

“Protecting our land and our water”

2010 Fairfax County Stormwater Status Report



A Fairfax County, VA., publication

Photos on cover(clockwise from top): Fish sampling in Prince William Forest Park; Sycamore Ridge Section I pond retrofit; watershed cleanup; Dead Run stream restoration adjacent to Mt. Vernon Library. All photos by Fairfax County.

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Private organizations

Earth Sangha
Fairfax ReLeaf
Reston Association

State agencies

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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 2010 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 completed and adopted six watershed plans between 2005 and 2008 as part of the first round of plans. By the end of 2010, two additional watershed management plans had been completed and adopted by the Fairfax County Board of Supervisors. The five remaining watershed

management plans were completed and adopted by the Fairfax County Board of Supervisors in early February, 2011. These plans provide an assessment of stormwater conditions, recommend protection strategies and improvement projects and encourage public involvement.

2. *Stormwater Capital Projects.* In 2010, the county and its partners continued to implement stormwater management-related capital projects, including five flood mitigation projects, more than ten stormwater management facility retrofits, ten 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.

3. *Operations.* The county operates its facilities in a manner consistent with the requirements of its Virginia Pollutant Discharge Elimination System (VPDES) 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 1,300 public stormwater management facilities and annually inspect over 400 of the more than 3,300 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 county and Park Authority property; 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 30 sites located around the county through a volunteer monitoring program.

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 2010, 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 second Stormy the Raindrop activity book was introduced to fourth grade science classes in the Fairfax County Public Schools. The activity book was also 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 improving the quality of stormwater that enters the streams and protecting watersheds through initiatives to control runoff and reduce the negative effects of the continual increase in impervious area. In 2010, 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

In 2003, Fairfax County embarked on a watershed planning initiative that assessed watershed needs and proposed improvements for the next 25 years. The county started with the Little Hunting Creek watershed and completed the remaining 12 watershed plans in 2010. Watershed management plans are one component of the Virginia Pollutant Discharge Elimination System permit requirements and are part of the Fairfax County Board of Supervisor’s Environmental Agenda. The goals of the planning effort include:

- Protecting and restoring county streams by identifying strategies to prevent and remove pollution from reaching our waterways
- Provide an assessment of current and future watershed conditions
- Provide an update to the original 1970s-era watershed management plans
- Establish a series of projects and recommendations to promote the restoration of our local waterways and the Chesapeake Bay

These plans were developed with the assistance of the community through public meetings and individual plan stakeholder groups. This public involvement process ensures that the plans met the needs, and had the support, of our residents.

The watershed planning process consists of 13 total plans. The county completed and adopted six watershed plans between 2005 and 2008 as part of the first round of plans. By the end of 2010, two additional watershed management plans had been completed and adopted by the Fairfax County Board of Supervisors (Table 1-1). The remaining five plans were completed and adopted by the Fairfax County Board of Supervisors in early February, 2011.

Table 1-1 Status of Fairfax County watershed planning process.

<i>Watershed Planning Group*</i>	<i>Watershed Name</i>	<i>Total Area (sq. mi.)</i>	<i>Fairfax Co. Area (sq. mi.)</i>	<i>Plan Adoption</i>
Little Hunting Creek	Little Hunting Creek	11.0	11.2	Feb. 2005
Popes Head Creek	Popes Head Creek	18.9	18.2	Jan. 2006
Cub Run and Bull Run	Bull Run	9.7	8.4	Feb. 2007
	Cub Run	55.3	39.1	
Difficult Run	Difficult Run	57.7	55.3	Feb. 2007
Cameron Run	Cameron Run	42.0	32.6	Aug. 2007
Middle Potomac Watersheds	Bull Neck Run	2.3	2.3	May 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	Feb. 2011
	Little Rocky Run	7.4	7.4	
Accotink Creek	Accotink Creek	51.1	37.8	Feb. 2011
Pohick Creek	Pohick Creek	36.5	34.3	Dec. 2010
Sugarland Run and	Horsepen Creek	23.5	8.8	Dec. 2010

Table 1-1 Status of Fairfax County watershed planning process.

<i>Watershed Planning Group*</i>	<i>Watershed Name</i>	<i>Total Area (sq. mi.)</i>	<i>Fairfax Co. Area (sq. mi.)</i>	<i>Plan Adoption</i>
	Sugarland Run	22.5	10.5	
Belle Haven, Dogue Creek and Four Mile Run	Belle Haven	2.8	2.8	Jan. 2011
	Dogue Creek	19.4	13.3	
	Four Mile Run	30.1	2.0	
Lower Occoquan Watersheds	High Point	6.3	6.3	Jan. 2011
	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	Jan. 2011
	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				

It is anticipated that structural projects will be primarily funded from Fund 125, Stormwater Management Program, as well as from Fund 316, Pro Rata Share Drainage Construction.

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 2010 were DPWES and the Fairfax County Park Authority (FCPA). The Maintenance and Stormwater Management Division (MSMD) of DPWES 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 2010.



Figure 2-1 Structural improvements to provide residential flood mitigation at Summertown Way. Photo by Fairfax Co.

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 (Fig. 2-1). In 2010, DPWES finished five projects under the county's ongoing flood mitigation program (Table 2-1).

New Construction of Stormwater Management Ponds

There were no new regional stormwater management facilities substantially completed in 2010.

Table 2-1 Flood mitigation projects completed in 2010.

<i>Project Location</i>	<i>Project Description</i>
Bouffant Blvd.	Provided adequate overland relief to mitigate structural flooding
Graham Road	Provided residential flood mitigation with structural improvements and flood control evaluation
Post Road	Provided residential flood mitigation with structural improvements
Summerton Way	Provided residential flood mitigation with structural improvements and improvements to the detention basin
Wye Oaks Commons	Completed a drainage project to reduce the potential of house flooding by adding a yard inlet and replacing a manhole with a yard inlet; this project involved resolving utility conflicts while maintaining mature trees for the homes and yards

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 in 2010. These retrofit projects treated over 300 acres in 2010 and removed over 800 pounds of nitrogen, 100 pounds of phosphorus and 30 tons of sediment.

Figure 2-2 Cinnamon Oaks pond retrofit. Photo by Fairfax County.

Table 2-2 Retrofit projects completed in 2010.

<i>Project Name</i>	<i>Description</i>
851DP retrofit	Removed sediment to restore pond functionality and added a wetland seed mix retrofit to enhance the environmental quality of the pond
Cinnamon Oaks	Increased detention capacity and improved water quality by constructing sediment forebays and planting a specially designed seed mix to enhance function and longevity with native species
Langley Oaks 2	Established permanent maintenance access, repaired existing dam embankment and retrofitted pond to provide water quality benefits
Mason District Park	Retrofitted detention basin for enhanced water quality
Oak Knoll Estate	Retrofitted detention basin for enhanced water quality

Table 2-2 Retrofit projects completed in 2010.

