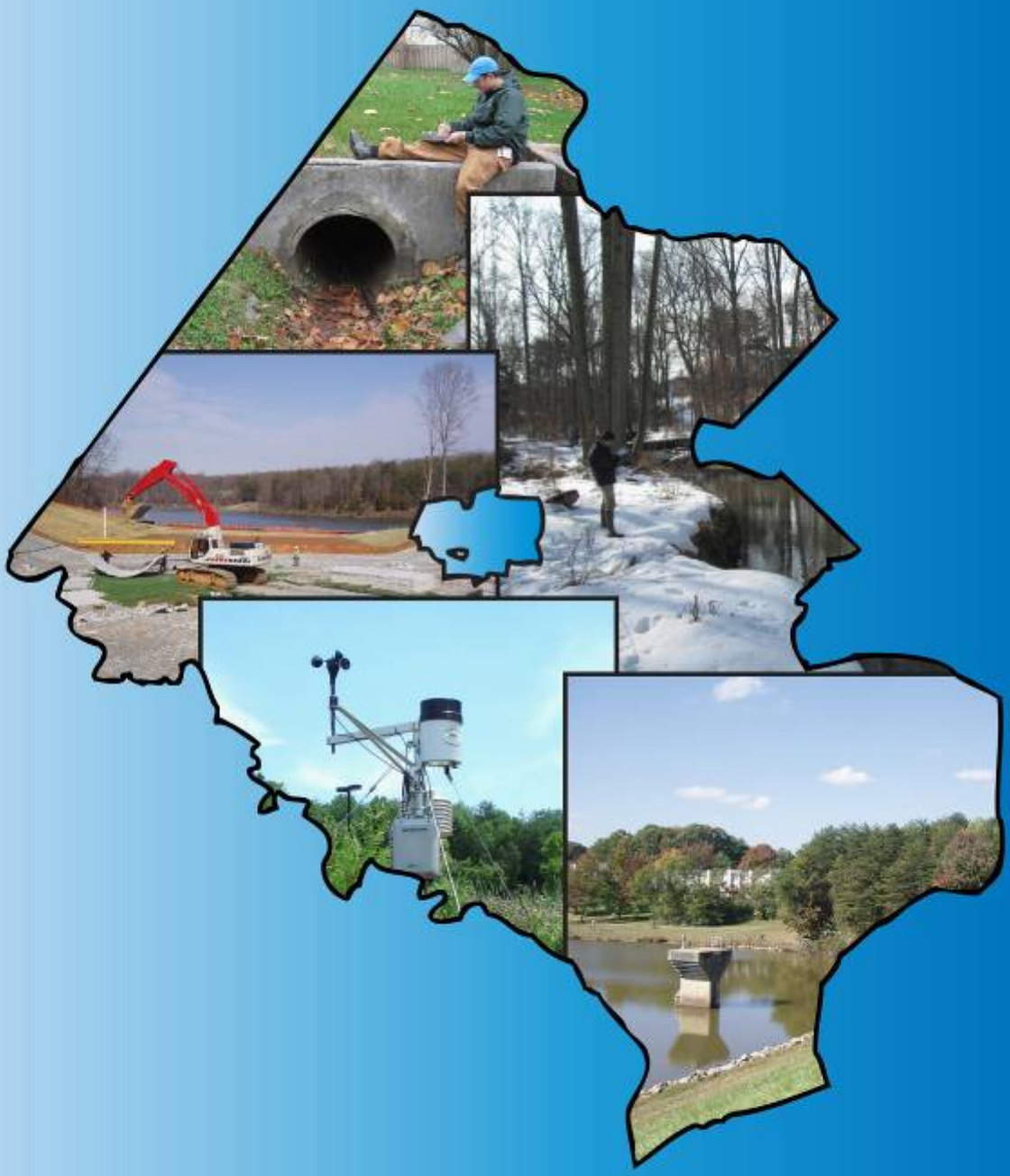
"Protecting our land and our water."

2009 Fairfax County
Stormwater Status Report



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Photos on cover(clockwise from top): Dry Weather Monitoring at a stormwater outfall in the Horsepen Creek watershed; surveying sites for biological monitoring in the Cub Run watershed; Lake Barton; weather monitoring station at Cub Run Rec Center; construction of dam at Lake Royal. All photos by Fairfax County.

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Private organizations
Earth Sangha
Fairfax ReLeaf
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

Other government agencies
Northern Virginia Regional Commission
Northern Virginia Soil and Water Conservation District

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 2009 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 government and 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 approximately 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 2009, the county and its partners continued to implement stormwater management-related capital projects, including 12 flood mitigation projects, more than 25 stormwater management facility retrofits, 14 low impact development (LID) projects, and three stream restoration and stream stabilization projects. Staff continued to monitor the quantity and quality of runoff from three innovative stormwater management systems throughout the county. Flood insurance premiums dropped in 2009 for residents of Fairfax County who have or may purchase flood insurance on their properties in Special Flood Hazard Areas due to an improved rating from the Federal Emergency Management Agency (FEMA).

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 property and parks; 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 2009, 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. A Stormy the Raindrop coloring book was distributed to various libraries, district offices and civic events and Stormy made public appearances at several county events.

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 2009, the DPWES and its partners collaborated on numerous efforts to improve the county's stormwater management program while meeting state and federal requirements. The emphasis is to control stormwater runoff close to the source, protect the environmental quality of streams and reservoirs and prevent or minimize 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 previous stormwater studies and compile available data. This information is used to evaluate watershed conditions and to project against stormwater runoff from ultimate development conditions, through 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 approximately 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.

In late 2008 and early 2009, staff of Fairfax County hosted the Introductory and Issues Scoping Forums for the final seven plans. After the forum, a Watershed Advisory Group (WAG) was created for each plan. These groups consist of 20 to 30 stakeholders, such as local residents, members of the business community and large landowners within the watershed. The WAGs 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 the initial and final drafts of the watershed management plan.

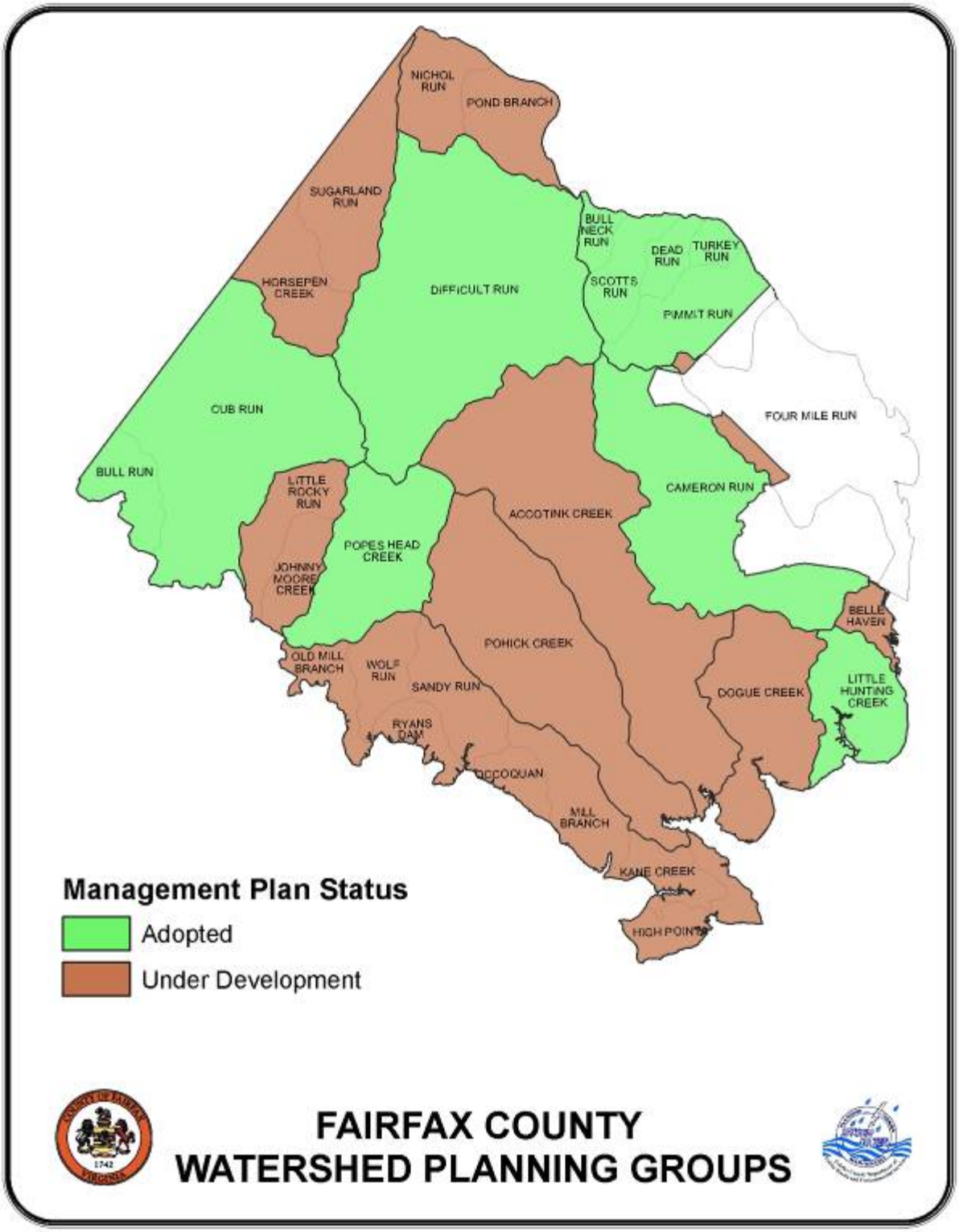

Figure 1.1 The adoption status of watershed management plans in Fairfax County

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 2009 were DPWES, the Fairfax County Park Authority (FCPA), and the Northern Virginia Soil and Water Conservation District (NVSWCD). 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 2009.

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 2009, DPWES finished 12 projects under the county's ongoing flood mitigation program (Table 2.1).

Table 2.1 2009 Flood mitigation projects

Project Location	***Project Description***
Cabin John Road	Provided overland relief and structural improvements.
Duncan Drive	Provided overland relief and structural improvements.
Wye Oak Commons	Lowered and replaced an existing one-throated yard inlet with a two-throated yard inlet to capture more surface drainage minimizing house flooding potential.
Woodacre Drive	Raised the grade for future building pad to a 100-year elevation after acquiring property and demolishing existing house.
Thornwood Drive	Installed drainage structures and pipes, graded for positive drainage, driveway replacement and site restoration.
Valley Lane	Provided residential flood mitigation with structural improvements.
Kendale Road	Provided overland relief and structural improvements.
Newington Commons Road	Added a throat and lowered an existing yard inlet to minimize the risk of house flooding.
Moline Place	Constructed additional throat openings on two yard inlets to allow for extra capacity of stormwater into the existing storm drain system.
Ellenwood	Modified a yard inlet by adding two throat openings and constructed a berm around the back of the structure.

Table 2.1 2009 Flood mitigation projects

Project Location	*Project Description*
Falls Hill	Provided flood mitigation measures by replacing an existing 9' long curb inlet top with an 18' curb inlet drop; replaced existing curb and gutter to match new curb inlet top.
Ampstead Court	Constructed an overland relief channel and added an additional curb inlet.

Flood insurance premiums dropped in 2009 for residents of Fairfax County due to an improved rating from the Department of Homeland Security, Federal Emergency Management Agency (DHS/FEMA). With this enhanced rating, residents who have or may purchase flood insurance on their properties in Special Flood Hazard Areas (SFHAs) will realize lower premiums for this protection. The rating change was effective May 1, 2009. County participation in the Community Rating Service (CRS) program saves the taxpayers approximately $186,000 annually. The average yearly premium for structures in the SFHA is $604. Fairfax County is one of only two jurisdictions in Virginia to achieve a Class 7 in the Community Rating.

