recipients in the construction industry and are an incentive to do excellent work.

Trail Improvements to Address Erosion Issues

Upgrades to the Cross County Trail (CCT)

The surface of the trail south of Vale Road was improved to reduce erosion to Difficult Run by lining the trail with geotextile fabric and rolling crushed, recycled concrete onto the trail. The project was completed in August 2008 just prior to Tropical Storm Hanna and held up well to flooding during that storm. Approximately 1,700 linear feet of trail was improved at a cost of $72,902.

Two reroutes of the CCT south of the Dulles Access Road were completed during the summer of 2008 as Eagle Scout projects. Both sections of the trail were extremely wet and muddy with considerable erosion into nearby Difficult Run. The scouts relocated the trail out of the floodplain and worked to close off the old sections of trail. Staff installed signs noting that the old trail is officially closed. Approximately 2,000 linear feet of trail was relocated at a cost of about $3000 for stone and signs.

A reroute of a small section of trail at Brian Jac Lane was constructed as an Eagle Scout project. The reroute redirected the flow of water that was running off the street directly down the natural surface trail, creating huge ruts in the trail route. Approximately 500 linear feet of trail was relocated by volunteers, and a small stone dike was constructed by park staff to redirect and disperse concentrated flow into a wooded section of parkland before reaching Difficult Run.

Improvements to the Potomac Heritage National Scenic Trail (PHNST) in Scotts Run Nature Preserve

In June 2008, volunteers working on National Trails Day relocated a section of the PHNST from the flood plain of the Potomac River to a drier and more stable route. Much of the route was armored with stone from the site. Another project to install water bars to prevent erosion on a section of the trail was begun on Trails Day and completed later in summer 2008 by a scout group and by a crew from the Student Conservation Association.

Figure 3.4. Feeding horses within a confined area designed to protect pasture from continuous grazing and trampling on a property in Fairfax County. Photo by Fairfax County.

Agricultural Land

Horse-keeping operations are the predominant agricultural land use in the county (Figure 3.4). 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 and Agricultural and Forestal District Ordinance require land in agricultural use to have a soil and water quality

Figure 3.5. A manure composting facility at a horse farm in Fairfax County. Photo by Fairfax County.

conservation plan. Plans include best management practices to reduce erosion and sediment pollution from pastures and stables, manage excess nutrients from animal waste and fertilizers and address the misuse of pesticides and herbicides. The plans prescribe vegetated riparian buffers for streams (Resource Protection Areas). In 2008, NVSWCD developed 17 soil and water quality conservation plans for 830 acres, which included 46,712 linear feet of Resource Protection Areas.

The Virginia Department of Agriculture and Consumer Services received four complaints about water quality pollution because of poor manure management. These complaints were filed under the Agricultural Stewardship Act. NVSWCD provided technical assistance and conservation plans for three of the landowners and the problems have been successfully resolved. The fourth case remained under investigation at the end of 2008.

NVSWCD used grant funding from DCR to build a manure composting facility at a horse-keeping operation (Figure 3.5). Its purpose is to demonstrate appropriate and economical manure management. This site will be used as part of a series of educational workshops for horse owners.

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 2008, VDOF completed eight Agricultural and Forestal management plans. Stream management zones were particularly noted on these plans, and efforts were made to include buffers from the agricultural uses. The protection of forest cover and water quality were both promoted in the plans. VDOF also completed two tree management plans for homeowner associations that included recommendations to plant trees to reduce storm water runoff. VDOF wrote one Stewardship Management plan for large landowners in the county advising on forest management for stormwater control among other objectives.

4. Monitoring and Assessment

Fairfax County oversees a vigorous 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.

Four storms were monitored in 2008, and the data were combined with 2005, 2006 and 2007 storm data. Pollutant concentrations at the two stations were compared statistically (Table 4.1), and significant differences were found between concentrations of seven of the nine of the constituents measured at the sites. Seasonal and annual unit-area constituent loadings were computed using the Simple Method and are summarized in Table 4.2. Nutrient loadings (nitrogen compounds and phosphorus) were significantly higher at the medium to high density residential land use site than at the low density site. Results were submitted to the Virginia Department of Conservation and Recreation in the 2008 VPDES permit annual report.

Table 4.1. Results of statistical analysis to determine if there is a significant difference between observed constituent concentrations at Stations VNA and OQN

	Station VNA			Station OQN			Differences Statistically Significant?**
Constituent*	**Median**	**High**	**Low**	**Median**	**High**	**Low**	
NH_3-N	0.21	0.73	0.03	0.02	0.27	0	YES
COD	74	292	22	43	69	2.5	YES
E. Coli	901	200000	18	747	38000	27	NO
Fecal Strep	11400	129000	117	1089	50900	45	YES
NO_3+NO_2-N	0.72	1.64	0.16	0.45	0.73	0.1	YES
TDS	128	836	51	101	160	71	NO
TKN	2.01	11.3	0.48	0.57	1.84	0.2	YES
TP	0.37	1.61	0.1	0.06	0.8	0.01	YES
TSS	60	1207	4.9	19	485	1.4	YES

*All constituent units are mg/l, other than *E. coli* and Fecal Strep which are in colonies per 100 ml.
* *Based on a Mann-Whitney 2-sample test at a 0.1 significance level.

Table 4.2. Computed seasonal and annual unit area constituent loading at monitored locations

	Unit-area loading *									
	Winter		Spring		Summer		Fall		Annual	
Constituent	VNA	OQN	VNA	OQN	VNA	OQN	VNA	OQN	VNA	OQN
NH_3-N	0.225	0.005	0.253	0.142	0.148	0.050	0.057	0.013	0.683	0.209
COD	50.354	12.257	84.180	63.621	48.296	13.116	50.869	13.634	233.7	102.6
E. Coli	0.542	0.510	5.881	20.660	149.566	8.550	19.089	13.329	175.078	43.049
Fecal Strep	1.050	2.171	20.032	21.593	106.589	30.554	60.924	12.885	188.596	67.203
NO_3+NO_2-N	0.542	0.201	0.745	0.531	0.653	0.280	0.221	0.128	2.161	1.139
TDS	148.301	53.888	151.135	98.071	76.961	79.827	51.838	34.397	428.2	266.2
TKN	1.304	0.193	4.645	1.592	1.574	0.535	0.495	0.212	8.018	2.533
TP	0.192	0.015	0.325	0.442	0.301	0.069	0.279	0.075	1.097	0.601
TSS	58.238	4.804	126.215	278.100	103.055	45.308	97.087	39.110	384.6	367.3

*All units are lb/ac, except for *E. coli* and Fecal Strep which are in billion colonies/ac. To compute total loads in lbs or billion colonies, multiply unit-area loading by drainage area of monitoring station in acres

Dry and Wet Weather Monitoring

Identifying and removing illegal or improper connections to storm drainage systems and receiving waters is a measure for reducing stormwater pollution. In 2008, the county selected 63 storm drainage outfalls for dry weather screening and recorded physical parameters at each outfall in accordance with the "Dry Weather Screening Program – Site Selection and Screening Plan." Water was found to be flowing at 22 of the outfalls, and was tested for a range of pollutants including ammonia, conductivity, surfactants, fluoride, pH, potassium, phenol, copper and chlorine. Low levels of copper and fluoride were detected at six of the outfalls tested. Upon retesting these sites, three continued to exceed the screening criteria, and further testing was conducted to track down the source. A map of the storm drainage system and a global positioning system (GPS) unit were used to track the network of sites. Observations of flowing water and land use were recorded, and water was tested where flow was found. This procedure was followed through the network of stormwater pipes until there was no water flowing. A specific source of pollutants could not be found at two of the sites. A discharge of cooling water from the roof of an office building was identified as the source of the third discharge. DEQ was notified, and they had a subsequent on-site meeting with the building owner who was required to remedy the situation.

Wet weather screening and industrial high risk monitoring was conducted twice at one site in 2008. The site was originally identified in 2007 using the county's GIS data layers and the procedures outlined in the Stormwater Management Program Plan (July 2006) as one of seven industrial and commercial facilities with the greatest potential for discharging pollutants. Sampling consisted of automated sampling in a manhole, which enabled calculations for event mean concentrations as well as for first flush sampling for oil and grease and chemical oxygen demand. The water chemistry data indicated that there was not a significant source of pollution in the stormwater from the site according to the Center for Watershed Protection's Illicit Discharge Detection and Elimination Guidance Manual (October 2004) and the Virginia Water Quality Standards (January 2006).

Kingstowne and South Van Dorn Street Monitoring

The Kingstowne Environmental Monitoring Program provides information to protect Huntley Meadows Park from the detrimental effects of upstream development, particularly excessive sediments and phosphorus, in the Dogue Creek watershed. Two stations (Kingstowne and South Van Dorn) were monitored to comply with a U.S. Army Corps of Engineers permit. Data are also used to evaluate the effectiveness of the Dogue Creek Watershed Stormwater Control Plan in removing phosphorus from stormwater discharges. From July 2007 through June 2008, 26 storm event samples were collected at the Kingstowne station and 24 were collected at the South Van Dorn station using automated samplers. The Kingstowne total suspended solids data suggest that erosion and sediment controls, including stormwater best management practices, are minimizing sediment loads to Dogue Creek. For the first time in six years, the permit phosphorous load reduction target of 50 percent was attained for South Van Dorn during this monitoring period. The mean annual total phosphorus concentration measured at South Van Dorn during storm events was 0.121 mg/L, which is equal to a 59.6 percent removal rate.