<i>Project Name</i>	<i>Description</i>
Prosperity Pond retrofit	Established permanent access and retrofitted detention basin to provide enhanced, extended detention to maximize water quality benefits
Regional Pond D-77	Improved the environmental quality and functionality of the regional pond by transplanting numerous plantings from similar ponds throughout the pond floor
Sycamore Ridge	Increased detention capacity and improved water quality by constructing sediment forebays and planting a specially designed seed mix to enhance function and longevity with native species
University Square	Established permanent access and retrofitted detention basin for enhanced water quality
Weltman Estates pond retrofit	Retrofitted detention basin for enhanced water quality
Woodstream pond retrofit	Established permanent maintenance access, stabilized stream banks, repaired existing dam embankment and retrofitted pond to provide water quality benefits

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 2010, Northern Virginia Soil and Water Conservation District (NVSWCD) coordinated a regional rain barrel initiative for Northern Virginia with neighboring jurisdictions. Eight “build-your-own” rain barrel workshops and two pre-made rain barrel sales were held in Northern Virginia (see Chapter 5, Rain Barrel Program).

The manual *Rain Garden Design and Construction: A Northern Virginia Homeowner’s Guide*, which includes instructions and calculations needed for a homeowner to build a rain garden on his or her property, continued to be distributed in 2010. NVSWCD presented four rain garden workshops during 2010. The workshops covered rain garden function, design, location, costs,

construction, maintenance, planting, and materials. The workshops were attended by 122 county residents. Two presentations about rain gardens were made to 89 industry professionals.

Summary of 2010 Low Impact Development Projects

DPWES, FCPA, various non-profit organizations and individual volunteers contributed to the design and implementation of ten projects within the county that incorporated one or more LID practices (Table 2-3). Combined, these projects treated over 11 acres and removed more than 47 pounds of nitrogen, eight pounds of phosphorus and three tons of sediment.

Table 2-3 LID projects constructed in 2010.

<i>Project</i>	<i>Description</i>	<i>Partners</i>
Armstrong Elementary School	Retrofitted existing site for improved water quality and channel protection	DPWES, Reston Association (RA)
Carl Sandberg Elementary School	Retrofitted the site with two rain gardens for improved water quality	DPWES
Clermont Elementary School	Retrofitted existing site with a bioretention and two tree box filters for improved water quality	DPWES
Fire & Rescue Training Academy Phase I	Constructed vegetated swale and planted with native seed; amended soil with organic compost and planted native seed mix	DPWES
Greendale Golf Course	Modified ~120' of swale to provide rain water harvesting, improve infiltration and improve both site infrastructure and aesthetics	FCPA
Lee District Park Family Recreation Area	Constructed a stormwater maintenance facility beneath the parking lots to reduce the amount of land disturbance required to provide storage capacity for on-site detention	FCPA
Linway Terrace Park & Pine Ridge Park	Renovated existing adult-sized natural turf 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
Ossian Hall Park-Phase II	Installed an underground stormwater management facility, infiltration trench, rain garden and a synthetic* turf field	FCPA
McLean Community Center	Constructed a natural channel to dissipate energy and increase water absorption and nutrient uptake within the pond and constructed two micro pools to increase uptake of nutrients and the settling out of sediment	DPWES
Spring Hill RECenter Parking Lot Expansion	Installed two large underground storm water management facilities, pervious concrete pavement, bio-retention basins, a vegetated swale and seven tree boxes to improve water quality for the parking lot	DPWES, FCPA

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



Figure 2-3 Before and after pictures showing the installation of a bioretention basin at Clermont Elementary School. Photo by Fairfax County.

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 approximately 49 rezonings and related applications (e.g., amendments), 49 special exceptions and amendments, and 119 special permits and amendments in fiscal year 2010 for environmental considerations. In 2010, NVSWCD provided recommendations to DPZ on 114 rezoning and special exception applications. Recommendations addressed better site design techniques, LID practices and stormwater management measures that would lessen impacts on streams.

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 Providence District Supervisor’s Office/Fire Station 30 in Merrifield, Cub Run RECenter and the Herrity building. A bioretention filter and basin, a rain garden and permeable pavement blocks with gravel underground storage were installed at Providence District Supervisor’s Office/Fire Station 30. A bioretention filter and basin with a vegetated swale were installed at Cub Run RECenter. 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 one to over seven inches of precipitation

have been collected thus far. The three systems have retained from 0.25 inches to more than three inches of the precipitation that fell in those storms. On average, 60 percent 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 2010, the county completed three stream restoration projects with the assistance of a number of non-profit organizations and volunteers. These projects treated 634 acres and removed 705 pounds of nitrogen, 38 pounds of phosphorus and seven tons of sediment. These projects are summarized in Table 2-4.

Table 2-4 2010 Stream restoration and stream stabilization projects.

<i>Project Name</i>	<i>Description</i>	<i>Partners</i>
Big Rocky Run Tributary	Restored ~350' of stream by establishing a stable stream morphology by stabilizing bank grades, installing natural channel design with varying rock structures and restoring the riparian area with native landscaping	DPWES
Bridle Path	Provided ~1200' of streambank stabilization using natural channel design techniques to improve water quality and reduce safety concerns	DPWES
Dead Run	Restored ~1500' of stream utilizing soil lifts, rock toe bases, rock vanes, compost berm and fiber log rolls in order to increase water quality for the stormwater outfall and reduce stream bank erosion	DPWES, FCPA



Figure 2-4 Stream restoration work on a tributary to Big Rocky Run, including natural stream channel design and native landscaping. Photo by Fairfax Co.

Reston Association Stream Restoration

Since 2008, over seven miles of stream restoration have been completed in Snakeden Branch and The Glade watersheds as part of the Northern Virginia Stream Restoration Bank. Active construction began in the Colvin Run watershed in November 2010. Additional 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 Anne and Lake Newport.

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 oversees private maintenance agreements for privately owned stormwater management facilities. In 2010, MSMD inspected 173 of the 1,338 county-maintained stormwater management and BMP facilities at least once. MSMD inspected 411 of the 3,348 privately-maintained facilities in 2010 with the goal of inspecting all privately-maintained facilities at least once during the permit cycle as required.

In 2010, MSMD continued its maintenance program for county stormwater management facilities. Maintenance can include repairs to stormwater management facility structures and removal of sediment. During 2010, the county cleaned and/or mowed 1,136 dam embankments, including 40 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 131 maintenance work orders to correct deficiencies in publicly maintained SWM/BMP facilities. In 2010, more of these work orders focused on major maintenance problems, which resulted in a lower number of total work orders from recent years.

In addition to routine maintenance inspections, county staff with expertise in dam design and construction continues to perform annual inspections of 18 state-regulated dams in the county which are owned by DPWES 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 (Table 3-1). 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.

Table 3-1 2010 Dam rehabilitation and safety projects.