The DPWES stormwater management program continues to utilize their signalization system to help guide the management of emergency response efforts. The signalization system was created out of concerns for the safety of individuals that must monitor state regulated dams during major storm events. The system consists of automated water level gages at nine locations throughout the county which provide real-time water level and rainfall data. Gage readings are relayed to the Fairfax County Government Center for use by DPWES and Office of Emergency Management (OEM) staff to monitor facilities and improve flood potential forecasting. The readings received from the signalization system provide valuable information that is used to make evacuation recommendations. With the addition of the signalization system the number of DPWES emergency response monitoring staff has been significantly reduced, resulting in a cost savings to the county.

New Construction of Stormwater Management Ponds

There were no new regional stormwater management facilities substantially completed in 2009.

Figure 2.1 Southern Oaks Pond Retrofit – completed pond and riser structure. Photo by Fairfax County.

Retrofit of Existing Stormwater Management Facilities

Stormwater management facility retrofits are intended to improve water quality and/or quantity control beyond their original designs. Water quality retrofits enhance nutrient uptake and increase the infiltration, uptake and transpiration of stormwater while water quantity retrofits help to reduce downstream flooding and erosion. Table 2.2 describes selected retrofit projects completed by the DPWES and the FCPA in 2009.

Table 2.2 2009 Retrofit of existing stormwater management facilities

Project Name	***Description***	***Partners***
Colts Neck Road	Modified outfall drop structure and installed a trash rack to address safety concerns	DPWES
Bucknell Manor Park	Removed an existing concrete ditch and constructed two vegetated swales for improved water quality	DPWES
Collingwood Park	Constructed a bio-retention filter, soil amendment area and several strips of no-mow areas in slopes near the entrance to improve water quality and attenuate flows before discharging to an existing outfall	DPWES
Pleasant Hill	Retrofitted a new headwall and trash rack	DPWES
Carol Place	Created a natural baffle to dissipate energy and divert water flowing into the pond into an extended flow path seeded with wetland grasses to maximize water absorption and nutrient uptake	DPWES
Rabbit Branch Stormwater Pond Outfall Stabilization	Installed 125' of stream stabilization measures to stabilize the outfall from an existing stormwater pond	FCPA
Green Spring Gardens and Magnolia Manor	Installed stream improvements at the outfall of the Magnolia Manor pond and removed the top of the drainage structure of a Park Authority pond and replaced it with a higher flow trash rack in order to provide long term stability to the restored section of Turkeycock Run at Green Spring Gardens	FCPA
Willoughby's Ridge	Retrofitted detention basin for enhanced water quality	DPWES
Englewood Mews	Retrofitted detention basin for enhanced water quality	DPWES
Foxfield Pond D Sec. 13	Retrofitted existing dry pond bottom with wetland planting for enhanced water quality and repaired eroding slope	DPWES
Fair Ridge Pond A Regional Pond	Retrofitted Big Rocky Run detention basin	DPWES
Fair Ridge, Richmond American ADD	Retrofitted Big Rocky Run detention basin	DPWES
Vine Street	Retrofitted detention basin for enhanced water quality	DPWES
Franklin Middle School	Retrofitted site for improved water quality and detention	DPWES
Colchester Hills	Repaired dam embankment; replaced principal spillway and outfall pipes; removed debris and sediment; planted trees and shrubs	DPWES
Fox Vale Section 6	Constructed riser structure; installed storm drain pipes and rip rap; landscaped; increased pond capacity	DPWES
Oakton Unity Church	Retrofitted dry detention pond and installed rain garden	DPWES, Oakton Unity

Table 2.2 2009 Retrofit of existing stormwater management facilities

Project Name	*Description*	*Partners*
Crestleigh PD1, 0765DP	Stabilized the pond walls with gabion baskets and rip rap; increased the pond volume; improved the outflow through the top of riser trash rack; removed trees from the embankment; restoration	DPWES
Southern Oaks	Provided for the retrofit of a stormwater detention pond and repaired the principal spillway, installed new storm pipes and riser structure and established a permanent access for maintenance	DPWES
Mill Run Crossing	Provided for the retrofit of a stormwater detention pond and repaired the principal spillway, installed new storm pipes and riser structure and established a permanent access for maintenance	DPWES
Whisperwood Pond 2	Removed sediment and debris; retrofitted a trash rack, wing walls and apron	DPWES
Cardinal Glen Section 2 Phase II	Constructed a stormwater riser structure, outfall pipe, open water channel; graded and restored site	DPWES
DC106	Provided for the retrofit of a stormwater detention pond and stabilized slope	DPWES
Oakstream	Removed sediment and provided for the retrofit of a stormwater detention pond	DPWES
Marblestone	Removed sediment and provided for the retrofit of a stormwater detention pond	DPWES

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 retrofit existing developed 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 2009, technical assistance was provided to 19 homeowners who attended one of two LID workshops and who requested help with improvements on their property. Small, start-up, matching grants and additional technical assistance were given to six homeowners to install LID stormwater control practices on their properties. The technical assistance consisted of site visits

and recommendations by NVSWCD staff. NVSWCD received a grant from the Chesapeake Bay Restoration Fund which enabled them to provide $3000 towards these start up grants, as well as $9000 to the Falls Hill Residential LID project in 2008. This project continues to educate citizens on the benefits of LID.

Figure 2.2 Rain garden at private residence in Falls Hill community. Photo by Fairfax County.

Two "build-your-own" rain garden workshops were conducted by NVSWCD in 2009. The workshops covered rain garden function, design, location, costs, construction, maintenance, planting and materials. The workshops were attended by 52 county citizens. A "build-your-own" rain garden manual was created by NVSWCD in partnership with the Park Authority. The manual, *Rain Garden Design and Construction: A Northern Virginia Homeowner's Guide,* provides instructions and calculations needed for a homeowner to build a rain garden on their own property. It includes photographs and an appendix with a list of suggested native plants. The manual is available in hard copy and electronic format at www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf.

In the summer of 2009, NVSWCD, along with the Park Authority and Fairfax Master Naturalists, coordinated the Watershed Friendly Garden Tour to demonstrate environmentally-sensitive landscape practices. The tour included 15 sites throughout the county, mostly private property, which featured LID practices such as green roofs, rain gardens, and rain barrels; native plants that require little water or fertilizer and attract pollinators; and features such as ponds and woodpiles that can alternately serve as wildlife habitat. All sites were open to the public and hosted by either the land owner or another knowledgeable host who could answer questions.

Figure 2.3 Left – Installation of bioretention basin at Center Lane. Right - Rain garden installed at Center Lane. Photos by Fairfax County.

Summary of 2009 Low Impact Development Projects

DPWES, NVSWCD, FCPA, various non-profit organizations and individual volunteers contributed to the design and implementation of 14 projects within the county that incorporated one or more LID practices (Table 2.3).

Table 2.3 LID practices constructed in 2009

Project	***Description***	***Partners***
Dearborn Drive	Restored species in a Resource Protection Area by removing the invasive plants and replanting with native vegetation	DPWES
Shrevewood Elementary School- Phase I& II SW Retrofit	Converted approximately 1.5 acres of turf to native forest and meadow	DPWES, FCPS, Fairfax ReLeaf & VDOF
Waples Mill Elementary School-Phase I&II SW	Amended soil and converted approximately 0.5 acres of turf to native meadow; installed bioretention basin	DPWES, FCPS
Baileys Elementary School Field, Greenbriar Park Field, Lee District Park Field	Renovated existing adult-sized natural turf soccer fields into synthetic turf* fields 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, FCPA
Center Lane	Constructed bioretention facility, graded site and reduced impervious area to improve stormwater runoff and provide water quality	DPWES, NVSWCD
Mt. Vernon Rec Center	Converted 2 acres of turf to native meadow	DPWES
Sherwood Library	Reset pavers; installed curb cuts, bio-retention basin, native plantings and organic compost	DPWES
West Drive	Constructed vegetated swale; installed permeable pavers; amended soil with organic compost and planted native plants	DPWES
Franklin Middle School	Constructed bioretention basin	DPWES
Hybla Valley Elementary School	Constructed bioretention basins and vegetated swale	DPWES
Walt Whitman Middle School	Constructed bioretention basins and vegetated swale; retrofitted outfall	DPWES
Pinecrest Golf Course	Reconstructed two embankments and outfall structures and installed a rain garden and infiltration trench	DPWES, FCPA

*The phosphorous removal efficiency rate for synthetic turf systems is a conservative 15 percent.

The Park Authority is planning the following LID-related projects for 2010:

- 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

The Department of Planning and Zoning (DPZ) provides a full range of environmental review, but does not track stormwater efforts independently from other environmental efforts. In coordination with other DPZ staff and staff from other county agencies, DPZ reviewed 82 rezonings and related applications (e.g., amendments), 74 special exceptions and amendments, and 179 special permits and amendments in fiscal year 2009 for environmental considerations. NVSWCD provided recommendations to DPZ on 122 rezoning and special exception applications. Recommendations addressed better site design techniques, LID practices and stormwater management measures that would lessen impacts on streams.

Fairfax County received special recognition for the Herrity Building's green roof by the Community Appearance Alliance of Northern Virginia. The award recognizes projects that merit special recognition for improving the overall appearance of the community and the Northern Virginia region. This green roof will help the county better design eco-friendly roofs in the future and directly supports the county's green building policy adopted in 2008.

LID Monitoring Efforts

DPWES staff is monitoring the quantity and quality of runoff from three innovative stormwater management systems installed at Fairfax County government facilities. Rain generally flows directly from impervious surfaces such as parking lots, roads and roofs into stormwater inlets and receiving streams unless it is intercepted before it becomes concentrated runoff. The three stormwater systems being monitored are designed to retain and absorb much of the stormwater onsite through infiltration and evapotranspiration before it enters into streams and waterways. These systems help replicate what naturally occurs when stormwater is retained by forests and meadows long enough to infiltrate into the soil and recharge groundwater.

The three stormwater systems are located at Fire Station 30 in Merrifield (also home of the Providence district supervisor's office), Cub Run Rec Center and the Herrity building. A bioretention filter and basin with a vegetated swale were installed at Cub Run RECenter. A bioretention filter and basin, a raingarden and permeable pavement blocks with gravel underground storage were installed at Fire Station 30. The Herrity site is located on the roof of the garage structure and demonstrates three types of vegetated roof on a 5,633 square foot area.

Early monitoring results show that these three systems significantly reduce the volume of stormwater leaving the sites. Data from storm events of 1 to over 7-inches of precipitation have been collected thus far. The three systems have retained from 0.25 to over 3-inches of the precipitation that fell in those storms. On average, 60% of the rainfall events in Fairfax County are 0.5-inch or less and carry most of the pollutants to our streams. Monitoring results, although preliminary, indicate these pollutants will be captured and reveal how well various components and the overall system are functioning over time.

Stream Restoration and Stabilization

In 2009, the county completed three 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 2009 Stream restoration and stream stabilization projects

Project Name	***Description***	***Partners***
Poplar Spring Court	Provided 700 linear feet of stream restoration by establishing a stable stream morphology through stabilizing bank grades, installing natural channel design with varying rock structures and restoring the riparian area through establishment of native plantings	DPWES
Poplar Spring-Hatches' Lake	Completed construction on approximately 300' of a tributary to Pohick Creek in order to stabilize the stream and reduce flooding for 5 houses in the RPA	DPWES, FCPA
Lakewood Lane	Designed and supervised installation of measures, including grade control structures, rock cross vanes and step pools, to stabilize the bed and banks of 450' of stream located within a private property in the Occoquan watershed	NVSWCD

Figure 2.4 Lakewood Lane - An example of a small-scale stream restoration on a limited budget. Photo by Fairfax County.

In addition to the projects summarized in Table 2.4, several other stream restoration projects are in the design and permitting phase. Construction is expected to begin in 2010 on the following projects:

- Restoration of the Huntley Meadows Park central wetlands. This project is a joint effort between DPWES, Park Authority and DCR and will be completed in several phases over three or four years.
- Stabilization of approximately 800 linear feet of Bradley Branch in the McLean area near Bridlepath Court. This stream project is half on parkland and half on homeowners' association land.
- Restoration of 340 linear feet of a tributary to Big Rocky Run. The design work was completed in the winter of 2009 and construction is scheduled to begin in the spring of 2010.