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 (Figure 4.1).

Figure 4.1. Ecologists collect macroinvertebrates from a county stream in spring 2008 (left). Fish are collected in late summer (right). Photo by Fairfax County.

Benthic macroinvertebrates are organisms lacking a backbone, which inhabit the stream bottom and are large enough to be seen with the naked eye (Figure 4.2). 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.

Figure 4.2. A county ecologist identifies macroinvertebrates in the lab. Photo by 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 40 sites are selected randomly for monitoring. At these sites, samples are collected for both benthic macroinvertebrates and fish (once annually) and for *E. coli* bacteria concentration (four times annually). Water quality and stream habitat characteristics are 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 www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm and in the biological monitoring program's standard operating procedures manual. Figure 4.3 (below) shows the locations of the 2008 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 40 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.

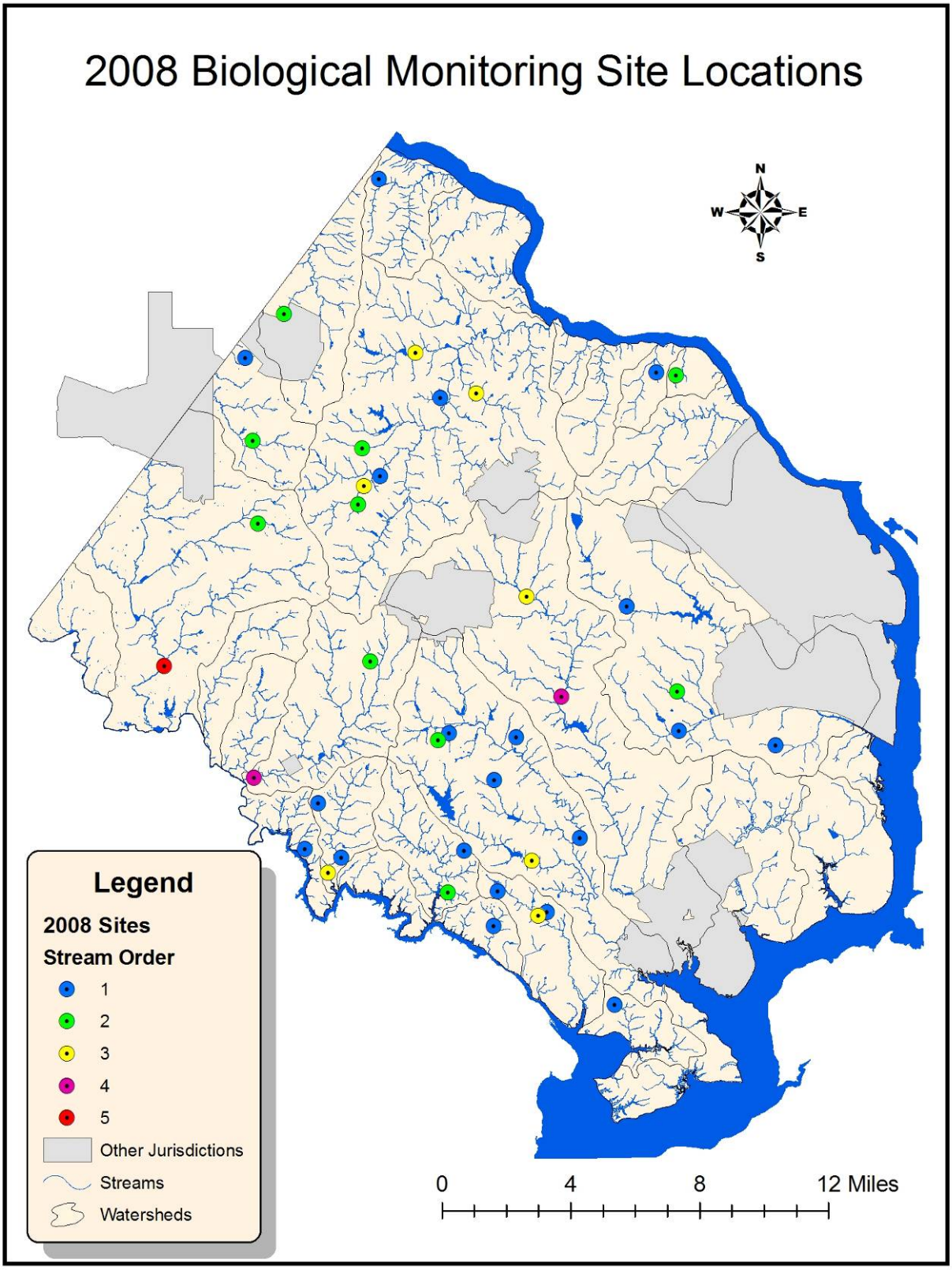

Figure 4.3. Location of 2008 biological monitoring sites

Results

Figures 4.4 and 4.5 show the results of the countywide distribution of macroinvertebrate and fish IBI scores, respectively.

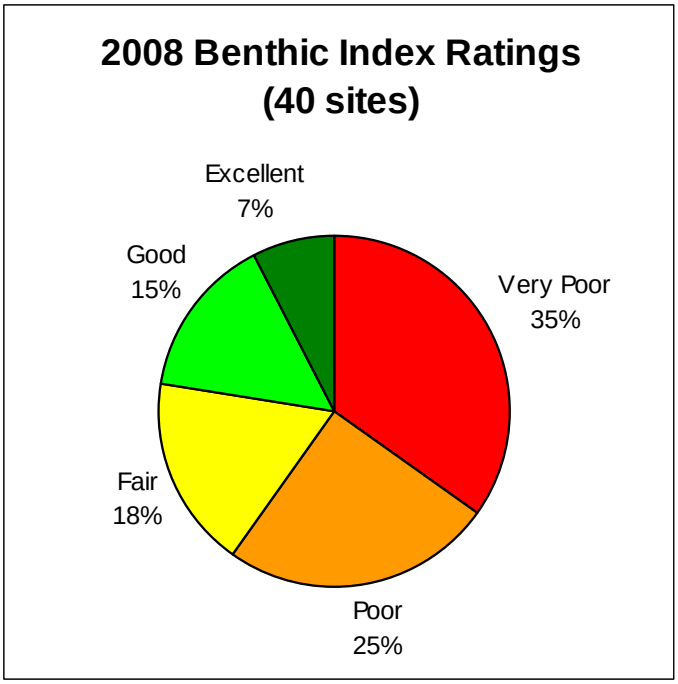

Figure 4.4. Countywide distribution of benthic macroinvertebrate IBI ratings

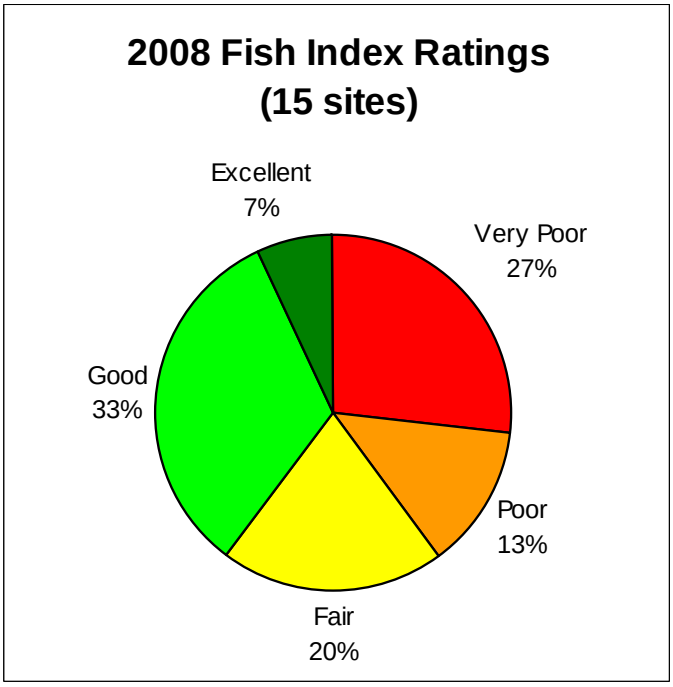

Figure 4.5. Countywide distribution of fish IBI ratings

Table 4.3 shows a breakdown (stratified by stream order) of the 2008 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 4.3. 2008 benthic macroinvertebrate sampling results by stream order

Stream Order	Number of Samples	Minimum Score	Maximum Score	Standard Deviation	Mean IBI Score	Rating
1	20	15.6	99.2	29.5	48.8	Fair
2	10	4.2	100.0	31.2	36.7	Poor
3	7	15.6	70.0	17.8	46.8	Fair
4 & 5	3	34.9	57.6	11.6	45.0	Fair
ALL	40	4.2	100.0	26.1	45.0	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 4.4. 2008 biological sampling results for individual monitoring sites