<i>Project Name</i>	<i>Description</i>
Burke Center Section 11B	Improved and retrofitted the dam to comply with the state dam safety requirements
Hampton Forest Spillway	Repaired and retrofitted dam for state certification
Kings Park Section 18	Improved and retrofitted the dam to comply with the state dam safety requirements
Lake Accotink Dam/Spillway	Improved dam and repaired spillway to comply with the state dam safety requirements
Woodglen Emergency Spillway	Rehabilitated emergency spillway
Flood Response Signalization System Phase II	Installed automated water level and rain gauges at 11 of the County's state-regulated regional ponds

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



Figure 3-1 Construction of the emergency spillway at Woodglen Lake. Photo by Fairfax County.

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. Construction for the second dam (Woodglen Lake) is substantially complete and construction on the third dam (Lake Barton) began in December, 2010. The total cost of the Woodglen Lake dam

rehabilitation project was approximately \$1.4 million, while the total cost of the Lake Barton dam rehabilitation is expected to be approximately \$3.4 million. A total of \$3.12 million in federal cost-share funds for both dams will be provided by NRCS through the American Recovery and Reinvestment Act. Planning and design for the fourth dam (Huntsman Lake) was initiated in April, 2010, and is expected to be complete by the end of 2011, with construction estimated to start by early 2012.

Storm Drainage Infrastructure Management

As required by its Virginia Pollutant Discharge Elimination System (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. During 2010, the GIS inventory was continuously updated with new as-built plans and field verification of system location and components within the identified easements. More than 200 as-built construction plans were digitized and 287 tax map grids were reviewed for completeness, proper maintenance responsibility identification and spatial accuracy verification. Routine maintenance began during the spring of 2010 on the GIS-based stormwater easement database. The inspection management schedule is summarized in Figure 3-2.

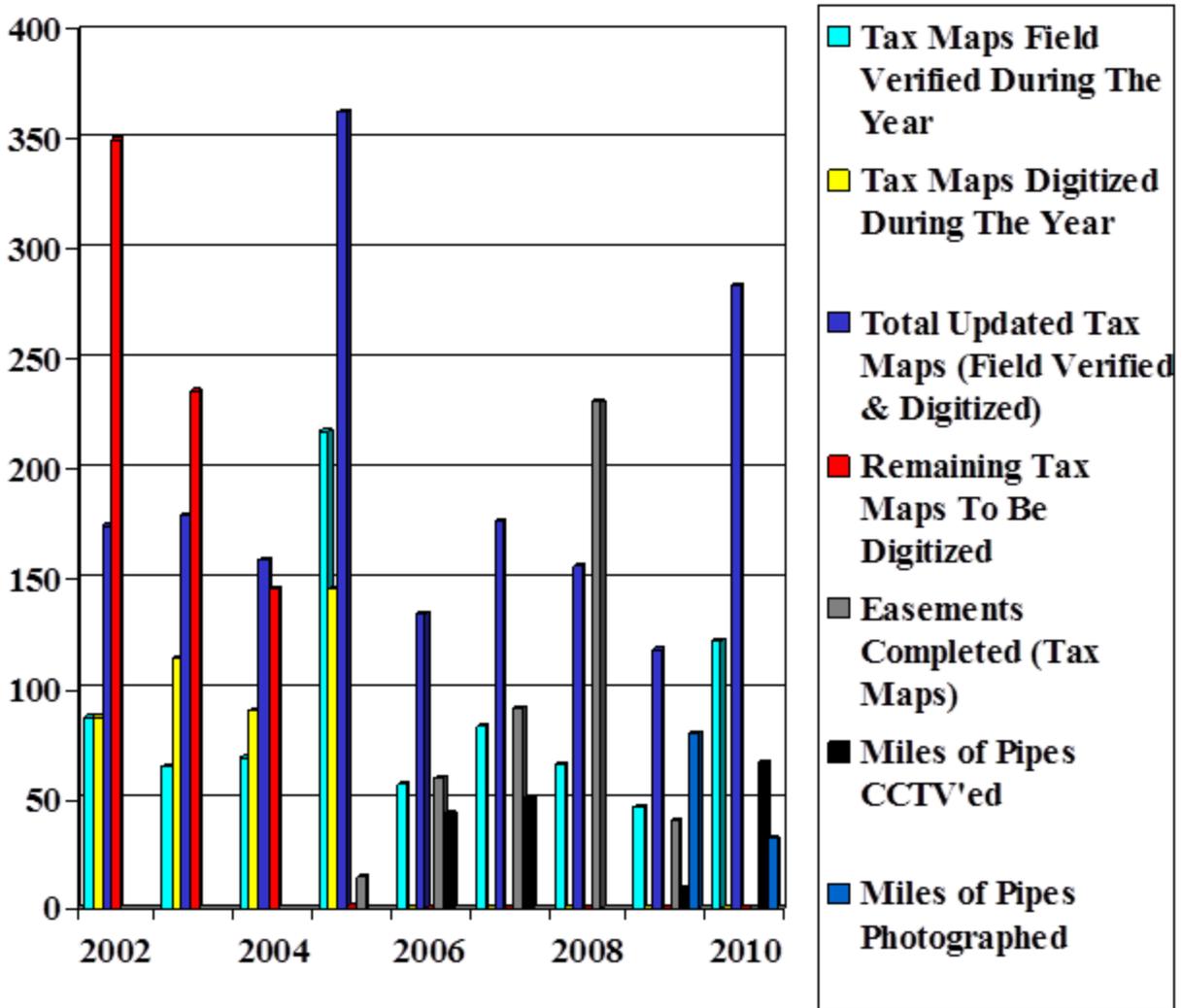


Figure 3-2 Infrastructure management schedule.

During 2010, MSMD continued implementation of its infrastructure inspection and rehabilitation program. Staff inspected 1,100 pipe segments and 9,500 storm structures with video and photo documentation. Under the rehabilitation program, more than 66 miles of pipe were videoed by contractors along with almost 70,000 photos taken by staff, documenting the existing structural

and service conditions of the interior of the storm system. These efforts represent 98 miles, or 6.5 percent of the storm drainage network being photographed or screened for obvious deficiencies. The inventory continues to be assessed for ongoing repair of identified deficiencies. In addition, more than 2,300 feet of more than 1,500 miles of storm pipe in the county’s inventory were rehabilitated or repaired through replacement or by lining entire pipe segments using cured-in place pipe lining methods (Table 3-2).



Figure 3-3 Wolftrap Oaks infrastructure replacement project. Photo by Fairfax Co.

Table 3-2 2010 infrastructure repairs and channel clearing projects.

<i>Project Location</i>	<i>Project Description</i>
Belgravia Court	Used the slip-lining method to rehabilitate the principal spillway pipe, while extending the life expectancy of the spillway pipe by 40 years; installed an endwall and trash rack to improve the functionality of the dam
Dawn Drive	Removed and replaced 272’ of storm pipe, installed three new drainage structures and realigned the pipes to within the limits of the established storm drainage easement
Multiple Locations	Completed approximately 1,700’ of stormwater conveyance system rehabilitation and lining projects; used trenchless technology so that no disturbance of yards or removal of trees was necessary
Peabody Drive	Replaced 200’ of deteriorated corrugated metal pipe, repaired curb inlet, and constructed new endwall in order to prevent flooding of adjacent dwelling due to complete pipe failure or collapse

Table 3-2 2010 infrastructure repairs and channel clearing projects.