Reston Association Stream Restoration

Over the past two years over 28,000 linear feet of restoration has been completed in Snakeden Branch and The Glade watersheds as part of the Northern Virginia Stream Restoration Bank. Stream reaches 4B, 5 and 6 in The Glade watershed are currently under construction and expected to be completed by 2011. Streams in Reston's Colvin Run watershed, located north of the Dulles Toll Road and east of Reston Parkway, are under design with focus on improving streams that drain into Buttermilk Creek, Lake Newport and Lake Anne.

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 2009, MSMD inspected 926 county-maintained SWM and BMP facilities at least once, which represents approximately 72 percent of the 1,284 existing facilities in the inventory at the start of 2009. This represents a shift to inspecting most pond facilities on a biannual basis, yet complies with the permit requirement to inspect all county-maintained facilities once during the term of the permit. MSMD inspected 570 of the 3,234 privately-maintained facilities in 2009 with the goal of inspecting all privately-maintained facilities at least once during the permit cycle as required.

In 2009, MSMD continued its maintenance program for county stormwater management facilities. Maintenance can include repairs to stormwater management facility structures and removal of sediment. During 2009, the county cleaned and/or mowed 1,074 dam embankments, including 39 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 264 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 2009.

Table 3.1 2009 stormwater management facility maintenance projects

Project Name	***Description***
Braddock 3T	Removed 266 cubic yards of sediment
Reston Sector	Removed 518 cubic yards of sediment
Page Avenue	Removed 175 cubic yards of sediment from pond and redesigned trash rack for improved pond functionality
Little Rocky Run	Removed 564 cubic yards of sediment and redesigned trash rack for improved pond functionality
Regional Pond D46	Redesigned trash rack for improved pond funcitonality

In addition to routine maintenance inspections, county staff with expertise in dam design and construction continues 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 safety requirements. 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.

Figure 3.1 Installation of articulated concrete blocks (ACBs) in auxiliary spillway of Lake Royal dam - completed April 2009. Photo by Fairfax County.

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. New federal and Virginia dam safety regulations necessitated the rehabilitation projects. The improvements are being funded by NRCS and Fairfax County, with NRCS providing up to 65 percent of the total project costs. Construction for the rehabilitation of the first of the four dams (Royal Lake) was completed in April, 2009. Planning and design for the second dam (Woodglen Lake) has been completed and the final design for the third dam (Lake Barton) will be completed shortly. It is anticipated that construction for the Woodglen Lake dam will begin by May, 2010, and will include building earthen training dikes along the auxiliary spillway and armoring the spillway and interior slope of the training dikes with articulated concrete blocks. Construction for the Lake Barton dam will begin in August, 2010, and will include two concrete cutoff walls across the auxiliary spillway and extending the training dike to better protect the toe of the dam. The Woodglen and Barton rehabilitation projects will cost approximately $2.5 million each. The $3.3 million in federal cost-share funding provided by NRCS will come from American Recovery and Reinvestment Act funds. Planning and design for the fourth dam (Huntsman Lake) will be initiated in April, 2010, and will be completed by the end of 2011, with construction estimated to start by early 2012.

Storm Drainage Infrastructure Management

As required by its VPDES MS4 permit, Fairfax County must maintain an accurate inventory of its infrastructure. 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 2009 by digitizing more than 350 as-built construction plans across 72 tax map grids. An additional 150 as-built plans are scheduled to be completed during the first half of 2010. The GIS database of stormwater-related easements, which was initiated in 2005, is now complete and routine maintenance of the GIS layers will begin in early 2010. The inspection management schedule is summarized in Figure 3.2.

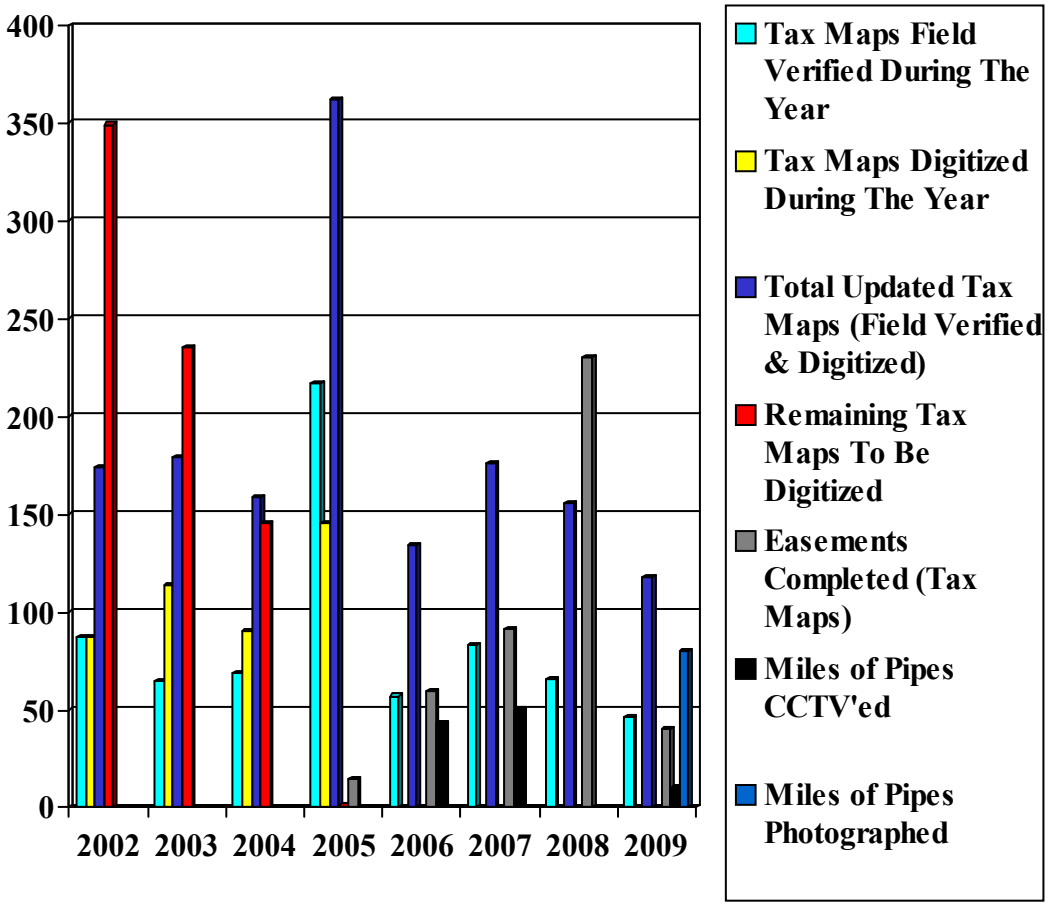

Figure 3.2 Infrastructure management schedule

MSMD completed construction of the pilot Infrastructure Rehabilitation Program, implemented in 2006. Infrastructure rehabilitation includes clearing channels and removing vegetation that can affect the integrity or performance of the storm drainage system. 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. During 2009, more than 7,900 feet of pipe was rehabilitated or repaired through replacement, cured-in-place point repair, lining entire pipe segments using cured-in-place lining methods or by test and seal methods at segment joints (Table 3.2).

Applying lessons learned from the pilot rehab program, the county initiated an Infrastructure Reinvestment Program in 2009. More than 10.1 miles of pipe were videoed under the reinvestment program. More than 6,220 storm structures and 2,700 pipe segments were photographed with over 35,000 photos documenting existing structural and service conditions. The combined efforts under the pilot rehab program and the reinvestment program resulted in

more than 80 miles of the storm drainage network being photographed or screened. The inventory continues to be assessed for ongoing repair of identified deficiencies. The county continues to refine the inventory to distinguish between MS4-regulated and non-regulated outfalls and other structures owned or maintained by neighboring jurisdictions.

Table 3.2 2009 infrastructure repairs and channel clearing projects

Project Location	***Project Description***
Countywide	Rehabilitated approximately 12,160 feet of storm drain pipe by installing liners and repairing and sealing pipe joints.
Atwood Road	Replaced 180 feet of blocked dilapidated storm sewer pipe and added a drop structure to avoid repeated structure blockages.
Laughlin Avenue	Removed inadequate storm drainage pipes and replaced with pipes that were larger in size to minimize house and yard flooding.
Paul Springs Parkway	Repaired and replaced two deteriorating outfall structures and associated pipe segments.

Also during 2009, a GIS based asset management system was developed and implemented. All maintenance activity and inspections that are performed on the county's storm drainage assets will be recorded along with notations of asset condition assessments and rankings. This system will be utilized to target areas and assets where rehabilitation efforts will be most beneficial.

Roadways

The county is responsible for maintaining approximately five miles of road segments and the parking lots of roughly 100 public facilities such as government centers, libraries, fire stations, police stations, health centers, bus transit facilities, park and ride lots, commuter rail stations, and staffed park locations. In an effort to limit the discharge of pollutants from parking lots into the county's streams, the county provides sand and chemical treatment only when dictated by safety. In compliance with the roadway maintenance requirements of the permit, the county sweeps material from each treated parking area once annually during the spring. In 2009, Stormwater Management removed approximately 185 cubic yards of material from 109 sites. The Park Authority cleaned treated areas that they own and maintain and disposed of the material in a landfill or removed it to central storage areas for reuse. The amount of material removed by the Park Authority was not tracked.

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 document containing suggested 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 that utilize pesticides, herbicides or fertilizers 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.

Park Authority staff worked to reduce the amount of mowed turf areas at several park sites around the county to promote water and air quality and provide additional wildlife habitat. At Pinecrest Golf Course staff stopped mowing around the primary irrigation pond, improving filtration of surface flows to the pond and reducing the attractiveness for Canada geese thus decreasing bank erosion. In addition, staff established several no-mow areas around the perimeter of the golf course which improves filtration of surface flows off of greens and fairways and reduced mowing costs. Mowing was discontinued on 5.9 acres in Cub Run Stream Valley Park, 2 acres in Braddock Park, and 1.75 acres at Mt. Vernon District Park, and mowing frequency was significantly reduced on 32 acres at Mountain Road District Park.

The Park Authority currently has approximately 515 acres under nutrient management plans. These areas are on golf courses. The vast majority of the remaining mowed turf areas do not receive any regular treatments of either fertilizers or pesticides.

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 2009, 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 2009, VCE trained 570 commercial pesticide applicators for re-certification in Northern Virginia. The trainees provided the following feedback about the experience:

- 94 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)
- 96 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). Each permit was reissued in 2009 with a new expiration date of June 30, 2014.

The municipal solid waste portion of the I-95 Landfill is now fully closed in accordance with Virginia Solid Waste Management Regulations for cover systems. An engineered cap covers 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. Storm water is collected and retained in ten sediment basins prior to discharge into local waterways.

Phase IIIA of the I-95 Area Three Lined Landfill Project continues to accept ash from the Energy from Waste (EFW) Facility located at the I-95 Complex, a similar facility in Alexandria and the Noman Cole Pollution Control Plant. This phase consists of a 7-acre cell underlain with three different composite liner systems and a composite drainage network to transport leachate. It is covered with a rain cap laid over a protective soil layer (protecting the liner system). Approximately two acres 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 that tie directly into the leachate collection trench. Stormwater is separated from leachate by soil cover, soil berms and rain cap. Approximately one half acre is provided with intermediate cover.

Phase IIB is no longer accepting ash. Of the 7.5-acres of this cell, approximately one acre remained open for emergency use. This 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, intermediate protective cover was placed on all but one acre of the active area in 2009.

Significant storm water improvements at the I-66 Transfer Station were completed in 2009, most notably the completion of the Recycling and Disposal Center (RDC) and resurfacing of the tractor trailer parking area. Storm water coming into contact with disposal activity is being collected by numerous new stormwater inlets and a new drainage network built into the asphalt pad. Storm water associated with the transfer station activity, closed landfill and truck parking area are now completely collected and retained in three sediment basins prior to discharge into local waterways.