Map Code	Site ID	Watershed	Physiographic Province	Stream Order	Drainage Area		Benthics		Fish	
					Acres	Miles^2	IBI*	Rating	IBI*	Rating
1	AC0801	Accotink Creek	Piedmont	4	15296	23.90	42.4	Fair	36	Poor
2	AC0802	Accotink Creek	Piedmont	3	7858	12.28	15.6	Very Poor	36	Poor
3	**CA0801**	Cameron Run	Piedmont	2	824	1.29	N/A	Very Poor	0	Very Poor
4	CA0802	Cameron Run	Piedmont	1	286	0.45	16.1	Very Poor	N/A	
5	**CA0803**	Cameron Run	Piedmont	1	530	0.83	N/A	Very Poor	14	Very Poor
6	**CA0804**	Cameron Run	Piedmont	1	109	0.17	N/A	Very Poor	N/A	
7	CU0801	Cub Run	Triassic Basin	5	30663	47.91	57.6	Fair	64	Good
8	CU0802	Cub Run	Triassic Basin	2	688	1.07	38.4	Poor	64	Good
9	DE0801	Dead Run	Piedmont	1	101	0.16	31.2	Poor	N/A	
10	DF0801	Difficult Run	Piedmont	2	533	0.83	20.1	Poor	7	Very Poor
11	DF0802	Difficult Run	Piedmont	2	179	0.28	16.2	Very Poor	N/A	
12	DF0803	Difficult Run	Piedmont	3	1530	2.39	52.2	Fair	71	Good
13	DF0804	Difficult Run	Piedmont	3	3011	4.70	70.0	Good	50	Fair
14	DF0805	Difficult Run	Piedmont	3	4041	6.31	45.9	Fair	57	Good
15	DF0806	Difficult Run	Piedmont	1	71	0.11	23.8	Poor	N/A	
16	DF0807	Difficult Run	Piedmont	1	65	0.10	29.6	Poor	N/A	
17	HC0801	Horsepen Creek	Triassic Basin	2	108	0.17	18.3	Very Poor	N/A	
18	HC0802	Horsepen Creek	Triassic Basin	1	172	0.27	21.7	Poor	N/A	
19	KC0801	Kane Creek	Coastal Plain	1	141	0.22	74.3	Good	N/A	
20	MB0801	Mill Branch	Piedmont	3	1286	2.01	50.9	Fair	7	Very Poor
21	MB0802	Mill Branch	Piedmont	1	74	0.11	48.3	Fair	N/A	
22	**MB0803**	Mill Branch	Piedmont	1	105	0.16	N/A	Very Poor	N/A	
23	NI0801	Nichol Run	Piedmont	1	44	0.07	62.9	Good	N/A	
24	OC0801	Occoquan	Piedmont	1	57	0.09	90.9	Excellent	N/A	
25	OM0801	Old Mill Branch	Piedmont	1	72	0.11	75.5	Good	N/A	
26	**PC0801**	Pohick Creek	Piedmont	1	201	0.31	N/A	Very Poor	N/A	
27	PC0802	Pohick Creek	Piedmont	3	4269	6.67	33.4	Poor	86	Excellent
28	PC0803	Pohick Creek	Piedmont	1	54	0.08	22.1	Poor	N/A	
29	PC0804	Pohick Creek	Piedmont	1	212	0.33	15.6	Very Poor	N/A	
30	**PC0805**	Pohick Creek	Piedmont	1	51	0.08	N/A	Very Poor	N/A	
31	PC0806	Pohick Creek	Piedmont	2	82	0.13	4.2	Very Poor	N/A	
32	PH0801	Popes Head Creek	Piedmont	4	12076	18.87	34.9	Poor	64	Good
33	PH0802	Popes Head Creek	Piedmont	2	251	0.39	62.8	Good	N/A	
34	SA0801	Sandy Run	Piedmont	2	281	0.44	100.0	Excellent	N/A	
35	**SA0802**	Sandy Run	Piedmont	1	23	0.04	N/A	Very Poor	N/A	
36	SU0801	Sugarland Run	Triassic Basin	2	1012	1.58	33.2	Poor	50	Fair
37	**TU0801**	Turkey Run	Piedmont	2	160	0.25	N/A	Very Poor	N/A	
38	WR0801	Wolf Run	Piedmont	3	3586	5.60	59.7	Fair	50	Fair
39	WR0802	Wolf Run	Piedmont	1	71	0.11	71.7	Good	N/A	
40	WR0803	Wolf Run	Piedmont	1	60	0.09	99.2	Excellent	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.

The Benthic IBI scores show that 59 percent of the sites evaluated exhibited "poor" to "very poor" biological conditions while the fish IBI showed that 40 percent were scored "poor" to "very poor." This is a decrease in the biological ratings compared to previous years. This may be a result of the random site selection (it is possible for a group of lower quality sites to be chosen in some years). 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.

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 total 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 4.5 shows the SQI for all years probabilistic monitoring has been employed. The 2008 SQI shows a decrease in overall stream quality from 2007. However, Figure 4.6 shows that there has been a positive trend in countywide SQI scores since 2004. This index will be reported annually to evaluate long-term trends in the overall health of streams. As more data are reported annually, emerging trends can be identified with greater certainty.

Table 4.5. Countywide Stream Quality Index for sampling years 2004-2008

Sampling Year	Percentage of Total Sites					Index Value
	Very Poor	Poor	Fair	Good	Excellent	
2004	40	30	17	13	0	**2.03**
2005	15	33	33	8	13	**2.70**
2006	36	34	16	11	2	**2.09**
2007	18	33	15	20	15	**2.83**
2008	35	25	18	15	8	**2.35**

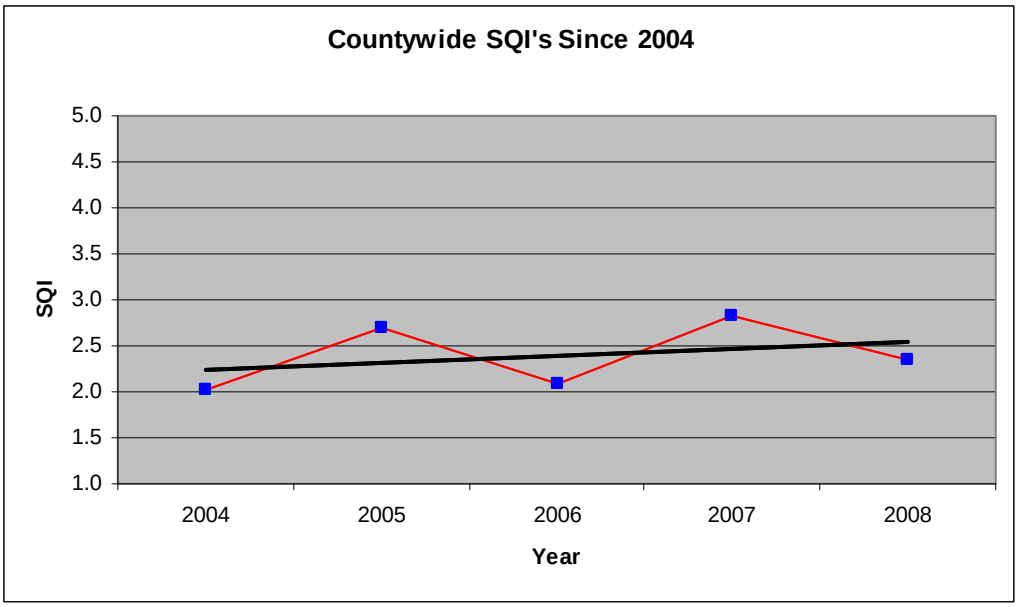

Figure 4.6. Trends in the countywide Stream Quality Index

For the last four years, the Benthic IBI has been calculated by comparing data collected in the county against the reference data collected that same year. Now that there is five years' worth of reference data available, the Benthic IBI is calculated using the cumulative reference data collected over the past five 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 4.5.

Table 4.6 presents a summary of biological monitoring data collected countywide since 2004. Results are presented by watershed 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 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 www.fairfaxcounty.gov/dpwes/ stormwater/streams/streamreports.htm.

Table 4.6. Overall watershed conditions for sampling years 2004-2008 combined

Overall Watershed Conditions (2004-2008)

Watershed	Benthics			Fish		
	Number of Sites	Average IBI	Rating	Number of Sites	Average IBI	Rating
Accotink Creek	18	24.1	Poor	11	33.1	Poor
Belle Haven	2	13.3	Very Poor	1	21.4	Poor
Bull Neck Run	N/A					
Bull Run	1	41.3	Fair	N/A		
Cameron Run	14	32.6	Poor	8	16.1	Very Poor
Cub Run	12	32.0	Poor	10	38.6	Poor
Dead Run	3	28.5	Poor	N/A		
Difficult Run	43	38.9	Poor	23	49.7	Fair
Dogue Creek	3	30.5	Poor	2	39.3	Fair
Four Mile Run	N/A					
High Point	N/A					
Horsepen Creek	2	20	Poor	N/A		
Johnny Moore Creek	3	41.8	Fair	1	64.3	Good
Kane Creek	2	58.9	Fair	N/A		
Little Hunting Creek	4	24.9	Poor	3	11.9	Very Poor
Little Rocky Run	7	18.1	Very Poor	3	54.8	Fair
Mill Branch	5	46.6	Fair	1	7.1	Very Poor
Nichol Run	6	64.4	Good	N/A		
Occoquan	3	85.8	Excellent	N/A		
Old Mill Branch	1	75.5	Good	N/A		
Pimmit Run	1	8.1	Very Poor	N/A		
Pohick Creek	29	31.1	Poor	12	53.6	Fair
Pond Branch	4	54.9	Fair	1	28.6	Poor
Popes Head Creek	13	51.9	Fair	8	65.2	Good
Ryans Dam	N/A					
Sandy Run	6	67.1	Good	N/A		
Scotts Run	1	13.4	Very Poor	1	7.1	Very Poor
Sugarland Run	5	44.7	Fair	2	46.4	Fair
Turkey Run	1	N/A*	Very Poor	N/A		
Wolf Run	5	78.8	Good	2	42.9	Fair
Fairfax County	194	38.9	Poor	89	42.4	Fair

* This site's sample did not contain enough individuals to calculate an IBI.