<i>Project Location</i>	<i>Project Description</i>
Wolftrap Oaks	Installed 285' of concrete and earth channel, including the relocation of fences and revegetation of disturbed areas

Roadways

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

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 concerns. The county sweeps material from each treated parking area once annually during the spring.

The county’s parking lot sweeping program is currently carried out by three organizations: Department of Public Works and Environmental Services, Department of Housing and Community Development (DHCD), and the Park Authority. DPWES sweeps parking lots at county government and public schools sites as well as paved county road segments, where feasible. DHCD sweeps parking lots on residential developments such as apartment complexes, townhouse developments, group homes and senior facilities that are owned and operated by DHCD. FCPA maintains essential use parking areas at staffed park locations and commuter parking lots. In 2010, more than 1,570 cubic yards of material was removed from 317 county government and public schools sites, 41 residential sites, essential use areas at parks and county-maintained road segments through sweeper trucks and hand sweeping.

Pesticide, Herbicide and Fertilizer Application Program

County agencies involved in the administration of public rights-of-way, parks and other municipal properties currently 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 guidelines, the Virginia Department of Agriculture’s guidelines, and the Virginia Pesticide Control Act, 2006. In addition, many agencies are also collecting information on the application rates and total annual usage of pesticides, herbicides and fertilizers (PHF).

In 2010, county agencies that have property ownership and maintenance responsibilities met to discuss the PHF program. Attendees reviewed the record keeping sections of the draft Nutrient Management Plan (dated October 15, 2007) and the Site Specific Nutrient Management Plan Content document (dated October 17, 2007). It was decided that the Site Specific Nutrient Management Plan Content sheet should be updated and could be adapted to develop a template for certifiable nutrient management plans. Attendees also reviewed the draft Integrated Pest Management Plan (IPM) and discussed how the Park Authority’s Early Detection – Rapid Response invasive plant program, the gypsy moth spraying program and other types of pest

management involving the use of chemicals around county buildings (such as termite and mosquito control) would be covered by the site specific plans. It was decided to undertake plan updates in 2011. 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 improvements and provide additional wildlife habitat. Mowing was discontinued on 15 acres in Vienna and McLean areas of the county.

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.

In 2010, a Virginia state-certified nutrient management planner in the Northern Virginia Soil and Water Conservation District (NVSWCD) prepared nutrient management plans covering 66.6 acres in the county. These included 31.1 “new acres” which were not previously part of any current or expired plan and 35.5 “revised acres” which were already under plans that had been recently rewritten because the previous ones had expired or were about to expire. All of the plans were for horse operations, except for 8.5 acres in hay production and 21.0 acres belonging to the George Washington historic farming operation at Mount Vernon Estates and Gardens.

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 2010, 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 2010, VCE trained 493 commercial pesticide applicators for re-certification in Northern Virginia. The trainees provided the following feedback about the experience:

- 99 percent of surveyed respondents stated that they felt the information learned could save them from possible legal action and monetary fines
- 90 percent gained new knowledge allowing them to make safe and informed decisions about pesticide use
- 78 percent have gained new knowledge to identify and control ticks and mosquitoes

In addition, the federal and state pesticide laws and regulations require pesticide applicators to dispose of pesticides properly. The disposal of canceled, banned or unwanted agricultural and commercial pesticides poses a significant challenge to agricultural producers and other pesticide users due to its high cost. The proper disposal of waste pesticides eliminates a potential threat to human health and the environment.

Virginia's Pesticide Disposal Program is a cooperative effort between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Pesticide Control Board, with participation from VCE and the Division of Consolidated Laboratory Services. The program assists agricultural producers, licensed pesticide dealers and pest control firms, golf courses and homeowners with the proper disposal of unwanted pesticides. The program is available at no cost to eligible participants. The Pesticide Disposal Program requires participants to transport their unwanted agricultural and commercial pesticides to a central collection site where the hazardous waste disposal contractor will package the pesticides for eventual disposal. If a participant cannot safely package the unwanted pesticides for transport, the disposal contractor will make arrangements to containerize the pesticides for transport.

In 2010, Fairfax County was the host for certified applicators and pesticide businesses in Fairfax and Arlington Counties and the Cities of Falls Church, Alexandria, and Fairfax. The VCE Agent and the VDACS pesticide investigator worked together to advertise the disposal program. VCE developed a flyer for both locations in Northern Virginia (Fairfax and Prince William/Loudoun) and organized and facilitated the collection location and VDACS organized the disposal contractor. A total of 13,494 pounds of unwanted, unused or mislabeled pesticides were collected at the Fairfax site. Statewide more than 70,000 pounds were collected. According to VDACS, the Fairfax site had the largest number of participants and most diversity of pesticides collected.

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(ATLL) continues to accept ash from the Energy from Waste (EFW) Facility located at the I-95 Complex, a similar energy-from-waste facility located 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 three acres of rain cap have been 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 two acres are provided with intermediate cover, which is a temporary cover generally consisting of stabilized soil.

Phases I and II of the ATLL are not currently accepting ash. Surfaces of these areas are either formally closed with an engineered cover to regulatory specifications, contain intermediate cover which can be removed for future use, or are covered with asphalt or milled asphalt. Stormwater is managed through a network of berms, ditches, gabion down chutes and sediment basins.

Stormwater associated with the I-66 transfer station, closed landfill Recycling and Disposal Center (RDC), and truck parking area are completely collected and retained in three sediment basins prior to discharge into local waterways.

Training in pollution prevention is provided once per year for facility staff. Pollution Prevention Plans are maintained at each facility and are updated when conditions change. 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.

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 maintains and tracks firefighter training/certification under OSHA 29 CFR 1910.120 (q) and NFPA 472. The department's Fire and Hazardous Materials Investigative Services (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 storm drainage system. 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 2010, FHIS received 390 complaints. Approximately 315 of the complaints involved the actual release of various petroleum or chemical substances. Of the 315 releases, 221 involved the release of either diesel fuel (23), home heating fuel oil (53), gasoline (42), motor oil (31), or hydraulic oil (72). Other releases investigated involved antifreeze, paint, sewage, wastewater discharges, water treatment chemicals and mercury. Storm drains were involved in 45 of the releases. In one instance, while inspecting a section of the county's stormwater infrastructure with a closed circuit TV system (CCTV), MSMD found that motor oil had been dumped into a curb inlet. The pipe was flushed and the oil was absorbed downstream using spill kits provided by FRD

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

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 drains. FHIS then monitors the discharge for the duration of the agreement. In 2010, the Hazardous Materials Technical Support Branch of FHIS started the year with 52 oversight files. During the year, 75 new oversight files were opened and 55 were closed. Most of these oversight files involve contaminated underground storage tank sites. Fifty-six oversight files will be carried into 2011.

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

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 and Capital Facilities business areas of DPWES.