Training in pollution prevention is provided for facility staff. Pollution Prevention Plans are maintained at each facility and are updated when conditions change. Plans for both sites were revised in 2009. Additionally, spill kits are readily available at each location.

Staff performs quarterly visual inspections of the stormwater outfalls located at the I-95 Landfill and the I-66 Transfer Station/Closed Landfill. Annual effluent limit and benchmark sampling is performed at each site during the monitoring year. Semi-annual TMDL sampling is performed at I-66 during the monitoring year. Water quality tests conducted to satisfy VPDES permit conditions have shown satisfactory results. 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 VADEQ.

DSWDRR incurs other costs not directly associated with stormwater management but of importance to the stream environment. Annual VPDES expenditures are estimated to be $200,000 for the I-95 facility and $100,000 for the I-66 facility (closed).

Hazardous Materials Spill Prevention and Response

The Fire and Rescue Department responds to all reported incidents of hazardous material releases, spills, and discharges in the county (regardless of whether the material has potential to enter the county-operated MS4 or another system, such as VDOT's). The department's Fire and Hazardous Materials Investigative Services (FHIS) personnel receive regular training in pollution prevention and are equipped to initiate spill control measures to reduce the possibility of hazardous materials reaching the MS4. Resources available to personnel include personal protective equipment, technical tools and equipment for spill control, and absorbent products such as pads and booms for spill containment. The section also maintains a contract with a major commercial hazardous materials response company to provide additional containment and clean-up support for large-scale incidents.

In 2009, FHIS received 465 complaints. Approximately 292 of the complaints involved the actual release of various petroleum or chemical substances. Of the 292 releases, 174 involved the

release of either diesel fuel (30), home heating fuel oil (49), gasoline (33), motor oil (17), or hydraulic oil (45). Other releases investigated involved antifreeze, paint, sewage, mineral oil, and mercury. Storm drains were involved in 52 of the releases.

In both emergency and non-emergency spills that reach the MS4, FHIS enforces appropriate codes and ordinances to ensure that responsible parties take appropriate spill control and cleanup actions to protect and restore the environment, as well as to recover costs incurred by the county for initial emergency response to the incident.

FHIS monitors, on a long-term basis, contaminated sites that have a potential for the contaminant coming in contact with surface waters or stormwater management facilities. As a part of the Oversight Program, FHIS, as an agent of the Director of DPWES, accepts, reviews, and processes requests to discharge treated groundwater from remedial activities at contaminated sites into county storm sewers. FHIS then monitors the discharge for the duration of the agreement. In 2009, the Hazardous Materials Technical Support Branch of FHIS started the year with 41 oversight files. During the year, 36 new oversight files were opened, and 26 were closed. Most of these oversight files involve contaminated underground storage tank sites. A few of the sites have been monitored for over 15 years. Fifty-two oversight files will be carried into 2010.

Four Fairfax County Department of Transportation (DOT) bus garages (at Alban, Jermantown, Newington and West Ox) are covered by general industrial stormwater permits. As required by the permit, each facility has developed and is implementing stormwater pollution prevention plans (SWPPPs), which include the spill prevention and response procedures to be implemented at each facility.

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, and uses closed circuit television (CCTV) to inspect trunk sewer mains in an effort to specifically identify defective sewer lines for repair and rehabilitation. In 2009, 226 miles of old sewer lines and 7 miles of new sewer lines were inspected, resulting in the identification of sanitary sewer lines and manholes needing repair and rehabilitation. In 2009, 114,681 feet of sanitary sewer lines were rehabilitated, bringing the total length of sewer lines repaired over the past ten years to 1,377,010 feet (261miles).

The Sanitary Sewer Extension and Improvement Program addresses pollution abatement and public health considerations by providing sanitary sewer service to areas identified by the Department of Health as having non-repairable, malfunctioning septic systems. In 2009, two

Extension and Improvement projects were completed consisting of 4,397 linear feet of eight inch sanitary sewer, five grinder pumps, and 630 linear feet of force main, and providing sanitary sewer connections to 50 existing homes.

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 2009, a total of 616 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 informing them of these individual sites on a monthly basis. NVSWCD provided comments to DPWES-Land Development Services on erosion and sediment control and stormwater management aspects of 17 site plans.

Fairfax County's Alternative Inspection Program, established in cooperation with DCR, resulted in 33,797 E&S inspections in 2009 on all sites under construction. This number represents 54% of the 62,546 total site inspections by Environmental and Facilities Inspection Division (EFID) personnel, meeting the self assessed goal, which requires E&S inspections to comprise at least 50% of total site inspections. Staff issued 909 "notices to comply with the approved plans" noting the deficiency found in each case and the respective corrective action required. There were 108 notices of violation given to developers who failed to take the required corrective action. During calendar year 2009, the county investigated 178 reports of illegal land disturbing and RPA violations resulting in 36 criminal proceedings to achieve compliance. The county's E&S program is fully approved by DCR.

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 to recognize the developers, contractors, site superintendents and site inspectors who demonstrated an exemplary effort in controlling erosion and sediment on construction projects during the past year. Each year, the Northern Virginia Soil and Water Conservation District fields a team of judges who inspect sites that were nominated in the spring and fall. Awards are presented for outstanding single family residential, commercial, infill, linear, and special development projects, as well as for best protected environmentally sensitive area. These awards are valued by recipients in the

construction industry and are an incentive to do excellent work. In 2009, 17 sites were nominated and 6 received awards (a tie was declared in one category). Two site superintendents, one contractor and two engineering firms were recognized for their work. The 2009 Land Conservation Awards program was held on January 22, 2010.

Trail Improvements to Address Erosion Issues

Upgrades to the Cross County Trail (CCT)

During 2009, 12,200 feet of degraded trail south of Lake Accotink was reconstructed. The project improved eroding conditions, created three stabilized stream crossings and collected trail users into a more limited corridor reducing floodplain area impact at a cost of more than three million dollars. Additionally, 250 trees were planted to reforest approximately 10,000 square feet of disturbed area along the trail corridor.

As part of the Phase II CCT improvements, approximately 900 linear feet of severely degraded eroding trail south of the Fairfax County Parkway was rerouted and reconstructed in the Pohick Stream Valley. The project cost approximately $800,000 for the improvement of eroding conditions, the replacement of three existing unstable stream crossings, the creation of two new stabilized stream crossings, and the collection of trail users into a more limited corridor reducing floodplain area impact. In addition, 600 trees and 75 shrubs were planted to reforest approximately 46,000 square feet of disturbed area along the trail corridor.

A section of trail between the Georgetown Pike parking lot and Georgetown Pike overpass was rerouted to a more stable section of the Difficult Run floodplain. Approximately 800 linear feet of degraded trail was rerouted as Eagle Scout projects under the supervision of the Fairfax Trails and Stream.

Improvements to the Potomac Heritage National Scenic Trail (PHNST) in Scott's Run

The Potomac Heritage Trail in Scott's Run Nature Preserve on the Potomac River was incomplete, and the steep slopes were being eroded above the floodplain causing sedimentation into tributary streams. The Park Authority obtained a $22,000 grant from the Potomac Heritage Trail Office to pay for the Student Conservation Association to spend five weeks installing a new staircase to complete the trail.

Improvements to the Potomac Heritage National Scenic Trail (PHNST) in Riverbend Park

The trail crossing of Clarks Branch was significantly improved with the installation of a bridge and stabilized trail area, which removed eroding footpaths that exist up and down the steep stream banks. The total project cost was $426,000, of which $60,000 was provided by a cooperative agreement from the National Park Service and used to fund the hydrology and archaeology phases of the project. Of special note is that the 90 foot bridge placement was accomplished with a 50 ton crane and the project location was approximately one mile from the closest paved right of way. Through careful planning the construction access route was limited to a width of 12 feet utilizing existing trails and previously disturbed areas and the entire project clearing only removed eight live trees over a six-inch caliper.

Figure 3.3 NVSWCD develops soil and water quality conservation plans for horse-keeping operations in Fairfax County. Photo by NVSWCD.

Agricultural Land

Horse-keeping operations are the predominant agricultural land use in the county. These are located in the northern, western and southern areas of the county, and range from five to more than 100 acres. Fairfax County's Chesapeake Bay Preservation Ordinance and Agricultural and Forestal District Ordinance require land in agricultural use to have a soil and water quality conservation plan. Plans include best management practices to reduce erosion and sediment pollution from pastures and stables, manage excess nutrients from animal waste and fertilizers and address the misuse of pesticides and herbicides. The plans prescribe vegetated riparian buffers for streams (Resource Protection Areas). In 2009, NVSWCD developed soil and water conservation plans for 39 parcels on 461 acres, which included 30,929 linear feet of Resource Protection Areas. In addition to the plans developed for horse operations, one plan was prepared for a veterinary clinic and another for a vegetable farm.

The Virginia Department of Agriculture and Consumer Services received one complaint under the Agricultural Stewardship Act for deliberate tree clearing and manure stacking within an RPA. NVSWCD prepared a soil and water conservation plan containing appropriate best management practices to address the problems. NVSWCD also prepared plans for two horse operations that were cited for County Code violations of unapproved tree removal activities within an RPA. In 2009, NVSWCD held 2 seminars for the equine community on pasture management and horse waste management.

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 2009, 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 owners of large parcels in the county advising on forest management for stormwater control among other objectives.

4. Monitoring and Assessment

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

Water Quality Monitoring

Watershed Monitoring

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

In 2009, four storms were monitored at each of the two water quality monitoring sites in Fairfax County. Rainfall, flow and water quality data were collected. Samples were tested for concentrations of nine constituents of concern (Table 4.1). Statistical analyses using the Mann-Whitney 2-sample test were performed to determine if there were significant differences between constituent concentrations at the two stations, as well as seasonal and annual unit-area constituent loadings.

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	53	292	22	30	122	2.5	YES
E. coli	901	200000	0	690	38000	27	NO
Fecal Strep	6500	129000	100	1089	51000	45	NO
NO_3+NO_2-N	0.83	1.64	0.16	0.4	0.73	0.1	YES
TDS	128	836	51	98	160	71	NO
TKN	1.73	11.3	0.48	0.57	2.41	0.06	YES
TP	0.3	1.61	0.06	0.06	0.8	0.01	YES
TSS	52.5	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.

Tests found significant statistical differences for concentrations of six of the nine constituents measured at the two sites. The differences for the remaining constituents were not statistically

significant. Results for the 2005, 2006, 2007, 2008 and 2009 sampling years appear in Tables 4.1 and 4.2. Monitoring will continue in 2010, and the full data set will be used to determine if the observed high variance in constituent concentrations from the medium/high density residential site (VNA) can be reduced sufficiently to allow detection of statistically significant differences for other constituents. The practical significance of this is that other than E. coli, fecal strep and TDS, the concentrations for all other constituents are measurably higher for the medium to high density residential site when compared to the low density residential site.