Bacteria Monitoring

In 2008, 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.

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. In 2008, SWPD completed its fifth year collecting data for the bacteria monitoring program since acquiring the program from the Fairfax County Health Department. To determine levels of *E. coli* in county streams, grab samples of stream water were taken at 40 sites in 17

watersheds throughout the county. Staff collected samples three times during the year of program assessment.

According to the Virginia Department of Environmental Quality (VDEQ), the following standard now applies for primary contact recreation to 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.

Water Chemistry Results

Temperature (◦C)
Minimum……3.8
Maximum……..26.7
Average ……12.7
Dissolved Oxygen (mg/L)
Minimum……6.0
Maximum……..17.7
Average …….11.0
Specific Conductance (µs/cm)
Minimum……72
Maximum……..1196
Average ……344
pH
Minimum……...5.9
Maximum……..8.7
Average ……7.4
Nitrate (mg/L)
Minimum……..<0.1
Maximum……..5.9
Average ……1.1
Total Phosphorous (mg/L)
Minimum……..<0.1
Maximum……..0.6
Average ……0.10

As bacteria sampling in Fairfax County was conducted three times in 2008, the geometric mean standard cannot be applied to the data. Therefore, 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, nitrate and total phosphorous 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 2008, 38 percent of Fairfax County's bacteria monitoring locations were consistently below the Virginia VDEQ's standard of 235 units per 100 mL of water (Figure 4.7). 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.

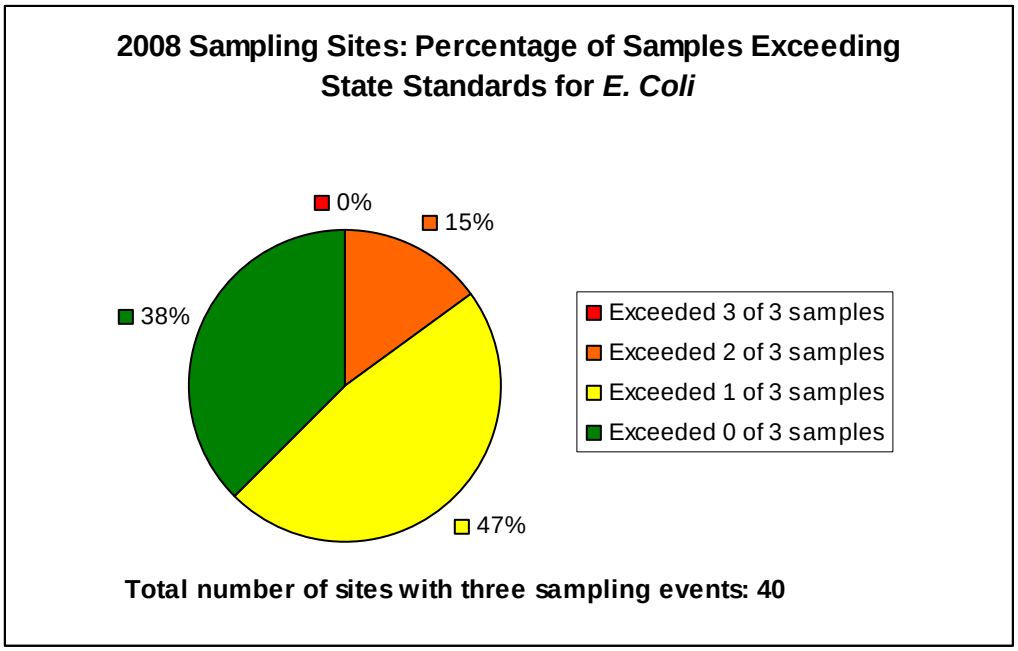

Figure 4.7. Percentage of sites with exceedances of Virginia's instantaneous water quality standard for *E. coli*

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, Health Department Annual Stream Water Quality Reports and monitoring methods are available on the Stream Quality Assessment Program page located at www.fairfaxcounty.gov/dpwes/stormwater/streams/assessment.htm.

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

The Virginia Department of Environmental Quality recently released the final 2008 summary of water quality conditions in Virginia from January 1, 2001, to December 31, 2006. 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 2008 Water Quality Assessment Integrated Report lists 41 water bodies with a total of 92 impairments in Fairfax County. Many of these water bodies are 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). Waters listed as impaired for aquatic life uses typically exhibit substantially suppressed ecosystems. Scores for biological integrity indices of these waters rank at or below 50 percent of the scores for natural (unimpaired) reference waters. 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. Table 4.7 presents additional details on the final 2008 list of impaired waters, including the impacted use and related water quality standard for each water body.

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. Upon approval, state law requires the development of a TMDL implementation plan outlining both point and non-point source controls needed to restore water quality. These specific controls may be incorporated into 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 program and the final 2008 Integrated Report are available at www.deq.virginia.gov/water/homepage.html.

Table 4.7. VDEQ 2008 List of Impaired Waters in Fairfax County

Water Type	Water Name	2008 Total
ESTUARINE	Accotink Bay	1
	Belmont Bay	1
	Belmont Bay (Occoquan River)	2
	Dogue Creek	2
	Fourmile Run	2
	Gunston Cove	2
	Hunting Creek	2
	Little Hunting Creek	2
	Occoquan Bay	3
	Occoquan Bay/Belmont Bay	2
	Occoquan River	2
	Occoquan River/Massey Creek	1
	Pohick Bay	3
	Potomac River	1
TOTAL ESTUARINE WATERS		17
TOTAL ESTUARINE IMPAIRMENTS		26
RESERVOIR	Occoquan Reservoir	3
TOTAL RESERVOIR WATERS		2
TOTAL RESERVOIR IMPAIRMENTS		3
RIVERINE	Accotink Creek	5
	Broad Run	7
	Bull Run	7
	Cameron Run/Hunting Creek	1
	Captain Hickory Run	2
	Cub Run	1
	Difficult Run	9
	Elklick Run	1
	Flatlick Branch	1
	Fourmile Run	1
	Holmes Run	2
	Indian Run	1
	Little Difficult Run	1
	Little Rocky Run	1
	Long Branch	2
	Mills Branch	1
	Mine Run	1
	Pimmit Run	7
	Pohick Creek	2
	Popes Head Creek	2
	Sandy Run	1

	Snakeden Branch	1
	Sugarland Run	2
	Tripps Run	1
	Wolf Run	1
	Wolftrap Creek	2
TOTAL RIVERINE WATERS		49
TOTAL RIVERINE IMPAIRMENTS		63
TOTAL WATERS		68
TOTAL IMPAIRMENTS		92

Volunteer monitoring

Figure 4.8. NVSWCD volunteers sample a stream using a seine. Photo by Fairfax County.

Northern Virginia Soil and Water Conservation District (NVSWCD) continues its successful volunteer stream monitoring program (Figure 4.8). This program supplements the county's stream bioassessment program. The data collected support the findings of the county's program and help to provide trend data. The data can also alert staff to emerging problems. Trained volunteers assess the ecological health of streams using the 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; there are currently more than 100 certified monitors. Data collected by volunteers are shared with Fairfax County, the VDEQ, Virginia Save Our Streams, and other interested organizations or individuals. The data help to confirm findings of biological monitoring performed by county staff, provide information on trends, and can serve as a first alert in areas where the county may monitor only once in five years. The program also builds awareness of watershed issues among participants. In 2008, there were 20 active volunteer monitoring sites in Fairfax County that are monitored four times per year. More information can be found at www.fairfaxcounty.gov/ nvswcd/monitoring.htm.

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 is among the organizations that voluntarily participate in the monitoring program using the SOS protocol, and they submit data on Reston streams to NVSWCD.

Several of Fairfax County Park Authority's Resource Management sites are included in the county stream quality monitoring program directly. The sites also support the program through training and sponsoring citizen volunteer monitors.

Figure 4.9. Autosampler shelter at Flatlick Branch. Photo by Fairfax County.

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. This agreement established a study designed to be an ongoing, long-term (5-10 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.

The monitoring network designed to fulfill the objectives of the study consists of four automated continuous water-resources monitoring stations (Figure 4.9) and ten less-intensely monitored sites. The four automated stations were constructed in 2007 and achieved full operational capability in 2008. Instruments at these stations collect streamflow and water-quality (water temperature, pH, 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 fourteen sites under various hydrologic conditions and analyzed for the same suite of constituents. 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.

In 2008, the automated stations collected as many as thirty-five thousand data points for each of the continuously measured parameters (water level, water temperature, pH, specific conductance, and turbidity) at 15-minute intervals for 365 days. The monthly and storm event sample collection activities resulted in the collection of 287 samples from the fourteen sites. These data, as well as additional study details, are available online via map interface at va.water.usgs.gov/cgi-bin/fairfax.cgi.