The Sanitary Sewer Infiltration Abatement Program conducts wastewater flow measurements and analysis to identify areas of the wastewater collection system with excessive inflow/infiltration problems, 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 2010, 213 miles of old sewer lines and seven miles of new sewer lines were inspected, resulting in the identification of sanitary sewer lines and manholes needing repair and rehabilitation. In 2010, 21.8 miles of sanitary sewer lines were rehabilitated, bringing the total length of sewer lines repaired over the past ten years to 208.64 miles (1,101,599 feet).

The Sanitary Sewer Extension and Improvement Program addresses pollution abatement and public health considerations and provides sanitary sewer services to areas identified by the Department of Health as having non-repairable or malfunctioning septic systems. In 2010, one Extension and Improvement project was completed consisting of 912 linear feet of eight inch sanitary sewer and sanitary sewer connections to five existing homes.

Construction Site Erosion and Sediment Control

Through its plan review process, DPWES staff enforces the Public Facilities 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 2010, a total of 655 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 36 site plans.

Fairfax County's Alternative Inspection Program, established in cooperation with DCR, resulted in 27,589 E&S inspections in 2010 on all sites under construction. This number represents 59 percent of the 46,912 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 percent of total site inspections. The county's E&S program is fully approved by DCR.

Residents may report complaints about erosion and sedimentation to the county by phone or through email. Residents can visit the following web page to find contacts for specific land development issues: (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 and site superintendents 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 small and large single family residential building, small and large commercial building, linear project and infill lot. One project was given an award for having the *Best Protected Environmentally Sensitive Site*. These awards are valued by recipients in the construction industry and are an incentive to do excellent work. In 2010, 13 sites were nominated and six received awards. Awards were also given to two Fairfax County site inspectors. The 2010 Land Conservation Awards program was held on January 21, 2011.



Figure 3-4 Judges inspecting construction project for the Land Conservation Awards program. Photo by NVSWCD.

Trail Improvements to Address Erosion Issues

Upgrades to the Cross County Trail (CCT)

During 2010, three new fiberglass bridges were installed on the CCT. One, on a tributary to Difficult Run near Brittenford Drive, lets trail users avoid having to climb up and down the stream banks. The second spans a gully in Oak Marr Park, and the third replaces a culvert that was

continually washing out in Wakefield Park. These improvements allow people to use the trail under more adverse weather conditions with less environmental impact.

Over 2,000 linear feet of natural surface trail in the vicinity of Georgetown Pike was reinforced with stone to make the surface more sustainable. The stone was integrated with the native soil to stabilize it. This reinforced trail section will withstand bicycle and equestrian use under adverse conditions, significantly reduce erosion and prevent the need for future trail re-routes.

In 2009, approximately 900 linear feet of severely degraded eroding trail south of the Fairfax County Parkway in Pohick Stream Valley Park was rerouted and reconstructed. This project included 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. This project received two Fairfax County Land Conservation Awards for tree preservation and planting in December 2010.

Lake Fairfax Park Natural Surface Trail Improvements

As part of Phase 1 of the Lake Fairfax Sustainable Natural Surface Trails project, approximately 1,200 linear feet of eroding, unsustainable trail was closed and more than two miles of new, sustainable trail was constructed. Two new fiberglass bridges were installed to reduce and improve the number of stream crossings and improve the user experience. The work was accomplished with a combination of professional and volunteer labor and a maintenance agreement was put in place with the local chapter of Mid-Atlantic Off-Road Enthusiasts (MORE), a mountain biking organization, with the idea that engaging the users would educate them about the need for stewardship in the park.

Kings Park Trail Improvements

Approximately 300 linear feet of existing degraded asphalt and gravel trail was repaved to provide a better surface for users and to prevent erosion into Long Branch, a tributary of Accotink Creek. The work included replacement of a non-functioning culvert.

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 known as Resource Protection Areas (RPAs). In 2010, NVSWCD developed soil and water quality conservation plans for 40 parcels on 489 acres, which included 29,654 linear feet of RPAs. The RPA's included 5,000 linear feet of new vegetated buffers and 24,654 linear feet of re-planned buffers. Three of the plans were required for the renewal of Agricultural and Forestal Districts in the county.

NVSWCD provided technical assistance to the county's Code Enforcement Division and three landowners by preparing plans for properties cited for county code violations. They included: a

remediation plan for tree removal and clearcutting beyond the limits of a soil and water quality conservation plan; an erosion and sediment control plan, followed by a soil and water quality conservation plan, for a horse operation that imported fill without a rough grading plan; and a restoration plan to correct illegal activities and improper use of an RPA.

In 2010, 55 participants attended two horse management seminars that were sponsored by NVSWCD. The seminars covered pasture planning and horse waste management. NVSWCD also created and published *Earth Friendly Suburban Horse Farming*, which contains detailed information about site planning, pasture management, non-vegetated heavy use areas, and animal waste management. This guide is distributed to the horse-keeping community directly, at events and on-line.



Figure 3-5 An example of a horse farm that practices controlled grazing duration and number of horses per field. Photo by NVSWCD.

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 2010, VDOF completed two 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.

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 2010, four rainfall events were monitored at each of the two water quality monitoring sites in Fairfax County. The June 10, 2010 storm at Vienna (VNA) was unsuccessful as the pickup hose was damaged during the storm. Rainfall, flow and water quality data were collected during each of the rainfall events. Samples were tested for concentrations of nine constituents of concern. Table 4-1 contains the median, high and low concentration of each of the nine constituents over the six years from 2005 to 2010.

In addition, 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. This year, for the first time, the analyses found significant statistical differences for concentrations of all of the nine constituents measured at the two sites (Table 4-1).

Seasonal and annual unit-area constituent loadings for 2010 were also established (Table 4-2).

Table 4-1 Results of statistical analysis to determine if there is a significant difference between observed constituent concentrations at Stations VNA and OQN for 2005 to 2010.

Constituent*	Station VNA			Station OQN			Differences Statistically Significant?***
	Median	High	Low	Median	High	Low	
NH ₃ -N	0.18	0.73	0.00	0.01	0.27	0.00	YES
COD	64	292	22	27	122	0	YES
<i>E. coli</i>	874	200000	0	631	38000	27	YES
Fecal Strep	5350	129000	100	1089	51000	18	YES
NO ₃ +NO ₂ -N	0.78	1.64	0.16	0.44	0.73	0.10	YES
TDS	137	836	51	98	160	71	YES

Table 4-1 Results of statistical analysis to determine if there is a significant difference between observed constituent concentrations at Stations VNA and OQN for 2005 to 2010.

TKN	1.77	11.30	0.48	0.57	2.41	0.00	YES
TP	0.33	1.61	0.06	0.06	0.80	0.00	YES
TSS	52.75	1207.00	4.90	17.00	485.00	1.40	YES

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

* *Based on a Mann-Whitney 2-sample test at a 0.1 significance level.

Table 4-2 Computed seasonal and annual unit area constituent loadings at monitored locations for 2010.