Table 4.2 2009 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	0.133	0.005	0.212	0.127	0.092	0.027	0.158	0.029	0.595	0.187
COD	30.528	7.572	73.412	72.996	29.124	9.819	123.189	35.018	256.3	125.4
E. Coli	0.295	0.292	3.617	11.431	83.948	10.377	10.862	7.562	98.722	29.663
Fecal Strep	0.599	1.329	12.673	13.441	62.009	30.530	34.657	7.359	109.939	52.658
NO_3+NO_2-N	0.356	0.132	0.836	0.451	0.411	0.194	0.630	0.352	2.233	1.129
TDS	95.910	37.078	153.063	91.297	47.244	52.699	131.474	90.203	427.7	271.3
TKN	0.788	0.109	3.627	1.693	0.923	0.380	1.262	0.538	6.600	2.720
TP	0.115	0.010	0.256	0.443	0.181	0.046	0.663	0.175	1.215	0.674
TSS	34.218	3.077	95.768	273.475	59.880	26.734	223.678	90.531	413.5	393.8

*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

In 2009, the county selected 99 MS4 outfalls for dry weather screening and recorded physical parameters at each outfall. Water was found to be flowing at 45 of the outfalls, and was tested for a range of pollutants (ammonia, conductivity, surfactants, fluoride, pH, potassium, phenol, copper, and chlorine) using field test kits. Of the outfalls tested, 12 required follow-up investigations because they exceeded the allowable limit for at least one pollutant. Upon retesting these sites, 10 continued to exceed the screening criteria, and further testing was conducted in an attempt to track down the source. This track down procedure consisted of using a map of the county's storm drainage system to track the storm network upstream of sites, recording observations of flowing water and land use, and testing the water where flow was found. This procedure was followed all the way up the network of storm sewer pipes until the source was found or there was no flowing water. Four of the sites no longer tested above exceedence criteria at the time of the trackdown and the source of the flow for one of the trackdowns could not be found. Two of the sites were determined to be water line leaks and the county is working with the Fairfax Water Authority

Figure 4.1 Dry weather screening. Photo by Fairfax County.

(FCWA) to correct these issues. One site had high levels of copper, phenol and chlorine. This site has a large sediment pit that is draining directly into a storm inlet. It appeared that the high levels of sediment were skewing the water quality results. Soil and water samples were sent to the wastewater treatment facility for further analysis and confirmed that the high levels of copper and phenol were most likely skewed due to the high levels of sediment in the water. The county and DEQ will work with this site to develop proper sediment storage techniques and develop an inspection schedule for future monitoring. Of the two remaining sites, the sources of copper were identified as Interstate 95 and a railroad.

Wet weather screening and industrial high risk monitoring were completed in 2009. Field screening for the seven sites yielded water chemistry data on pollutant concentrations in stormwater runoff that were generally typical of published data on industrial runoff characteristics. The data essentially indicate that there was no significant source of pollution in the stormwater from all but one of the sites, 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). This one site showed abnormally high oil and grease concentrations at the first flush for one event, suggesting that the high values were the result of a one time occurrence, not an illicit connection. Sampling consisted of automated sampling in a manhole, which enabled calculations for event mean concentrations of rain storms as well as for first flush sampling for oil and grease and chemical oxygen demand.

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 2008 through June 2009, 15 storm event samples were collected at the Kingstowne station and 15 were collected at the South Van Dorn station using automated samplers. The Kingstowne station data suggest that erosion and sediment controls, including stormwater best management practices, are minimizing sediment loads to Dogue Creek. 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 0.116 mg/L. Phosphorous data was only available for the Sounth Van Dorn station.

Biological Monitoring

Approach

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

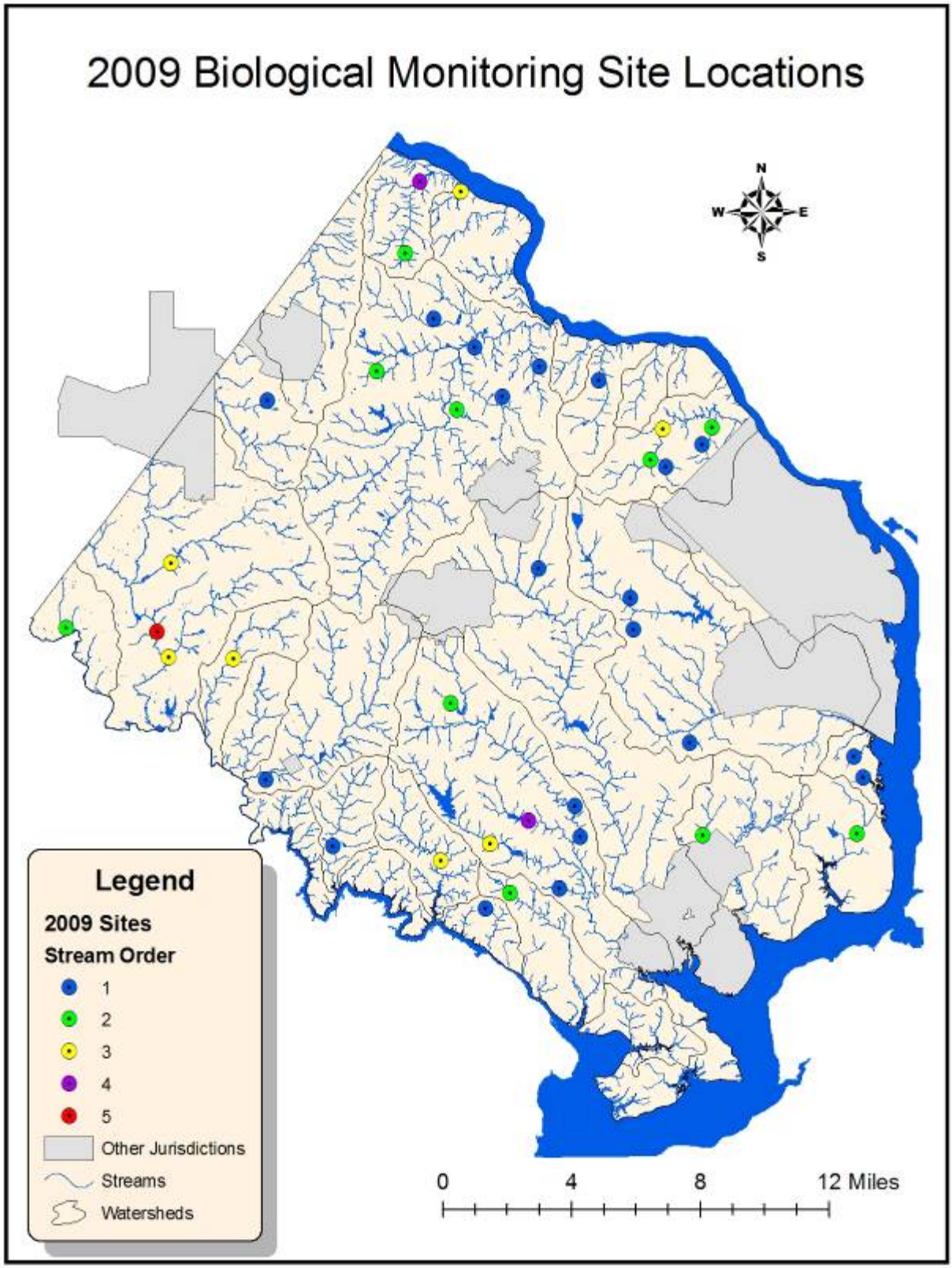

Figure 4.2 Location of 2009 biological monitoring sites

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 4.2 shows the locations of the 2009 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.

Results

Figure 4.3 shows the results of the countywide distribution of macroinvertebrate and fish IBI scores, respectively.

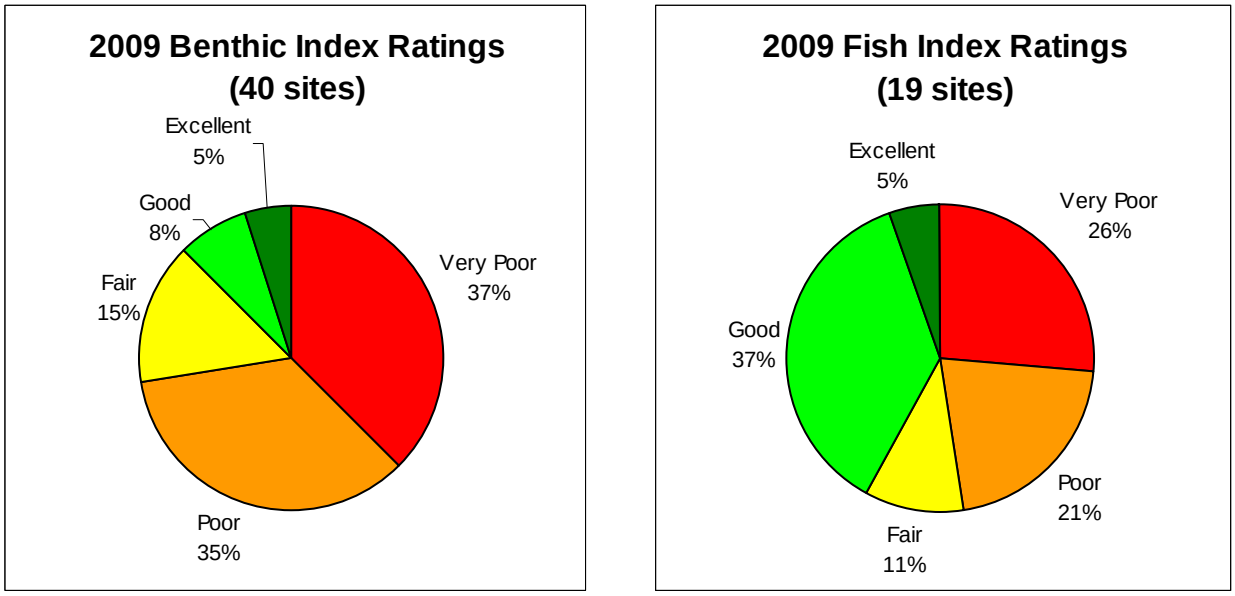

Figure 4.3 Countywide distribution of benthic macroinvertebrate and fish IBI ratings

Table 4.3 shows a breakdown (stratified by stream order) of the 2009 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 2009 benthic macroinvertebrate sampling results by stream order

Stream Order	Number of Samples	Minimum Score	Maximum Score	Standard Deviation	Mean IBI Score	Rating
1	20	8.5	94.3	24.8	32.8	Poor
2	10	9.7	40.5	11.2	25.9	Poor
3	7	7.0	71.2	21.2	34.6	Poor
4 & 5	3	19.3	69.4	25.4	42.0	Fair
ALL	40	7.0	94.3	16.7	28.9	Poor

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 2009 biological sampling results for individual monitoring sites