Interpretation of water-quality conditions and trends requires multiple years of data for statistically rigorous evaluation; thus, these analyses are not yet available for this study. Preliminary evaluation of general patterns in water-quality conditions is expected in mid-2009. This cooperative study is a progressive and unique effort to characterize conditions in urban and suburban streams that is expected to facilitate an understanding of watershed-scale responses to management practices which has yet to be accomplished by other studies.

5. Public Outreach and Education

The Department of Public Works and Environmental Services (DPWES) continues to work with partners from several organizations to enhance public outreach and education campaigns. Partnerships with these groups result in an organized effort to educate county residents on key elements to improve and protect the environment. In 2008, these organizations partnered with DPWES for outreach efforts:

- Alice Ferguson Foundation: organizes the Potomac River Watershed Cleanup
  - www.potomaccleanup.org www.fergusonfoundation.org
- Earth Sangha: assists and provides volunteers for tree plantings
  - www.earthsanga.org
- Friends of the Occoquan: organizes two Occoquan River cleanup events each year
  - www.friendsoftheoccoquan.org
- Fairfax Watershed Network: promotes the Potomac River Watershed Cleanup
- Fairfax ReLeaf: assists with tree plantings
  - www.fairfaxreleaf.org
- Ocean Conservancy: organizes the International Coastal Cleanup
  - www.oceanconservancy.org
- Northern Virginia Soil and Water Conservation District (NVSWCD): provides support for outreach activities
  - www.fairfaxcounty.gov/nvswcd
- Northern Virginia Regional Commission (NVRC): through the efforts of Clean Water Partners which includes Fairfax County and neighboring jurisdictions, the commission coordinates regional pollution prevention outreach through radio public service announcements (PSAs) and an improved Web presence
  - www.novaregion.org
- Reston Association: provides support for outreach activities
  - www.reston.org
- Virginia Department of Conservation and Recreation, Adopt-A-Stream Program: provides information and assistance to individuals and groups to clean an adopted section of a stream twice a year
  - www.dcr.state.va.us
- Virginia Department of Forestry: assists with tree plantings
  - www.dof.virginia.gov

The above list includes those organizations that partnered directly with DPWES. Individual Web sites provide additional information.

Educational Booths and Presentations

Fairfax County Stormwater Management

Fairfax County makes presentations to various groups throughout the county regarding stormwater management and watershed basics. The presentations include an overview of watersheds, stormwater management and actions that residents can take to protect the water quality of local streams, the Occoquan Reservoir, the Potomac River and the Chesapeake Bay. In

addition, the county works with residents on each stormwater project, of which education is a component. In 2008, the county presented this information to homeowner's associations, school groups (teachers and students), civic associations, Fairfax Master Naturalist trainees, master gardeners, Northern Virginia Community College students and others.

Fairfax County hosts educational booths at several public events annually to raise awareness among residents about stormwater issues and to encourage watershed-friendly behaviors. In 2008, Fairfax County participated as an exhibitor or environmental educator at more than 47 events, including: Celebrate Fairfax; the Occoquan River Festival at Occoquan Regional Park; Fall for Fairfax (Figure 5.1); and Board of Supervisors' town meetings, resource fairs and environmental fairs.

Figure 5.1. Stormy the Raindrop greets a visitor to the Stormwater Planning Division's display at Fall For Fairfax. Photo by Fairfax County.

Northern Virginia Soil and Water Conservation District

In 2008, NVSWCD made the following presentations:

- Demonstrated the Enviroscape watershed model 16 times to 352 youths and adults
- Gave 22 presentations to audiences in industry, government and the general public in which 663 people learned about ecological concepts, soils, implementing the new soil survey, water quality monitoring, stream cleanups, rain gardens, erosion and sediment (E&S) controls on construction sites, managing horse-keeping operations in an urbanizing area and the findings and recommendations from the Rain Garden Study
- Distributed information on environmental programs and other topics of interest (e.g. environmental landscaping, stream restoration, solutions for drainage problems, rain gardens, rain barrels) at five events
- Provided technical advice to 435 homeowners and homeowner associations, including 115 on-site visits to advise on erosion, drainage, pond management and other environmental problems
- Provided soils information to 173 consultants, realtors and homeowners
- Conducted five workshops on the design, installation and maintenance of rain gardens; one for the industry, one for Master Naturalists, and three for homeowners
- Sponsored a *Conservation Landscaping Tour* during which 40 people traveled by bus to five sites
- Responded to 1,954 information inquiries by telephone, email and during office visits
- Sponsored six Saturday morning green breakfasts, featuring presentations on recycling and solid waste; the Adopt-a-Stream program and stream cleanups; wetlands; trees; update of stormwater and E&S recommendations from the Infill Study; and buffers along headwater streams

Furthermore, all low impact development (LID) projects NVSWCD completed in 2008, such as the Falls Hill project described in Section 2, were demonstration projects that have a strong educational component.

Fairfax County Solid Waste Management

The Fairfax County Solid Waste Management Program (SWMP) plays an important role in protecting surface water resources through its outreach efforts to promote responsible waste management practices. The SWMP supports education of residents and business owners about how they can reduce the volume of waste they generate, and how to dispose of and recycle it properly. Education is conducted in a variety of forums with community groups and school students. In 2008, SWMP:

- Gave approximately 50 *Sewer Science* program presentations at county high schools, ranging from individual classes to entire schools
- Provided financial and operational support for the annual Earth Day/Arbor Day event held at Northern Virginia Regional College's campus in Annandale, and staffed a booth to educate about recycling practices in the county
- Conducted public outreach at a variety of speaking engagements including the Fairfax County Board of Supervisors' local meetings regarding environmental issues
- Supported *Celebrate Fairfax* and *Fall for Fairfax*, the two annual events sponsored by the county, with a large display manned by SWMP staff (Figure 5.2)

Figure 5.2. Stormwater Management booth at Celebrate Fairfax 2008 (left). Young anglers "fished" for floatable trash and litter and learned about water pollution (right). Photo by Fairfax County.

Fairfax County Park Authority

Huntley Meadows Park staff held the annual Wetlands Awareness Day to educate citizens on the importance of maintaining healthy wetlands.

Reston Association

Reston Association provides watershed education opportunities for the public at its Walker Nature Education Center. The nature center conducts weekend programs for all ages that

promote watershed appreciation and conservation, including stream and lake explorations, interpretive kayak programs, rain barrel workshops and fishing programs.

Reston Association also includes watershed education, stream and lake exploration as well as fishing and boating activities at its summer camp programs for children ages three to 16. Reston Association held six summer camp programs for 944 campers between June 23 and August 22, 2008.

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. These interpretive signs are for all ages.

Virginia Department of Forestry

Virginia Department of Forestry (VDOF) regularly works with Fairfax County to conduct watershed and water quality presentations to students, homeowners, professionals and organizations. Volunteers are educated and enlisted to plant riparian buffers. 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 35 such presentations by VDOF in 2008.

Communication Initiatives

In response to news releases and public service announcements that were sent to the media, stormwater staff provided interviews to television, radio and print reporters. Topics included the watershed management plans, dam safety, tree cutting on dams and the Herrity garage demonstration green roof.

Printed Materials/Mailings

In 2008, NVSWCD published and distributed three editions of *Conservation Currents.* Topics included: the rain garden study; rehabilitation of the Pohick dams; the Little Pimmit Run stream restoration project; growing native; NEST stewardship training; plants that are pests; the county tree canopy goal; home improvement tax credits; energy audits; an LID project to demonstrate faith and sustainability; Fairfax Master Naturalists; the Herrity Building vegetated roof; Monarch butterfly way stations, the state of the Potomac River: no-till agriculture; drinking water protection; and the emerald ash borer infestations. Homeowner associations are encouraged to reprint articles in their newsletters. Many of the articles are posted on the NVSWCD Web site.

Fairfax County Stormwater Management

In 2008, the staff of Stormwater Management created a series of educational brochures to encourage public involvement in the current comprehensive watershed management planning effort. One brochure summarized the general watershed issues that residents identified during the first round of watershed planning. This will help participants become familiar with issues they may see in their watersheds. Seven other brochures were created to provide more specific background information on the areas covered by the seven watershed plans currently under development.

Stormwater Management staff completed a brochure describing the floatables monitoring program, and a brochure to educate residents on the basics of maintaining their private stormwater management facilities.

Health Department

The Health Department mailed 14,460 flow diversion valve reminder notices in 2008. The notices are sent to homeowners on the anniversary of the installation of their septic system to remind them to turn their flow diversion valve once a year. It reminds them to pump out their septic tank every three to five years.

Northern Virginia Soil and Water Conservation District

NVSWCD distributed 2,333 brochures, publications and other information to colleagues and the public.

Reston Association

The Walker Nature Education Center, operated by Reston Association, continued to distribute 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."

Fairfax County Park Authority

The Park Authority developed and released a brochure, "Water," which describes the effect of stormwater on streams as well as provides tips for homeowners.