Constituent	Unit-area loading *									
	Winter		Spring		Summer		Fall		Annual	
	VNA	OQN	VNA	OQN	VNA	OQN	VNA	OQN	VNA	OQN
NH ₃ -N	0.211	0.003	0.084	0.021	0.189	0.020	0.052	0.005	0.536	0.050
COD	56.138	6.168	29.039	12.288	50.583	8.528	53.393	7.153	198.2	34.1
<i>E. Coli</i>	0.564	0.427	6.143	22.507	118.99	14.932	18.763	11.054	144.46	48.921
Fecal Strep	0.914	1.888	21.526	19.480	89.390	43.699	58.062	10.761	169.891	75.828
NO ₃ +NO ₂ -N	0.577	0.120	0.331	0.094	0.707	0.180	0.250	0.070	1.865	0.464
TDS	148.17	31.754	60.546	20.866	79.926	45.777	56.923	19.199	345.6	117.6
TKN	1.314	0.116	1.435	0.285	1.583	0.333	0.553	0.109	4.885	0.843
TP	0.197	0.009	0.101	0.076	0.313	0.040	0.255	0.032	0.867	0.157
TSS	81.435	2.832	37.882	46.272	95.604	23.463	80.690	16.687	295.6	89.3

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

Dry Weather Monitoring

In 2010, the county selected 117 MS4 outfalls for dry weather screening in accordance with the general protocol outlined in the Fairfax County Dry Weather Screening Program: Site Selection and Screening Plan (July 2007). Physical parameters were recorded at each outfall. Water was found to be flowing at 31 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, nine 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 drain pipes until the source was found or there was no flowing water.

The source of the flow for one of the track downs could not be found, although it was most likely the same source as an adjacent outfall that exceeded the same criteria. Six of the track downs were solely for high fluoride levels, while two of the remaining track downs were high for fluoride as well as other analytes. The county purchased a new fluoride testing device this year which detects fluoride at a wider range than the photometer used in 2009. The fluoride limit was set at 0.2



Figure 4-1 Illicit discharge found during dry weather screening. Photo by Fairfax County.

mg/l this year, as suggested by Brown et. al (2004), instead of the 0.6mg/l used in 2009. This may explain why there were so many fluoride track downs this year as compared to 2009. It was suspected that five of the fluoride track downs were water line leaks, therefore we contacted Fairfax Water to help us determine the exact source of the leaks. Staff is coordinating with Fairfax Water to resolve these issues.

SWPD staff also worked closely with DEQ in 2010 to resolve one illicit connection from a dry cleaning operation, one contaminated discharge resulting from a car washing operation at an auto body shop and one illicit connection from an office building in Springfield.

During dry weather screening, staff noticed some businesses in the county that appeared to be washing cars and draining the dirty water directly to the storm drain system. Staff is developing outreach materials to target businesses that wash cars on how to properly discharge dirty wash water.

In addition, an illicit discharge was found while the county was CCTVing its stormwater infrastructure. Dye was used in the sewer drains on the first floor of the suspected building, which confirmed that four hand sinks, one kitchen sink and three water closets were connected to an eight inch green pipe which was connected to the county's stormwater system. The Health Department issued a violation to the building owner and the water to the suite was turned off. The sanitary sewer plumbing was corrected and inspected by the county.

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. Monitoring data from the Kingstowne station was used primarily to determine the sufficiency of erosion and sediment controls for achieving an 80 percent sediment trapping efficiency downstream of the

Kingstowne development site. From July 2009 through June 2010, only three storm event samples were collected at the Kingstowne station. Sampling was hindered by equipment problems and some adverse sampling conditions. There was no active construction at the Kingstowne development site during this time period, so sediment trapping efficiencies could not be calculated for the three individual storm events. However, the available Kingstowne data suggest that erosion and sediment controls are minimizing sediment loads to Dogue Creek to the required levels over the long term. The estimated long-term average sediment removal efficiency is 82.9 percent. The South Van Dorn monitoring station was established to support an evaluation of the effectiveness of the Dogue Creek Watershed Stormwater Control Plan in removing phosphorus from stormwater discharges. From July 2009 through June 2010, 15 storm event samples were collected at the South Van Dorn station using automated samplers. The mean annual total phosphorus concentration measured at South Van Dorn during storm events was 0.197 mg/L, which corresponds to a phosphorus removal efficiency of 34.2 percent, short of the long-term 50 percent phosphorus load reduction target.

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.