Site ID	Watershed	Physiographic Province	Stream Order	Drainage Area		Benthics		Fish	
				Acres	Miles^2	IBI*	Rating	IBI*	Rating
AC0901	Accotink Creek	Piedmont	1	830.8	1.30	14.4	Very Poor	35.7	Poor
BE0901	Belle Haven	Coastal Plain	1	55.9	0.09	25.1	Poor	N/A	
BE0902	Belle Haven	Coastal Plain	1	150.7	0.24	42.0	Fair	N/A	
BL0901	Bull Run	Triassic Basin	2	1390.5	2.17	36.2	Poor	N/A	
CA0901	Cameron Run	Piedmont	1	67.2	0.10	8.5	Very Poor	N/A	
CA0902	Cameron Run	Piedmont	1	171.2	0.27	19.3	Very Poor	N/A	
CA0903	Cameron Run	Piedmont	1	38.2	0.06	18.1	Very Poor	N/A	
CU0901	Cub Run	Triassic Basin	3	5973.5	9.33	28.6	Poor	57.1	Good
CU0902	Cub Run	Triassic Basin	3	4460.6	6.97	27.4	Poor	35.7	Poor
CU0903	Cub Run	Triassic Basin	5	24479.5	38.25	37.3	Poor	42.9	Fair
DC0901	Dogue Creek	Coastal Plain	2	883.3	1.38	38.7	Poor	50.0	Fair
DF0901	Difficult Run	Piedmont	1	50.1	0.08	43.6	Fair	N/A	
DF0902	Difficult Run	Piedmont	1	123.3	0.19	53.2	Fair	N/A	
DF0903	Difficult Run	Piedmont	1	97.4	0.15	17.8	Very Poor	N/A	
DF0904	Difficult Run	Piedmont	1	86.6	0.14	19.8	Very Poor	N/A	
DF0905	Difficult Run	Piedmont	2	662.6	1.04	34.4	Poor	21.4	Poor
DF0906	Difficult Run	Piedmont	2	308.1	0.48	15.7	Very Poor	64.3	Good
HC0901	Horsepen Creek	Triassic Basin	1	63.2	0.10	45.1	Fair	N/A	
LH0901	Little Hunting Creek	Coastal Plain	2	1175.3	1.84	22.7	Poor	14.3	Very Poor
LR0901	Little Rocky Run	Piedmont	3	2344.4	3.66	33	Poor	78.6	Excellent
MB0901	Mill Branch	Piedmont	2	581.5	0.91	21.3	Poor	28.6	Poor
NI0901	Nichol Run	Piedmont	2	207.1	0.32	40.5	Fair	N/A	
NI0902	Nichol Run	Piedmont	4	3690.6	5.77	69.4	Good	57.1	Good
OC0901	Occoquan	Piedmont	1	60.2	0.09	94.3	Excellent	N/A	
PC0901	Pohick Creek	Piedmont	1	54.3	0.08	9.3	Very Poor	N/A	
PC0902	Pohick Creek	Piedmont	1	69.8	0.11	16.8	Very Poor	N/A	
PC0903	Pohick Creek	Piedmont	1	175.2	0.27	19	Very Poor	N/A	
PC0904	Pohick Creek	Piedmont	2	430.3	0.67	9.7	Very Poor	14.3	Very Poor
PC0905	Pohick Creek	Piedmont	4	1539.2	2.40	19.3	Very Poor	71.4	Good
PC0906	Pohick Creek	Piedmont	3	3045.5	4.76	21.9	Poor	64.3	Good
PH0901	Popes Head Creek	Piedmont	1	74.3	0.12	80.7	Excellent	N/A	
PM0901	Pimmit Run	Piedmont	1	33.5	0.05	22.4	Poor	N/A	
PM0902	Pimmit Run	Piedmont	2	2279.4	3.56	27.6	Poor	0.0	Very Poor
PM0903	Pimmit Run	Piedmont	2	1691.1	2.64	12.4	Very Poor	0.0	Very Poor
PM0904	Pimmit Run	Piedmont	1	231.1	0.36	11.3	Very Poor	N/A	
PM0905	Pimmit Run	Piedmont	3	3236.0	5.06	7	Very Poor	7.1	Very Poor
PN0901	Pond Branch	Piedmont	3	699.6	1.09	71.2	Good	71.4	Good
SA0901	Sandy Run	Piedmont	3	2767.3	4.32	53.2	Fair	64.3	Good
SC0901	Scotts Run	Piedmont	1	86.0	0.13	25.1	Poor	N/A	
WR0901	Wolf Run	Piedmont	1	14.8	0.02	70.5	Good	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 72 percent of the sites evaluated exhibited “poor” to “very poor” biological conditions while the fish IBI showed that 47 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 Countywide Stream Quality Index for sampling years 2004-2009

Sampling Year	Percentage of Total Sites					Index Value
	Very Poor	Poor	Fair	Good	Excellent	
2004	40	30	17	13	0	**2.03**
2005	15	32.5	32.5	7.5	12.5	**2.70**
2006	36.4	34	15.9	11.4	2.3	**2.09**
2007	17.5	32.5	15	20	15	**2.83**
2008	35	25	17.5	15	7.5	**2.35**
2009	38	35	15	8	5	**2.08**

Figure 4.4 and Table 4.5 shows the SQI for all years probabilistic monitoring has been employed. The 2009 SQI shows a decrease in overall stream quality from 2008. 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.

For the last five 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

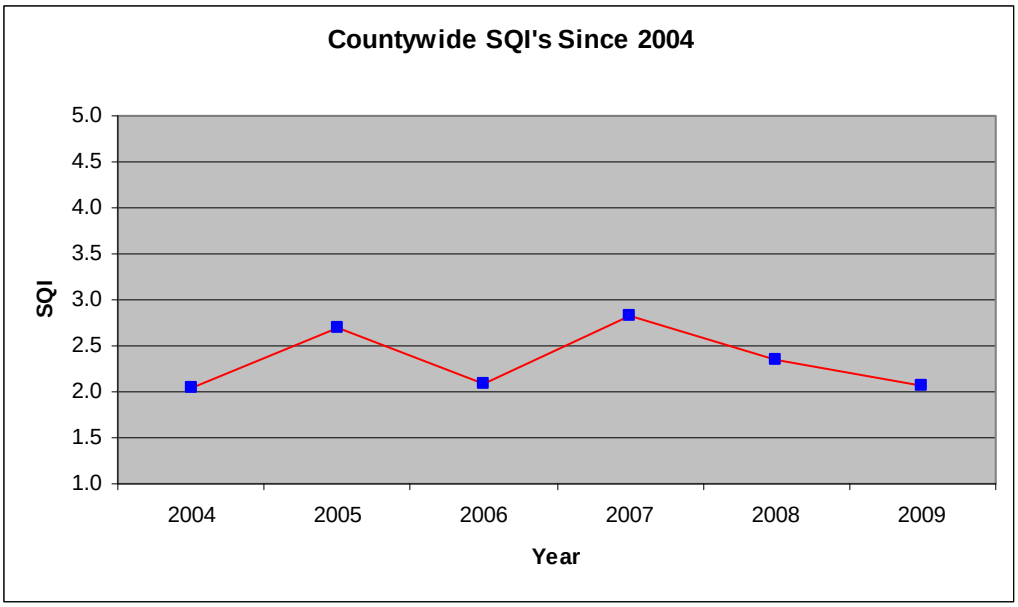

Figure 4.4 Trends in the countywide Stream Quality Index

Table 4.6 (next page) 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.

Figure 4.5 Benthic macroinvertebrate sampling. Photo by Fairfax County.

Table 4.6 Overall watershed conditions for sampling years 2004-2009 combined

Overall Watershed Conditions (2004-2009)

Watershed	Benthics			Fish		
	Number of Sites	Average IBI	Rating	Number of Sites	Average IBI	Rating
Accotink Creek	19	24.3	Poor	12	33.3	Poor
Belle Haven	4	23.4	Poor	1	21.4	Poor
Bull Neck Run	N/A					
Bull Run	2	38.7	Poor	N/A		
Cameron Run	17	29.5	Poor	8	16.1	Very Poor
Cub Run	15	31.8	Poor	13	40.1	Fair
Dead Run	3	28.5	Poor	N/A		
Difficult Run	49	38	Poor	22	48.7	Fair
Dogue Creek	4	32.5	Poor	3	42.9	Fair
Four Mile Run	N/A					
High Point	N/A					
Horsepen Creek	3	28.4	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	5	24.2	Poor	4	12.5	Very Poor
Little Rocky Run	8	20	Poor	3	61.9	Good
Mill Branch	6	42.4	Fair	2	17.9	Very Poor
Nichol Run	8	61.9	Good	1	57.1	Fair
Occoquan	4	87.9	Excellent	N/A		
Old Mill Branch	1	75.5	Good	N/A		
Pimmit Run	6	14.8	Very Poor	3	2.4	Very Poor
Pohick Creek	35	28.5	Poor	15	52.9	Fair
Pond Branch	5	58	Fair	2	50	Fair
Popes Head Creek	14	54.1	Fair	8	65.2	Good
Ryans Dam	N/A					
Sandy Run	7	65	Good	1	64.3	Good
Scotts Run	2	19.3	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	6	77.3	Good	2	42.9	Fair
Fairfax County	234	38.9	Poor	99	42.4	Fair

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

Bacteria Monitoring

In 2009, 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 2009, SWPD completed its sixth 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

Water Chemistry Results

Temperature (◦C)
Minimum……7.3
Maximum……..24.2
Average ……15.0
Dissolved Oxygen (mg/L)
Minimum……4.2
Maximum……..14.5
Average …….9.6
Specific Conductance (µs/cm)
Minimum……52
Maximum……..5358
Average ……457.9
pH
Minimum……...6.0
Maximum……..11.0
Average ……7.2
Nitrate (mg/L)
Minimum……..<0.1
Maximum……..4.4
Average ……1.2
Total Phosphorous (mg/L)
Minimum……..<0.1
Maximum……..0.1
Average ……0.1

sites in 19 watersheds throughout the county. Staff collected samples three times during the year. Sites are normally sampled four times during the year for bacteria, but sites were not able to be sampled during the last quarter of 2009 due to an extended period of extremely wet conditions.

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

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

As bacteria sampling in Fairfax County was conducted three times in 2009, 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 2009, 47 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 4.6). 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.

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."

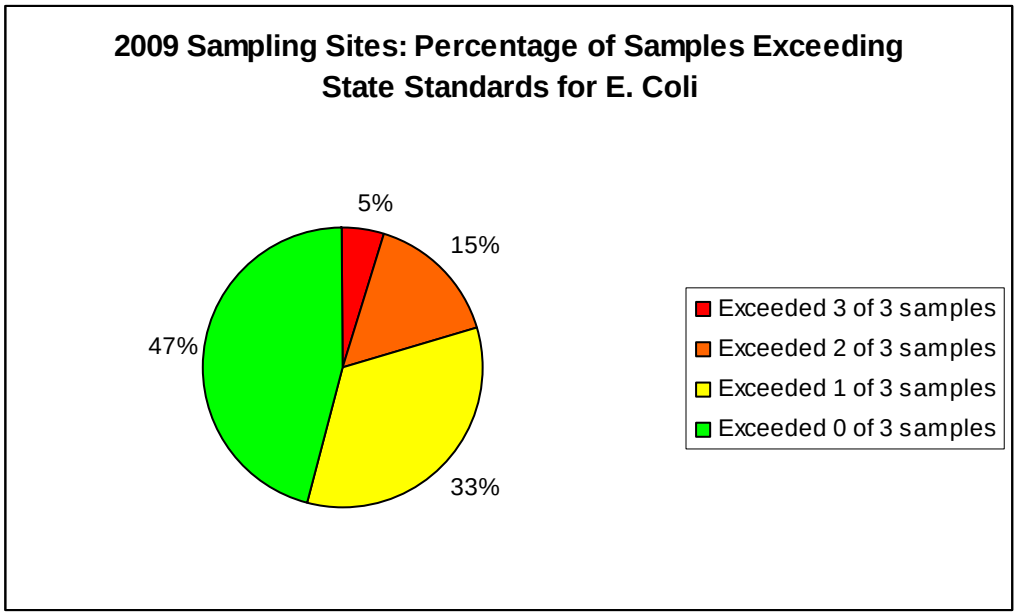

Figure 4.6 Percentage of sites exceeding Virginia's instantaneous water quality standard for *E. coli*

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

In 2008 the Virginia Department of Environmental Quality (VDEQ) released its summary of water quality conditions in Virginia from January 1, 2001, to December 31, 2006. This report is released on a bi-annual basis and will be released again in 2010. 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.

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

Table 4.7 VDEQ 2008 list of Impaired Waters in Fairfax County

	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

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.

Accotink Creek, above Lake Accotink, has been identified as an impaired water body and the commonwealth is currently developing a benthic TMDL which proposes a reduction in stormwater flow draining to Accotink Creek. The Accotink Creek TMDL is scheduled for completion in the spring of 2010. The EPA is currently developing a TMDL for the Chesapeake Bay watershed, in which Fairfax County is the most populous local jurisdiction. This multi-state initiative would set restrictions on nutrient and sediment pollution throughout a 64,000-square-mile watershed. Under a Virginia consent decree, the Chesapeake Bay TMDL must be established no later than May 1, 2011.

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.

Volunteer monitoring

Northern Virginia Soil and Water Conservation District (NVSWCD) continues its successful volunteer stream monitoring program (Figure 4.7). 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 enhanced Virginia Save Our Streams (SOS) protocol. Monitoring includes biological and chemical aspects and a physical habitat assessment. NVSWCD provides training, equipment, support, data processing, and quality control; 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 2009, there were 30 active volunteer monitoring sites in Fairfax County that were monitored four times per year. In addition 45 public stream monitoring workshops and field trips were held throughout the county and 365 county citizens attended. At each workshop or field trip biological monitoring was performed and information was presented on stream ecology, stormwater runoff, urban hydrology and watersheds. More information can be found at www.fairfaxcounty.gov/ nvswcd/monitoring.htm.