Fairfax County Solid Waste Management

The Solid Waste Management Program created and distributed a new brochure regarding energy-saving benefits and proper disposal techniques for compact fluorescent lamps. A copy of the brochure is available at www.fairfaxcounty.gov/dpwes/publications/recycling/fluorescent.pdf

As part of the Schools/County Recycling Action Partnership, the Solid Waste Management Program published the 2008-2009 edition of "SCRAPBook," an annual guide to Fairfax County resources teachers may use to educate students about recycling. "SCRAPBook" is available online at www.fairfaxcounty.gov/dpwes/publications/recycling/scrapbook.pdf

Television

Fairfax County Stormwater Management

- Public service announcements aired on Fairfax County's channel 16 in English and Spanish. "Only Rain Down the Drain," addresses the issue of illegal dumping into storm drains and streams.
- A 13-minute television program about the environmental protection role played by Maintenance and Stormwater Management Division (MSMD) employees was produced with channel 16. This program features interviews with staff and demonstrates to viewers how MSMD's mission helps the environment and protects business and private property.

Radio - Regional Pollution Prevention Outreach Campaign

As a member of the Northern Virginia Clean Water Partners, Fairfax County participates in the annual regional stormwater education campaign. Calendar year 2008 marked the fourth year of the campaign, with "The Call" public service announcement airing 1,064 times on eight radio stations including one Spanish language station. In addition, the partners developed complementing print, video- and Web-based products (www.onlyrain.org) to aid in raising the awareness of Northern Virginia residents about behaviors leading to non-point source pollution and the actions residents can take to protect local and regional water quality.

Digital Media

Stormwater Management Web Site

- Views of Stormwater Management Web sites (main page located at www.fairfaxcounty.gov/dpwes/ stormwater) increased from approximately 7,000 in 2007 to approximately 12,000 in 2008. The main page received more than 25,000 individual requests for files from the page (hits) in 2008.
- The watershed management planning Web sites were moved from off-site to be hosted by the county. The move has helped the county to provide consistent information on watershed plans that have been completed and information on upcoming plans to county residents. In 2008, Web pages with consistent formatting were created for all the watershed management plans and populated with plan information.
- Stormwater Management staff encourage public participation through the "Get involved in your watershed" Web site at www.fairfaxcounty.gov/dpwes/ watersheds/involved. In 2008, the Web site was reformatted and updated to add the "What Watershed Do I Live In?" feature, which directs residents to Fairfax County's My Neighborhood online geographic information system (GIS) tool to identify their watershed using a street address.
- A floatables Web page (www.fairfaxcounty.gov/dpwes/stormwater/floatables.htm) was created to encourage resident to participate in watershed cleanups and report their cleanup activities to the county.

Northern Virginia Soil and Water Conservation District Web Site

A broad array of information on environmental topics and newsletter articles are located at www.fairfaxcounty.gov/nvswcd.

In 2008, staff of NVSWCD disseminated information on county environmental programs and events monthly via two email lists, the Green Breakfast Group (450 recipients) and the Watershed Calendar (800 recipients).

Fairfax County Solid Waste Management

- Continued to maintain the Know Toxics Web site (www.knowtoxics.com) in partnership with NVRC and the Northern Virginia Waste Management Board as 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 Web site

provides a resource where businesses can learn how to legally and appropriately manage these materials.

- Provided continued updates and revisions to the "Recycling and Trash" portion of the county Web site to ensure the most up-to-date information for county residents.

Web Podcasts

Podcast messages available for download from www.fairfaxcounty.gov were initiated in 2007 and continued throughout 2008. Podcast topics include: general lawn care, water efficiency, watering cycles, fertilization, soil amendment, mowing strategies, pesticides, herbicides, E&S control, dumping into storm drains, discharging swimming pool water, disposal of household hazardous waste and picking up pet waste. The podcasts receive 50 hits per day, seven days per week for a weekly audience of 350. Ninety-seven percent of podcast listeners are Fairfax County residents.

Storm Drain Marking Program

Fiscal year 2008 marked the third year of NVSWCD's countywide storm drain marking initiative which is funded by Fairfax County (at approximately $12,000 per year for plastic markers and glue). The objective is to facilitate environmental stewardship among Fairfax County residents and educate the public about non-point source pollution prevention. During each storm drain marking project, volunteers engage in outreach among their peers (e.g., distributing educational fliers door-to-door), then place the pre-printed labels with a "no dumping" message on their neighborhood storm drains (Figure 5.3). The one-on-one education with each household helps to make this an effective program. In calendar year 2008, the Storm Drain Marking Program coordinated 30 projects that placed markers on 2,644 storm drains and educated 28,331 households on ways they protect water quality. Each household received a flyer 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.

Figure 5.3. An example of a storm drain marker used by NVSWCD and volunteers

Thirteen thousand homes received educational material through an ongoing partnership with the Kingstowne Homeowners Association. In 2008, the association staff published an article in the community's monthly magazine. One hundred and thirty two storm drains in Kingstowne were labeled through a project organized by the association with resident volunteers and a Girl Scout troop.

Should Fairfax County continue to fully fund the storm drain marking initiative in fiscal year 2009, the annual cost will be approximately $15,000 to $18,000. Staff of NVSWCD has set a fiscal year 2009 objective of educating 20,000 Fairfax County residents and applying labels to 3,000 or more storm drains.

Figure 5.4. Preparing barrels for a rain barrel workshop. Photo by Fairfax County.

Rain Barrel Program

In 2008, NVSWCD coordinated a regional rain barrel initiative for Northern Virginia in cooperation with the Reston Association, Fairfax County Park Authority, Fairfax County Public Schools, Arlington County, the City of Falls Church, the City of Alexandria and the non-profit Arlingtonians for a Clean Environment. Thirteen "build-your-own" rain barrel workshops and four pre-made rain barrel sales were held in Northern Virginia including one free rain barrel workshop for teachers and one "train the trainer" event (Figure 5.4). Six hundred thirty-seven people participated in these programs, including 35 volunteers, and 806 rain barrels were distributed. Fifty percent of program participants were Fairfax County residents, and nine programs were held within Fairfax County. NVSWCD also staffed a conservation landscaping display with information about rain barrels at fairs and events throughout the county.

Neighborhood Ecological Stewardship (NEST) Program

During spring and summer 2008, the Neighborhood Ecological Stewardship (NEST) Program sponsored a series of hands-on workshops and land and water explorations that provided opportunities for residents to learn about and love their natural world. Two hundred sixty-one adults participated in the program. Seventy-three organizations, writers, artists and scientists partnered with the NEST program to provide a wide range of classes and activities from watershed explorations by land and water, to soils art, bat habitat and stream ecology. More than 115 activities were linked to the NEST program.

Watershed Cleanups

The Fairfax County Floatables Monitoring Program fulfills the floatables monitoring and Adopt-A-Stream requirements of the Virginia Pollutant Discharge Elimination System permit by:

- Obtaining floatables survey data from organizations that sponsored stream cleanups
- Populating a Microsoft Access database with floatables survey data
- Developing outreach and educational materials such as a floatables data entry form, content for a floatables monitoring program Web site and a floatables monitoring program brochure
- Producing a floatables monitoring report

In 2008, the county continued to promote the Adopt-A-Stream program by providing support and staff for various stream and river cleanup events. The county continues to work with and support the following organizations that coordinate volunteer cleanups:

- The Alice Ferguson Foundation (Potomac River Watershed Cleanup)
- The Virginia Department of Conservation and Recreation
- The International Coastal Cleanup
- The Friends of the Occoquan

Cleanups take place throughout the year as part of the Virginia Department of Conservation and Recreation's Adopt-A-Stream program in county parks.

During stream cleanup events, volunteers remove a tremendous amount of floatable materials from the county's stream system. In the spring of 2008, 105 sites were established throughout the county for the annual Alice Ferguson Foundation Potomac River Watershed Cleanup. Two thousand four hundred volunteers removed 123,165 pounds (60 tons) of trash. In the fall, during the annual International Coastal Cleanup, 864 volunteers removed 19,360 pounds (ten tons) of trash from 33 sites.

In 2008, Fairfax County Park Authority sponsored and organized cleanup days at many of the county's stream valley parks and at two lakefront parks. These day-long volunteer events draw many citizens into the creeks, lakes and woods, providing excellent learning opportunities as well as removing large amounts of trash from streams and waterbodies.

The Park Authority administers an Adopt-a-Park program to encourage stewardship of county parklands. Through the program, FCPA has established partnerships with community organizations and individuals such as the adopting partnerships with McLean Youth Soccer Team to remove trash from Lewinsville Park; with nearby homeowners and civic associations to remove trash from McLean High Park; with the Greater Hillwood Citizens Association to remove debris from Azalea Park and recycle plastic and aluminum from surrounding homes; and with nearby civic associations to remove debris from John Mastenbrook-Greenway Downs Park. Debris is moved to a landfill or to recycling centers. Fairfax Trails and Streams (FTS) is the Adopting Partner for Pimmit Run Stream Valley Park. On a weekly basis, FTS core volunteers clean the stream bed and surrounding grounds, coordinating with Park Authority staff to remove the debris to the landfill and recycling sites. They monitor the condition of the trail and stream crossings along the stream and document storms and repair damage as they occur. FTS coordinates large volunteer groups to remove trash and debris during the spring Potomac River Watershed Cleanup and during Volunteerfest in the fall.