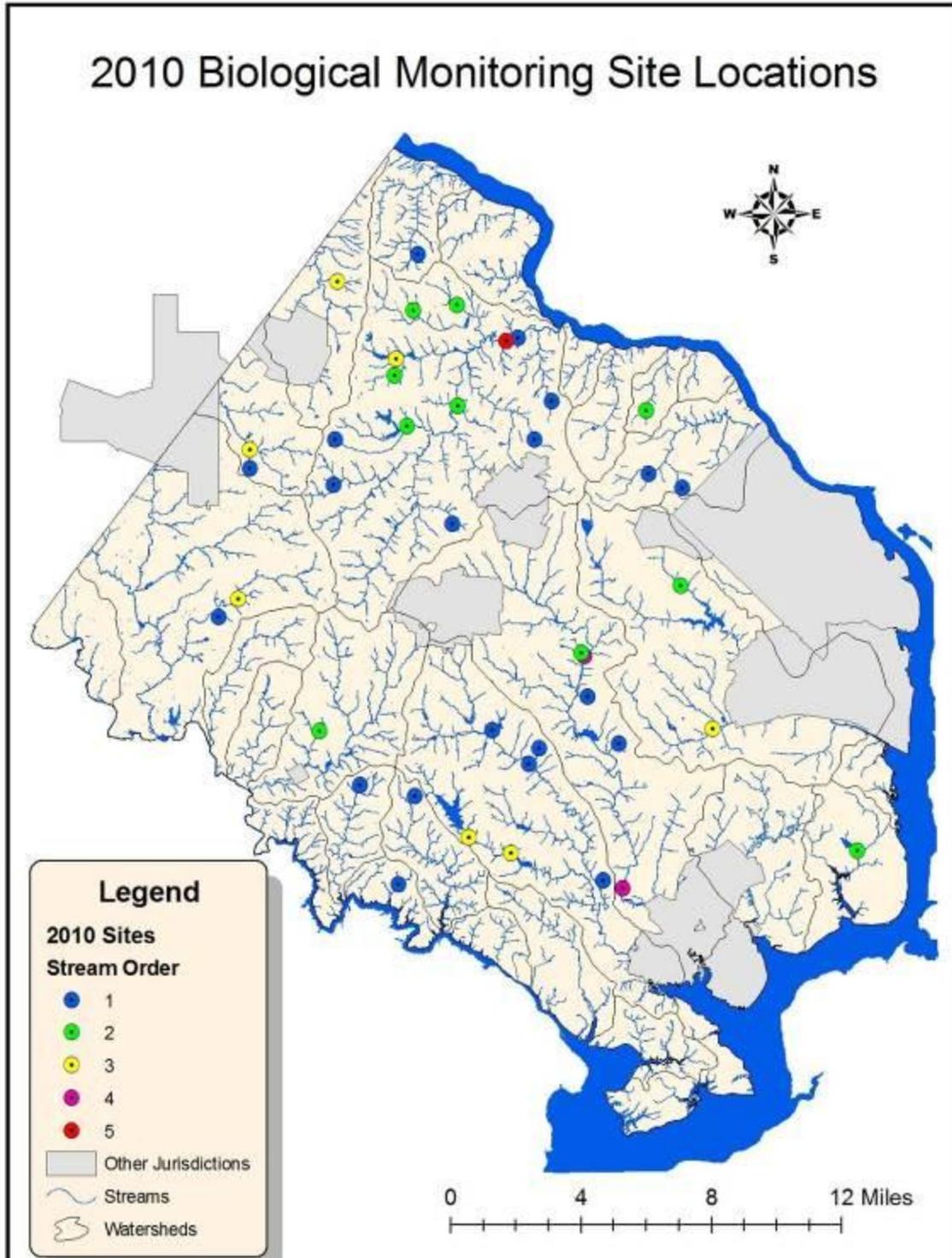


Figure 4-2 Location of 2010 biological monitoring sites.



Figure 4-3 Fish sampling in Prince William Forest Park.
Photo by Fairfax County.

Countywide biological monitoring is conducted annually using a probabilistic design approach. Using this approach, statistically valid inferences may be made about the condition of the county's streams. Each year, all potential sampling sites are stratified by stream order (first through fifth order) and 40 sites are selected randomly for monitoring. At these sites, samples are collected for both benthic macroinvertebrates and fish (once annually) and for *E. coli* bacteria concentration (four times annually). Water quality and stream habitat characteristics are evaluated. As more data are collected and compiled,

meaningful trends can be inferred with greater confidence. The previous year's annual stream reports are available online at www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm and in the biological monitoring program's standard operating procedures manual. Figure 4-2 shows the locations of the 2010 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 4-4 shows the results of the countywide distribution of macroinvertebrate and fish IBI scores, respectively.

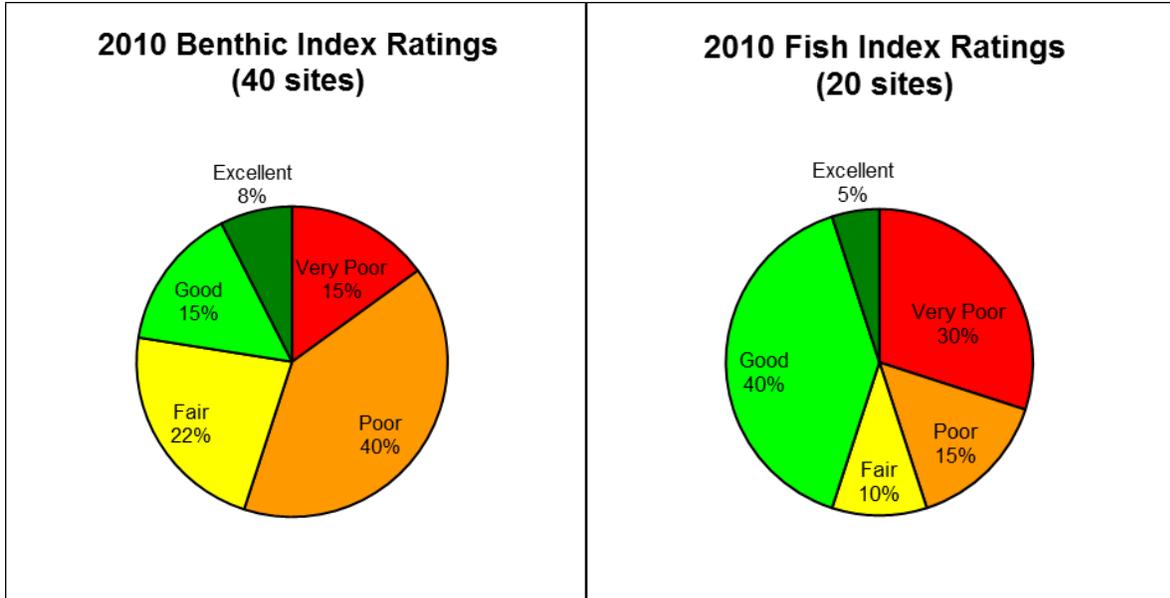


Figure 4-4 Countywide distribution of benthic macroinvertebrate and fish IBI ratings.

Table 4-3 shows a breakdown (stratified by stream order) of the 2010 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 2010 benthic macroinvertebrate sampling results by stream order.

Stream Order	Number of Samples	Minimum Score	Maximum Score	Standard Deviation	Mean IBI Score	Rating
1	20	9.7	95.5	26.7	39.9	Poor
2	10	23.4	75.2	20.7	43.8	Fair
3	7	15.7	66.0	16.9	40.5	Fair
4 & 5	3	23.2	63.4	21.1	47.0	Fair
ALL	40	9.7	95.5	21.6	40.9	Fair