Figure 4.7 Volunteers conduct biological monitoring to assess stream health. Photo by NVSWCD.

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. Five nature centers and an imbedded naturalist at Cub Run RECenter provide water quality and environmental education to hundreds of thousands of visitors each year. The sites also support the program through training and sponsoring citizen volunteer monitors.

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 4.8) 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.

Figure 4.8 Autosampler shelter at Flatlick Branch. Photo by Fairfax County.

In 2009, 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 over 340 samples from the fourteen sites. These data, as well as additional study details, are available online via map interface at www.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. 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 2009, 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
- 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 Forestry: assists with tree plantings
  - www.dof.virginia.gov

Educational Booths and Presentations

Fairfax County Stormwater Management

Fairfax County gives 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

Figure 5.1 Stormwater Management booth - 2009 Earth Day Expo. Photo by Fairfax County.

Figure 5.2 Enviroscape watershed model demonstration to classroom for Nonpoint Source Pollution education program. Photo by NVSWCD

project, of which education is a component. In 2009, 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 annual public events to raise awareness among residents about stormwater issues and to encourage watershed-friendly behaviors. In 2009, Fairfax County participated as an exhibitor or environmental educator at approximately 20 events, including: Fall for Fairfax, Board of Supervisors' town meetings, resource fairs and environmental fairs.

Northern Virginia Soil and Water Conservation District

In 2009, NVSWCD made presentations, provided displays, and sponsored events that included:

- Demonstrated the Enviroscape watershed model 15 times to 556 youth and adults; four county teachers and day care instructors were trained to use the model and demonstrated it to their own classes.
- 52 presentations given to audiences in industry, government, youth and the general public, in which 2,023 people learned about rain gardens and other low impact development techniques, water conservation, best management practices for horsekeeping operations, the new soil survey, soil concepts, art with soils, stream cleanups, water quality monitoring, award-winning erosion and sediment controls on construction sites, ecological concepts and nonpoint source pollution. Two of the workshops for homeowners covered the design and installation of rain gardens.
- Displays and publications about environmental landscaping, stream restoration, volunteer monitoring, storm drain marking, rain barrels and other environmental topics were made available at 5 events.
- Sponsored 6 Saturday morning Green Breakfasts featuring presentations on: the Huntley Meadows restoration project; the role of native plants in the landscape; birds of Northern Virginia and creating a bird-

Figure 5.3 LID workshop sponsored by NVSWCD. Photo by NVSWCD

friendly habitat; reducing your carbon footprint; preserving agriculture in urbanizing communities; and tree initiatives in Fairfax County, including the 30-year tree canopy goal and the new tree ordinance.

Furthermore, all low impact development (LID) projects NVSWCD completed in 2009, such as the ”build-your-own” rain garden workshops and the Watershed Friendly Garden Tour 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 2009, SWMP:

- Gave approximately 16 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 Fall for Fairfax, an annual event sponsored by the county, with a large display manned by SWMP staff.

Fairfax County Park Authority

Five nature centers and an imbedded naturalist at Cub Run RECenter provide water quality and environmental education to hundreds of thousands of park visitors each year. For example, Huntley Meadows Park staff held the annual Wetlands Awareness Day to educate citizens on the importance of maintaining healthy wetlands. Through exhibits and numerous programs staff at just one of our nature centers, Hidden Pond, reached over 50,000 people in 2009 teaching the value of wetlands, importance of water quality and highlighting our connections to the Chesapeake Bay.

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 eight summer camp programs for 1,139 campers between June 22 and August 21, 2009.

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 47 such activities presented by VDOF in 2009.

Communication Initiatives

Printed Materials/Mailings

Fairfax County Stormwater Management

In 2009, the staff of Stormwater Planning created educational fact sheets on urban stream restoration and stabilization; detention basin retrofits; stream health action steps; clean streams for Fairfax County; how to discourage resident geese and picking up pet waste. A flood protection newsletter was sent to 20,000 Fairfax County residents. News releases were sent to the media including “Fairfax County Gains Improved FEMA Rating” and “Herrity Green Roof Wins Community Award”.

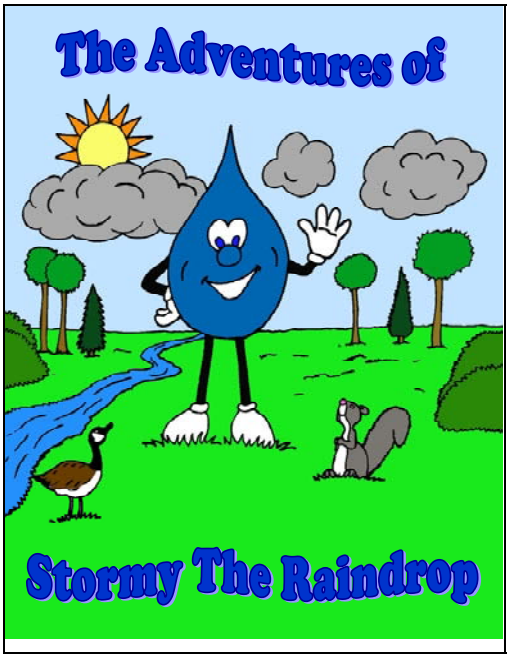

Figure 5.4 Cover of "The Adventures of Stormy the Raindrop" coloring book

Stormwater Planning staff created a coloring book depicting the journey of a raindrop from a cloud to a storm drainage system and ultimately to a local stream. The coloring book is intended to foster watershed awareness and deliver a straightforward anti-pollution message. More than 1,800 copies of the “Adventures of Stormy the Raindrop” activity book were distributed at various libraries, district supervisor’s offices and public events.

Health Department

The Health Department mailed 14,604 flow diversion valve reminder notices in 2009. 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.

In FY2009 2,372 non-compliance letters were mailed to owners of homes that have not pumped out their septic tank during the 5 year period required in Chapter 68.1 of the Fairfax County Code and the Chesapeake Bay Preservation Area Designation

and Management Regulations. If a homeowner fails to comply, a follow-up letter is mailed to the them informing them that action will be taken under the regulations to insure their septic tank is pumped out as required.

Northern Virginia Soil and Water Conservation District

In 2009, NVSWCD published 3 editions of Conservation Currents. Topics included achieving a trash-free Potomac, emerging contaminants in water, Fairfax County's Land Conservation Awards, Grosbeaks for dinner, stewardship opportunities, native seedlings, limiting Lyme disease naturally, the Fairfax County Restoration Project partnership, the importance of native bees and other pollinators, the "Rebuild" effort to promote green building and green jobs, preserving habitat in winter landscapes, frost seeding for horse pastures, science fair projects, and bottled vs. tap water. NVSWCD sent 2,800 copies mainly to homeowner associations who are encouraged to reprint articles in their newsletters. Many articles are also posted on the NVSWCD website.

NVSWCD continued to distribute copies of three publications it has published: Residential Low Impact Landscaping Guide; You and Your Land-A Homeowners Guide; and the Study of the Physical Characteristics of Rain Gardens. NVSWCD distributed 1,685 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 Solid Waste Management

The Solid Waste Management Program published a 2009 educational 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 2009-2010 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, including a six-minute program on "What's in Your Water?" and a "Pick up the Dog Waste" program.
- 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 2009 marked the fifth year of the campaign, with a new radio public service announcement "Switching Bathwater with Stormwater" airing 651 times on six radio stations including one Spanish language station.

Digital Media

Stormwater Management Web Site

- Visits and views to Stormwater Planning Division pages and to Maintenance and Stormwater Management Division pages were combined for a total of 56,044 visits and 78,317 views. The main stormwater page at www.fairfaxcounty.gov/dpwes/stormwater is ranked number 46 in the top 200 Fairfax County pages. The frequently asked questions (FAQs) page on snow removal at www.fairfaxcounty.gov/dpwes/navbar/faqs/snowremoval.htm is ranked number 53 and the page on watersheds at www.fairfaxcounty.gov/dpwes/watersheds is ranked number 55.
- A new series of web pages was created entitled "Fishes of Fairfax County" to help educate residents on the various species and distribution of species of fish throughout the county (http://www.fairfaxcounty.gov/dpwes/stormwater/fish/fishes_of_fx.htm)
- A series of public service videos was placed on You Tube in 2009; Only Rain Down the Drain received 771 views, Stormwater Management received 706 views, Pick up Pet Waste received 16 views, Fertilizer Runoff received 168 views and What's in Your Water received 101 views.

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 2009, NVSWCD disseminated information on county environmental programs and events monthly via two email lists, the Green Breakfast Group (545 recipients) and the Watershed Calendar group (an average of 835 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.
- Initiated a new electronic newsletter as part of the SCRAP program-SCRAPmail.

Web Podcasts

Podcast messages available for download from www.fairfaxcounty.gov were initiated in 2007 and continued throughout 2009. Podcast topics include: dam safety, picking up pet waste, the Community Rating Service, proper discharge of swimming pool water and soil testing. 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.

Figure 5.5 An example of a storm drain marker used by NVSWCD and volunteers

Storm Drain Marking Program

Fiscal year 2009 marked the fourth 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 5.5). The one-on-one education with each household helps to make this an effective program. In calendar year 2009, the Storm Drain Marking Program coordinated 26 projects that placed markers on 2,235 storm drains and educated 16,457 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. In 2009, 388 volunteers contributed 1,051 hours to the program. Since the program began, 2,376 volunteers have helped to complete 131 projects which resulted in outreach to 261,985 households and labeling of 13,487 storm drains.

Figure 5.6 Rain barrel workshop hosted by NVSWCD. Photo by NVSWCD.

Rain Barrel Program

In 2009, 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. Seven “build-your-own” rain barrel workshops and two 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 5.6). Six of the 11 events were held within Fairfax County, two were held in Arlington, two were held in Alexandria, and one was held in Falls Church. Four hundred forty-one people participated in these programs. A total of 580 rain barrels were distributed, including 48 free barrels at training events, 312 barrels made at “build-your-own” workshops, and 220 barrels sold at other distribution events.

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

In 2009, 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/Clean Virginia Waterways
- The Friends of the Occoquan
- Clean Fairfax Council

During stream cleanup events, volunteers remove a tremendous amount of floatable materials from the county's stream system. In the spring of 2009, approximately 107 sites were established throughout the county for the annual Alice Ferguson Foundation Potomac River Watershed Cleanup. Cleanups were conducted at numerous state, county and local parks (see below) and the county wastewater treatment plant. More than 1,890 volunteers removed approximately 40.3 tons of trash, which included 1,597 bags of trash and litter, 248 tires, 4,613 cigarette butts, and over 10,000 plastic shopping bags from Fairfax County streams. The Alice Ferguson Foundation also held two site leader trainings in Fairfax County with approximately 25 participants. These trainings were to prepare volunteers and site leaders for the Potomac cleanup as well as inform them on the workings of the Trash Free Potomac Initiative.

According to Clean Virginia Waterways, a total of 805 volunteers participated in the International Coastal Cleanup in Fairfax County during September and October 2009. More than 20 stream and shoreline miles were cleaned, and over 30,600 pounds of trash and marine debris were removed. Litter from recreational activities and fast food consumption (e.g. plates, forks etc.), beverage containers, and plastic bags were the most commonly collected trash items collected in the county.

The county continued to promote the “Adopt a Stream” program. The Stormwater Planning Division distributed copies of its Floatables Monitoring Program Brochure to various public

offices and during educational activities and outreach events throughout the county. The brochure was also made available on the Floatables web page at www.fairfaxcounty.gov/dpwes/stormwater/floatables.htm. Stream cleanup event organizers were encouraged to record their cleanup information on the Floatables Data Reporting Form (available in the brochure or on the web) and return the completed form to the county. Cleanup data submitted to the county were entered in the Floatables database. During 2009, various "Friends of" citizen groups reported that over 88 bags of general trash, 323 plastic shopping bags, 318 pounds of bulk items, and 18 tires were removed from county streams by 86 adult, teen, and child volunteers.