Earth Sangha is the Adopting Partner for Marie Butler Leven Preserve and the on-site rain garden, regularly cleaning the grounds, the surrounding drainage area and the spring fed stream bed that flows into Little Pimmit Run. The rain garden constructed in 2007 by Earth Sangha, NVSWCD and the Park Authority treats more than an acre of lawn, parking lot and road. In 2008, the rain garden underwent moderate design revision and Earth Sangha removed invasive plant species and replanted the Preserve as a native plant arboretum.

Household Hazardous Waste Management

Putting hazardous household wastes in the trash or down the drain contributes to the pollution of surface waters. The Fairfax County Solid Waste Management Division (SWMP) is responsible for the county's Household Hazardous Waste (HHW) Management Program where county residents are given the opportunity to properly dispose of hazardous waste (such as used motor oil, antifreeze, and other automotive fluids) at no charge (Figure 5.5). The program is supported by funding generated by the SWMP at a cost of about $600,000 each year. The SWMP has two

Figure 5.5. Some of the items collected through the county's Hazardous Household Wastes Program. Photo by Fairfax County.

permanent HHW facilities and five roving HHW collection events at various locations around the county to encourage the use of the program. Fairfax County continually reviews its solid waste management practices to stay abreast of the ever-changing waste generated within the county. SWMP assesses new waste streams and attempts to provide solutions for managing new and problematic wastes. Two emerging waste streams that have been identified by the SWMP are compact fluorescent lamps (CFLs) and other fluorescent lamps, and televisions with cathode ray tubes. Plans are in progress to ensure that these items are appropriately managed.

The management of CFLs and other fluorescent lamps from residences in the county is addressed in several ways. In 2008, county residents were able to take CFLs and other fluorescent lamps to either of the county's household hazardous waste facilities (at the I-66 Transfer Station complex in Fairfax, or the I-95 Landfill complex in Lorton) at no charge. Residents may take CFLs to any of the five one-day HHW collection events hosted around the county. These one-day events are intended to give residents a convenient way to properly dispose of these light bulbs. SWMP staff prepared a brochure describing the energy-saving benefits of using these lamps and how to dispose of them properly at the end of their useful life.

Since 2002, the county has provided opportunities for residents to recycle obsolete computers and televisions. The service is advertised through the county Web site and local newspapers. To date, more than 1,000 tons of obsolete electronics have been kept out of the county's energy-from-waste facility, preventing the potential for the dispersion of pollutants in the air or their discharge to surface waters. Nine electronics recycling events were conducted in Fairfax County in 2008.

In 2008, the SWMP continued a rechargeable battery recycling program in collaboration with the Rechargeable Battery Recycling Corporation Program (RBRC), an industry-funded program where rechargeable batteries can be collected and sent for recycling at no charge. Collection boxes are located at the offices of all members of the Fairfax County Board of Supervisors and at major county buildings.

Stream Buffer Restoration and Seedling Sale

Fairfax County continues 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.

As part of the county's buffer restoration program, Earth Sangha volunteers planted 1,269 trees and shrubs representing 37 native plant species at six locations in fall 2008 (Table 5.1).

Table 5.1. 2008 Buffer Restoration Plantings (Earth Sangha)

Site	***Plants***	***Volunteers***	***Area (sq ft)***	***Planting type***
Eakin Community Park	100	25	6,465	New
Franklin Middle School	440	130	23,500	New
Frying Pan Farm Park	156	18	21,600	Enrichment
Noman Cole Pollution Control Plant	100	18	24,208	Enrichment
Rocky Run Stream Valley Park	270	35	12,197	Replanting
Roundtree Park	203	31	24,320	Enrichment
Totals	**1,269**	**257**	**112,290**	

In 2008, Earth Sangha made follow-up visits to 15 previously planted sites and performed maintenance as needed. Maintenance work included collecting tree shelters that were washed out by heavy rains, removing trash and resettling the shelters. Earth Sangha provided detailed reports on the return visits to the Stormwater Planning Division.

The Fairfax County Park Authority, Fairfax ReLeaf and the Virginia Department of Forestry hosted independent stream buffer restorations in the county in 2008. The Park Authority completed its fourth year of riparian buffer enhancement. To date there have been 35 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. The Park Authority also had three projects amending the enhanced buffer restoration areas. More than 1,000 native trees and shrubs were planted in 2008. In 2009, the Park Authority plans to maintain and amend the completed planting sites in the riparian buffer enhancement. Additional sites may be added to the project, and existing sites will expand.

In 2008, Fairfax ReLeaf planted 3,974 trees in Fairfax County (Table 5.2). Nearly seven percent (472) were riparian buffer plantings. Of the total, 757 trees were planted on private property. The other 3,217 trees were planted on public property (including schools and county parks). Fairfax ReLeaf also distributed 3,103 trees to residents.

Table 5.2. 2008 Fairfax ReLeaf Planting Projects

Location	***# Trees***	***Project Type***
St. Michaels	163	Church
Citizen Plantings around Fairfax County	3,103	Citizen (Distribution)
Kings Park Library	75	County Land
Furnace Road Mason Neck	200	County Land
Franklin Farm Planting	100	HOA
Waterview Cluster	22	HOA
South Run Rec Center Park	70	Park
Accotink Park	3	Park
Wolftrap Farm Park	150	Park
South Run Rec Center Park	25	Park

Table 5.2. 2008 Fairfax ReLeaf Planting Projects

Location	***# Trees***	***Project Type***
Lake Fairfax Park	100	Park
South Run Rec Park	250	Park
Pine Ridge Park	120	Park
Woodglen Lake	110	Park
Woodglen Lake	17	Park
South Run Rec Center Park	11	Park
South Run Rec Center Park	131	Park
Woodglen Lake	240	Park
Wolftrap Farm Park	200	Park
Franklin Farm MS	15	School
James Madison HS	100	School
Oakton High School	56	School
Rachel Carson MS	27	School
Aldrin Elementary School	76	School
Oakton High School	47	School
Delivery to Dale Taylor	46	School
Oakton High School	266	School
Rachel Carson MS	882	School
Wegmans Storm Water Pond	300	Storm Pond
Herndon Storm Pond	172	Storm Pond
TOTAL	**7,077**	

The Virginia Department of Forestry (VDOF) continues to plant riparian buffers in watersheds throughout Fairfax County in support of the county's riparian buffer initiative. In 2008, VDOF worked with volunteers from organizations such as Fairfax ReLeaf, Eagle Scouts, homeowner associations and school groups and planted approximately 1,000 seedlings in the county.

At Marie Butler Levin Preserve, the Chesterbrook Farms Homeowner Association (HOA) planted 12 trees in spring 2008 at the crest of the stormwater pond that drains into Little Pimmit Run. The planting was coordinated with DPWES and the Park Authority.

The Park Authority, with strong volunteer support, continues the aggressive management of invasive, non-native plants on more than 33 acres of parkland as part of the Invasive Management Area (IMA) program. More than half of the management sites are within Resource Protection Areas, where invasive species interfere with forest functions of critical riparian buffer vegetation. Nine hundred native trees, shrubs and herbaceous (ground cover) plants were planted at IMA sites in 2008.

In conjunction with Fairfax County Park Authority (under the Adopt-a-Park Program), Earth Sangha performed invasive species control and planted about 785 native trees and shrubs on about 1.3 acres of Wilburdale Park. The work included installing 500 plants to extend the forest on the east side of Backlick Run by half an acre, establishing another half-acre forest renewal area in a different portion of the park with 200 plants, installing 15 to 20 plants near recent small

channels to mitigate erosion and planting about 70 plants along the eastern stream bank adjoining the park's lawn.

For the second year, the Park Authority offered the Invasive Conservation Corps internship program through which five interns assisted park staff and volunteers with ongoing invasive species removal projects. In summer 2008, interns helped maintain rain gardens at the Cub Run and Mount Vernon RECenters by removing weed plants and undesireable trees.

In 2008, Fairfax County continued to partner with NVSWCD in its annual seedling sale. A variety of 6,000 native shrubs and trees were sold to help promote urban reforestation, habitat enhancement and water quality protection. The theme, "butterfly buffet," highlighted the need for host and food plants to support these pollinators, as well as the role of native vegetation in preventing erosion, conserving energy and decreasing and filtering stormwater runoff.

Public School Environmental Education Partnerships

Fairfax County Public Schools Curriculum

Environmental issues and concerns are a part of many science courses. The Fairfax County Public Schools curriculum for its approximately 14,000 seventh-grade students includes a course titled "Investigations in Environmental Science." Students study basic ecology concepts and how to apply them to their local watershed and the Chesapeake Bay ecosystem. The biology curriculum for the 10,000 ninth-grade students includes exploring the interactions of populations in ecology. The course in geosystems includes a section on the hydrologic cycle and a study of the effect of economic and public policy on natural resources. This course exposes students to specific environmental projects across the county. Students in advanced courses in biology and environmental science complete school-based projects that examine geomorphologic changes, non-point source pollution and stream monitoring.

Meaningful Watershed Experience Program

Fairfax County Stormwater Management continues to partner with Fairfax County Public Schools to implement the Meaningful Watershed Field Experience Program. The program incorporates field trips for students in the seventh grade "Investigations in Environmental Science" course, and creates a hands-on learning experience that calls for the students to collect data on and analyze a variety of water quality parameters. Course materials were adapted from information provided by the Chesapeake Bay Foundation. Stormwater Management staff assist this program by training life science teachers in the county's water quality monitoring techniques and program, educating teachers about local, state and federal policies surrounding watershed protection and informing them of stewardship opportunities offered by the county for teachers and students.