As in past years, Fairfax County Park Authority hosted and organized numerous cleanup events in many stream valley parks and two lake front parks during 2009. Over 61 stream cleanups were conducted on county parkland as part of the Alice Ferguson Foundation's Potomac Watershed Cleanup. These events provided an excellent learning opportunity for a reported 1,023 volunteers who removed 46,612 pounds of trash from county streams and water bodies.

Figure 5.7 Stream cleanup during Public Works Week. Photo by Fairfax County.

In addition, the Park Authority continued to organize separate cleanup events in the spring, such as the Holmes Run cleanup at Roundtree Park, which attracted 50 volunteers and removed 28 large bags of trash, and two cleanups in Pohick Stream Valley Park which removed approximately 72 bags of trash. Fairfax Trails and Streams (FTS) is the Adopting Partner for Pimmit Run Stream Valley and the corresponding trail system. They coordinated large volunteer groups to remove trash and debris during the spring Potomac Watershed Clean Up and again during the fall Volunteerfest. On a weekly basis, FTS core volunteers clean the stream bed and surrounding grounds, coordinating with Park Authority staff to truck the debris to the landfill and recycling sites. They also monitor the condition of the trail and stream crossings along the stream following storms and repair damage as it occurs. The Park Authority also administers an Adopt-a-Park program to encourage stewardship of county parklands. Through the program, FCPA establishes partnerships with community organizations and individuals to remove trash from parks.

The staff at Riverbend Park addressed trash problems related specifically to fishing activities along the Potomac River shoreline by placing three new trash cans near popular fishing spots, fabricating and installing two fishing line recycling stations, increasing staff presence on foot and by boat to educate and enforce no-littering laws, requesting increased presence by state game wardens, and organizing cleanup events with volunteers and court-assigned teenagers.

Reston Association coordinated four stream cleanups and its annual lake cleanup in 2009.

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 Program (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. The program is supported by funding generated by the SWMP at a cost of about $650,000 each year. The SWMP has two permanent HHW facilities.

The SWMP is constantly amending its practices to accommodate new types of wastes such as compact fluorescent lamps (CFLs) and other fluorescent lamps. These lamps can be taken 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 continued to distribute an updated educational brochure describing the energy-saving benefits of using these lamps and how to dispose of them properly at the end of their useful life. This publication was made available online and is the most viewed document on the SWMP's portion of the county website.

In 2009, the SWMP instituted a monthly electronics recycling program for county residents known as Electric Sunday. The SWMP dedicates one Sunday per month where residents can drop off used computers and televisions in order to have them recycled. Over 500,000 lbs of electronic waste, equating to about 35 tons of lead, were prevented from being introduced into the Fairfax County environment, significantly reducing the opportunity to negatively impact stormwater runoff.

In 2009, 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 performed site check-ups and maintenance on 10 sites, invasives control activities on three sites, and donated 170 native trees, shrubs, and herbs and the necessary tree protectors, for enrichment of two of those sites (Table 5.1). Sangha volunteers also installed 2,940 native plants on three additional riparian sites in the County. Roughly 2,870 plants, all propagated by Earth Sangha from local, wild native plant populations, were provided to local schools, churches, HOAs, restoration organizations, government agencies, and individuals for restoration projects. The majority of these projects took place in Fairfax County.

The Fairfax County Park Authority, Fairfax ReLeaf and the Virginia Department of Forestry hosted independent stream buffer restorations in the county in 2009. The Park Authority completed its fifth 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. Park Authority staff completed

Table 5.1 2009 buffer restoration activities (Earth Sangha)

Site	***Activity type***	***Volunteers***	***Plants Installed***
Bureau of Land Management - Thompson Creek	New Planting	56	500
Bureau of Land Management - Ecological Display Area (5 events)	New & Enrichment Planting	155	545
Bureau of Land Management - Ecological Display Area	Direct seed sowing	79	175 lbs. of seed
Bureau of Land Management - Horse Barn Site	Enrichment Planting	70	350
Canterbury Woods (2 events)	Invasives Removal	26	0
Flag Run Park (2 events)	Invasives Removal	22	0
Flag Run Park	Enrichment Planting	24	60
Luria Park	Invasives Removal	24	0
Marie Butler Leven Preserve (24 major events)	Planting/Invasives Removal	673	1,050
Roundtree Park (3 events)	Invasives Removal	151	0
Roundtree Park	Enrichment Planting	44	110
Royal Lake Park (IMA project)	Planting/Invasives Removal	47	120
Wilburdale Park (5 events)	Invasives Removal	97	0
Totals		**1,468**	**2,785**

additional planting projects in the RPA unrelated to the county's buffer planting program. Two such projects in 2009 were the planting of 50 trees in Pohick Stream Valley Park, and the planting of over 240 trees and shrubs in Accotink Stream Valley Park to promote reforestation after the completion of a federally funded commuter and stream valley trail. Other projects were focused on reforestation of uplands to include the planting of over 70 trees at Pinecrest Golf Course and 75 trees at Mount Vernon District Park.

Park Authority staff worked with a contractor through a Water Quality Improvement Fund grant from Virginia Department of Conservation and Recreation to do an extensive planting along several branches of east Barnyard Run at Huntley Meadows Park to stabilize stream banks, reduce downstream sedimentation and improve instream habitat. The project was completed in December 2009 and included the planting of 2,200 trees and shrubs over more than 3 acres of riparian buffer.

In 2009, Fairfax ReLeaf planted 3,933 trees in Fairfax County (Table 5.2). Nearly 30 percent (1,115) were riparian buffer plantings. Fairfax ReLeaf also distributed 3,868 trees to residents.

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 2009, VDOF worked with volunteers from organizations such as Fairfax ReLeaf, Eagle Scouts, homeowner associations and school groups and planted approximately 800 seedlings in the county.

Table 5.2 2009 Fairfax ReLeaf planting projects

Location	***# Trees***	***Project Type***
Chestnut Grove Cemetery	96	County land
Distributions around Fairfax County	3,868	Distribution
Oakton Glen HOA	250	HOA
Franklin Farm Planting	198	HOA
Laurel Hill	98	HOA
Laurel Hill #2 (riparian)	687	HOA
Singal Hill HOA	50	HOA
Wolftrap Farm Park	394	Park
Pine Ridge Park	234	Park
Lake Accotink	5	Park
Byron Avenue Park	205	Park
Pohick Bay Park	150	Park
Mt. VernonRECenter	78	Park
Waverly Park	87	Park
Meadowood Recreation Area	300	Park (BLM)
Reston Association	10	Park
Rachel Carson MS	50	School
El-lman Learning Center	16	School
Oakton High School	50	School
Cardinal Forest Elementary School	63	School
Shrevewood Elementary School	348	School
Fairhill Elementary School	438	School
Cardinal Glen storm water pond	126	Storm Pond
TOTAL	**7,801**	

The Park Authority, with strong volunteer support, continued the aggressive management of invasive, non-native plants on more than 37 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. Four hundred native trees, shrubs and herbaceous (ground cover) plants were planted at IMA sites in 2009. The Park Authority also contracts for herbicide removal of invasive species at selected sites. In 2009, approximately 250 acres were treated with selective herbicide for the support of invasive species eradication. Reston Association conducted a program in 2009 to remove Purple Loosestrife from Reston's lakes and to incorporate the data into GIS. The county also eradicated 0.5 acres of kudzu from Dead Run in 2009.

In 2009, Fairfax County continued to partner with NVSWCD in its annual seedling sale. A variety of 6,500 native shrubs and trees were sold to help promote urban reforestation, habitat enhancement and water quality protection. The theme, For the Birds, offered species that provide food and shelter for birds.

Figure 5.8 NVSWCD participates in the annual seedling sale. Photo by NVSWCD

Public School Environmental Education Partnerships

Fairfax County Public Schools Curriculum

Stormwater Management staff initiated talks in 2009 with Fairfax County Public Schools to provide stormwater and watershed educational materials to all public elementary schools. An activity book is under way that will incorporate 4th grade SOL requirements while providing information in a new and innovative way. Staff continuously receives requests to speak to various schools and age groups throughout the year. From a summer Youth Scholar program for 4th and 5th graders to middle school Career Days and high school Science Fairs, Stormwater Management has partnered with the school system to provide many educational opportunities to 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 2009, Stormwater Management staff continued to partner

Figure 5.9 Sewer Science class. Photo by Fairfax County.

with Wastewater Management and Solid Waste Management staff to bring the program to four schools, instructing 450 students during 16 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. There was one year long experiment run during the 2008-2009 school year. Over the past four 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 litter prevention and support for recycling. In 2009, 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.
- Gave 31 recycling presentations to middle and elementary school students.
- Hosted 25 tours of facilities for students of all ages.
- Hosted the Virginia Association of Science Teachers at the I-95 Landfill Complex for a presentation and tour of the facility.
- 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 13 schools to fund school environmental projects involving litter prevention, litter control or recycling.
- Hosted its 8th annual Community Recycling Roadshow at Herndon High School on October 24, 2009.

Reston Association's Watershed Education Programs for Students

Reston Association offers a watershed field trip program for students in grades three through six. During the field trip, students learn about watersheds and explore an area of the Difficult Run watershed. Students conduct biological inventories and perform water quality tests at Lake Newport and a tributary of Colvin Run. They also discuss ways that residents can protect the watershed. In 2009, Reston Association conducted the watershed field trip for four classes with a total of 100 students.

Reston Association's Walker Nature Education Center also provides the Watershed Traveling Nature Trunk Program for students in grades three through eight. The nature center lends Reston schools, camps and scout groups 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 2009, the traveling

watershed trunk was used at 14 programs that reached 345 participants, including one Fairfax County in-service training for teachers.

Envirothon

NVSWCD sponsored teams from Madison, West Potomac, George Marshall, Langley, and Centreville in the local, regional and state Envirothon, a natural resources competition for high school students.

Technical Support and Training

Land Development Services

- Conducted year long training sessions with DCR on joint monthly Virginia Stormwater Management Permit (VSMP) inspections
- Conducted a bonds and agreements forum with Industry and staff
- Sponsored a training session at Hanson Pipe and Precast in Manassas with Industry, VDOT, all EFID inspectors and MSMD, which included a plant tour and continuous pipe video demonstration

Northern Virginia Soil and Water Conservation District

- Provided technical advice to 333 homeowners and homeowner associations, which included 117 on-site visits, to advise on erosion, drainage, pond management and other environmental problems
- Provided soils information to 129 consultants, realtors and homeowners
- Responded to 1,280 information inquiries by telephone, email and during office visits

Environmental Horticulture Division of Fairfax Cooperative Extension

- Hosted more than 450 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 78 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.

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 requirements to control stormwater runoff close to the source.

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. Onsite infiltration with subsequent groundwater recharge is one of the many benefits to be derived from this approach.

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. Concerns were raised by the community and the National Park Service about the alignment of the proposed levee/floodwall. The Corps is currently addressing these concerns. The county expects to present alternative alignments to the community in the summer of 2010. Once the final alignment is agreed upon, the Corps will complete a 65 percent design of the selected levee/floodwall alternative. The current schedule is to have a 65 percent design in February/March 2012.

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. On May 7, 2009 the county hosted a community meeting to review the 65 percent design and discuss the alternatives. Funding for the 100 percent design and the construction have not yet been identified.

Stormwater staff has been working with the Federal Emergency Management Agency (FEMA) on revisions to FEMA's Flood Insurance Rate Maps (FIRMs) and creation of the Digital Flood Insurance Rate Maps (DFIRMs) for the county. The purpose of a FIRM is to show the areas in a community that are subject to 100-year flooding, called Special Flood Hazard Areas (SFHA), and the risks associated with these flood hazards in order to determine the flood insurance premium rates. Revisions to the FIRMs were made to re-delineate SFHA's. The updated FIRMs and new DFIRMs will be adopted September 17, 2010. As part of the adoption process, the county is revising its floodplain regulations.

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 is currently being updated to reflect the new DFIRMs. It is also periodically updated as new watershed master plans are completed and new data (e.g. floodplain studies, FEMA maps) are made available.

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