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. In 2008, Stormwater Management staff continued to partner with Wastewater Management and Solid Waste Management staff to bring the program to nine schools, instructing 691 students during 14 presentations.

Thomas Jefferson High School Mentoring Program

Fairfax County Stormwater Management continues to work with a group of Thomas Jefferson High School seniors to identify potential sources of *E. coli* in surface water using new and innovative techniques. During the 2007-2008 school year, the group included six students who developed three experiments. Over the past three years, these projects have become more sophisticated in their breadth and scope, asking questions whose answers benefit all Fairfax County residents. This collaboration truly is a win-win situation: students benefit from the mentoring program by examining new concepts and technology; and the county benefits by having more informed residents and accumulating more water quality data.

Recycling Program

Fairfax County's Solid Waste Management Program continues to provide support and education in the public school system regarding preventing litter and supporting recycling. In 2008, the program:

- Continued to support the Schools County Recycling Action Program (SCRAP).
- Continued to give presentations containing a recycling message in support of the *Sewer Science* program for Fairfax County high school students.
- Sent information about recycling to approximately 150,000 Fairfax County Public School students.
- Sent litter and recycling newsletters to all fifth and seventh grade students.
- Awarded Johnie Forte environmental grants of $500 each to 18 schools to fund school environmental projects involving litter prevention, litter control or recycling.
- Hosted its 7th annual Community Recycling Roadshow at Herndon High School on October 25, 2008.

Reston Association's Watershed Education Programs for Students

Reston Association offers a school field trip program for students in grades three through six. Through the program, students learned about watersheds and explored an area of Snakeden Branch in the Difficult Run watershed. Students conducted inventories and water quality tests at Lake Audubon and in Snakeden Branch, and discussed ways that residents can protect the watershed. In 2008, Reston Association conducted the watershed field trip for seven classes with a total of 140 students.

Reston Association's Walker Nature Education Center also provides the Watershed Traveling Nature Trunk Program to students in grades three through eight. The nature center lends Reston schools a collection of interactive watershed education materials including teacher activity guides, posters, videos, books and a demonstration watershed model that allowed students to experiment with best management practices. In 2008, Reston Association loaned the traveling watershed trunk to five classes with 134 students.

Envirothon

NVSWCD sponsored teams from Madison High School and the Hidden Pond Ecology Club in the local, regional and state Envirothon, a natural resources competition for high school students.

Technical Support and Training

Land Development Services

In 2008, Land Development Services:

- Gave presentations in English and Spanish to the Heavy Construction Contractors Association Conference and EXPO on the county's E&S requirements
- Conducted a class for practicing engineers in the land development industry through the Engineers and Surveyors Institute on designing, installing and inspecting E&S controls on individual lots

Environmental Horticulture Division of Fairfax Cooperative Extension

In 2008, Fairfax Cooperative Extension:

- Hosted more than 550 attendees at various pesticide recertification workshops. Participants were instructed on pesticide safety, application, storage and disposal.
- Held a four day pesticide certification workshop in which 81 participants from the landscape industry based in Fairfax and throughout Northern Virginia reviewed the Virginia Core Manual and Categories in Ornamentals and Turf. Several participants were found to be applying pesticide without an applicators certificate. At the conclusion of the workshop, the Virginia Certification exam was offered to allow attendees to become certified applicators.

Northern Virginia Soil and Water Conservation District

Five team leaders were trained to conduct Livable Neighborhood programs in their communities, which educate, encourage and assist individuals as they make personal commitments to behaviors that benefit water quality and the environment.

6. Strategic Initiatives

The Department of Public Works and Environmental Services (DPWES) and its partners continue to improve watershed protection and stormwater quality through initiatives to control runoff and reduce the negative environmental effects of the continual increase in impervious area. The following section discusses some of these initiatives as well as continuing efforts by DPWES and its partners to improve the county's stormwater management program and meet state and federal guidelines to control stormwater runoff close to the source.

Public Facilities Manual

In September 2008, amendments were made to Chesapeake Bay Preservation Area Map sheets 47-2 and 110-1. The amendment to map sheet 47-2 added a new perennial stream segment and pond with their associated Resource Protection Areas (RPAs) that begins near Hunter Mill Road and runs in a southwesterly direction between Marbury Road and Mystic Meadow Way to a point of confluence with a perennial stream. The amendment to map sheet 110-1 corrected the location of a stream segment near the intersection of Adrienne Drive and Old Mill Road that is piped for approximately 450 feet where it crosses Adrienne Drive. It also corrected the location of the pipe's outfall and removed the RPA from over the top of the piped segment of the stream. There were no proposed amendments to the text of the Chesapeake Bay Preservation Ordinance.

In November 2008, the Board of Supervisors adopted amendments to Chapter 104 of the County Code. These amendments incorporate a new State Code provision that allows the submittal of annual erosion and sediment control specifications to the state by persons engaging in the creation and operation of stream restoration banks in more than one jurisdiction, in lieu of submitting a conservation plan to the local jurisdictions.

The new Tree Conservation Ordinance and amendments adopted in October 2008 (described below) also resulted in changes to the PFM.

Better Site Design

The use of multiple LID practices on a site is very effective in improving the quality of stormwater flowing from the site into county streams. Fairfax County continues to recommend and encourage "Better Site Design" development techniques. LID practices are used to the fullest extent allowed by the Public Facilities Manual and the related Letters to Industry to improve the quality of stormwater leaving a site.

Tree Conservation Ordinance

On October 20, 2008, the Board of Supervisors adopted amendments to the *Public Facilities Manual* (PFM) and the *Code of the County of Fairfax, Virginia* (County Code) related to the conservation of trees during the land development process. The action created a New Tree Conservation Ordinance and amended other ordinances including the Zoning Ordinance, the Subdivision Ordinance, the Erosion and Sediment Control Ordinance and the old Tree Conservation Ordinance. The PFM amendment deleted the then-current tree planting and preservation provisions in Chapter 12 in its entirety and replaced it with the new Chapter 12 to

incorporate the new tree conservation amendments. In November 2008, DPWES posted a Letter to Industry concerning these changes (www.fairfaxcounty.gov/dpwes/publications/lti/08-22.pdf). The amendments became effective on January 1, 2009.

Floodplain Management

In 2006, the U.S. Army Corps of Engineers (Corps) and county staff performed a flood study to assess the flooding risks to communities in the Belle Haven watershed. This study produced the critical hydrologic, hydraulic and statistical models necessary to perform benefit-cost analysis for flood reduction alternatives. In 2007, the Corps indentified benefit-cost ratios for three alternatives to reduce the flooding risks in these communities. In 2008, the county and the community selected a levee as the final flood-protection alternative. The Corps is working on the final alignment. Once the final alignment is agreed upon, the Corps will complete 65 percent of the selected levee alternative. The 65 percent design is due in 2010.

A similar effort was undertaken for the Huntington residential community located on the lower reach of Cameron Run, a significant portion of which lies within the 100-year floodplain. Construction of a levee was selected by the county and the community as the preferred flood-protection alternative. The Corps recently completed the 65 percent design of the levee. Funding for the 100 percent design and the construction have not yet been identified. On May 7, 2009 the county hosted a community meeting to review the 65 percent design and discuss the alternatives.

The county is working with the Federal Emergency Management Agency (FEMA) on revisions to FEMA's digital Flood Insurance Rate Maps (FIRMs). The purpose of a FIRM is to show the areas in a community that are subject to flooding and the risk associated with these flood hazards. Revisions to the FIRMs are being made to re-delineate Special Flood Hazard Areas (SFHA). New FIRMs are expected to be completed in 2009. The county will need to adopt the new maps before they become official county floodplains.

Online Floodplain Warning Tool

The DPWES permits database launched in 2006 is equipped with a floodplain warning tool. This tool flags permits associated with properties within or overlapping floodplains. The database has proved to be very successful. The database will continue to be updated periodically as new watershed master plans are completed and new data (e.g. floodplain studies, FEMA maps) are made available.

Cameron Run Study

In September 2004, the US Army Corps of Engineers, Fairfax County and the City of Alexandria undertook a partnership to develop a feasibility study with the aim of improving water quality, flood protection and habitat in the Cameron Run watershed. Beginning in 2006, NVRC provided support to this multi-jurisdictional project by providing logistical and technical support for project partners, publishing a public e-newsletter about project activities and hosting a Web page dedicated to the project (www.novaregion.org/cameron_run.htm). The partner organizations defined six project goals:

- Reduce stormwater impacts on the Cameron Run watershed from impervious areas to help restore and protect the streams

- Preserve, maintain and improve watershed habitats to support native flora and fauna
- Preserve, maintain and improve the water quality of the streams to benefit humans and aquatic life
- Improve stream-based quality of life and recreational opportunities for residents of and visitors to Cameron Run watershed
- Provide adequate, cost-effective flood protection for adjacent communities along major tributaries in the Cameron Run watershed
- Build a framework for long-term regional cooperation

This coordinated effort is ongoing. During 2008, the Cameron Run Feasibility Study continued coordination with the Corps of Engineers' effort to address the flooding situation in Huntington. A concept design of stream restoration practices on the main stem of Cameron Run's lower reaches was initiated during 2008 and is expected to continue development towards preliminary design during 2009.

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