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

Table 4-4 2010 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
AC1001	Accotink Creek	Piedmont	2	13151.9	20.55	43.4	Fair	7.1	Very Poor
AC1002	Accotink Creek	Piedmont	4	331.0	0.52	23.2	Poor	71.4	Good
AC1003	Accotink Creek	Piedmont	1	21.7	0.03	20.4	Poor	N/A	
AC1004	Accotink Creek	Piedmont	1	176.5	0.28	17.2	Very Poor	N/A	
AC1005	Accotink Creek	Coastal Plain	4	25145.0	39.29	54.3	Fair	57.1	Good
CA1001	Cameron Run	Piedmont	2	2807.2	4.39	25.3	Poor	0.0	Very Poor
CA1002	Cameron Run	Piedmont	3	3848.7	6.01	24.6	Poor	21.4	Poor
CU1001	Cub Run	Triassic Basin	3	3053.0	4.77	39.7	Poor	64.3	Good
CU1002	Cub Run	Triassic Basin	1	32.6	0.05	10.7	Very Poor	N/A	
DE1001	Dead Run	Piedmont	2	423.1	0.66	23.4	Poor	14.3	Very Poor
DF1001	Difficult Run	Piedmont	1	87.3	0.14	35.1	Poor	N/A	
DF1002	Difficult Run	Piedmont	2	836.0	1.31	67.5	Good	14.3	Very Poor
DF1003	Difficult Run	Piedmont	2	269.0	0.42	25.3	Poor	N/A	
DF1004	Difficult Run	Piedmont	1	104.5	0.16	10.6	Very Poor	N/A	
DF1005	Difficult Run	Piedmont	1	445.2	0.70	50.3	Fair	28.6	Poor
DF1006	Difficult Run	Piedmont	1	59.3	0.09	12.8	Very Poor	N/A	
DF1007	Difficult Run	Piedmont	2	393.9	0.62	37.5	Poor	50.0	Fair
DF1008	Difficult Run	Piedmont	3	990.2	1.55	53.6	Fair	21.4	Poor
DF1009	Difficult Run	Piedmont	2	772.1	1.21	72.1	Good	71.4	Good
DF1010	Difficult Run	Piedmont	1	87.5	0.14	96	Excellent	N/A	
DF1011	Difficult Run	Piedmont	1	90.3	0.14	22.7	Poor	N/A	
DF1012	Difficult Run	Piedmont	2	1532.1	2.39	43.0	Fair	92.8	Excellent
DF1013	Difficult Run	Piedmont	5	34042.3	53.19	63.4	Good	64.3	Good
HC1001	Horsepen Creek	Triassic Basin	1	144.3	0.23	22.3	Poor	N/A	
HC1002	Horsepen Creek	Triassic Basin	3	2450.6	3.83	15.7	Very Poor	14.3	Very Poor
LH1001	Little Hunting Creek	Coastal Plain	2	1265.6	1.98	24.9	Poor	42.9	Fair
NI1001	Nichol Run	Piedmont	1	76.9	0.12	50	Fair	N/A	
PC1001	Pohick Creek	Piedmont	1	19.5	0.03	51.8	Fair	N/A	
PC1002	Pohick Creek	Piedmont	1	91.9	0.14	39.1	Poor	N/A	
PC1003	Pohick Creek	Piedmont	1	87.9	0.14	48.9	Fair	N/A	
PC1004	Pohick Creek	Piedmont	3	2357.6	3.68	66.0	Good	57.1	Good
PC1005	Pohick Creek	Piedmont	3	3241.4	5.06	45.2	Fair	57.1	Good
PC1006	Pohick Creek	Piedmont	1	125.0	0.20	27.8	Poor	N/A	
PH1001	Popes Head Creek	Piedmont	2	312.5	0.49	75.2	Good	64.3	Good
PM1001	Pimmit Run	Piedmont	1	86.1	0.13	9.7	Very Poor	N/A	
PM1002	Pimmit Run	Piedmont	1	586.8	0.92	36	Poor	14.3	Very Poor
RD1001	Ryans Dam	Piedmont	1	168.6	0.26	90.6	Excellent	N/A	
SA1001	Sandy Run	Piedmont	1	38.3	0.06	63.9	Good	N/A	
SU1001	Sugarland Run	Triassic Basin	3	418.7	0.65	38.7	Poor	50.0	Fair
WR1001	Wolf Run	Piedmont	1	583	0.08	83.0	Excellent	N/A	

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

The Benthic IBI scores show that 54 percent of the sites evaluated exhibited “poor” to “very poor” biological conditions while the fish IBI showed that 45 percent were scored “poor” to “very poor.” This is an increase 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). Over the past seven years, a small increase in the benthic IBI scores has emerged. As future sampling results are added, a trend in biological integrity should begin to emerge. The countywide stream quality index, described in the following sub-section, is a way of tracking and evaluating these conditions over time.

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
2010	15	40	22	15	8	2.63

Figure 4-5 and Table 4-5 shows the SQI for all years probabilistic monitoring has been employed. The 2010 SQI shows an increase in overall stream quality from 2009. This index will be reported annually to evaluate long-term trends in the overall health of streams. Over the past seven years of sampling, a very small increase in the SQI has emerged. As more data are reported annually, emerging trends can be identified with greater certainty.

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.

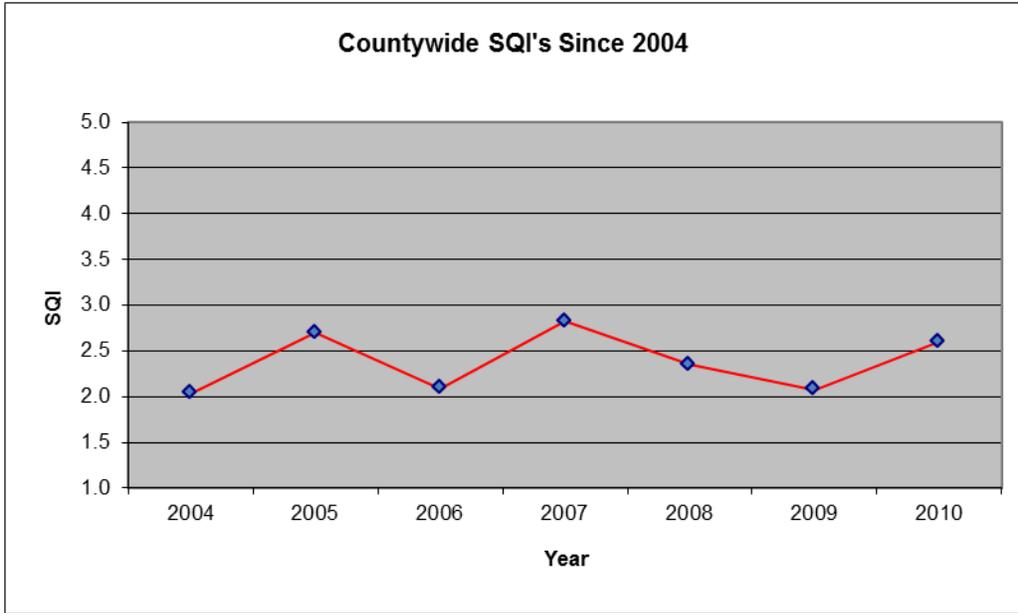


Figure 4-5 Trends in the countywide Stream Quality Index.

Table 4-6 presents a summary of biological monitoring data collected countywide since 2004. Results are presented by watershed to give a general indication of stream conditions within each watershed. Due to the random site selection methodology employed, some watersheds have not been sampled for benthic macroinvertebrates and/or fish. For general conditions of these particular watersheds, see the 2001 Stream Protection Strategy (SPS) Baseline Study at www.fairfaxcounty.gov/dpwes/environmental/sps_main.htm. The data reported in the SPS study were collected in 1999 and watershed conditions may have changed significantly since that time. Additionally, section four of the 2006 annual stream report has detailed watershed condition maps showing the results of county and resident volunteer monitoring data from 1999 through 2005 and can be found at <http://www.fairfaxcounty.gov/dpwes/stormwater/reports.htm>.

Table 4-6 Overall watershed conditions for sampling years 2004-2010 combined.

Overall Watershed Conditions (2004-2010)

Watershed	Benthics			Fish		
	Number of Sites	Average IBI	Rating	Number of Sites	Average IBI	Rating
Accotink Creek	22	26.9	Poor	15	35.7	Poor
Belle Haven	4	23.4	Poor	1	21.4	Poor
Bull Neck Run	N/A					
Bull Run	2	38.2	Poor	N/A		
Cameron Run	19	26.6	Poor	10	15	Very Poor
Cub Run	16	33	Poor	14	41.8	Fair
Dead Run	4	22.2	Poor	1	14.3	Very Poor
Difficult Run	62	39	Poor	32	49.1	Fair
Dogue Creek	4	32.3	Poor	3	42.9	Fair
Four Mile Run	N/A					
High Point	N/A					
Horsepen Creek	5	24.6	Poor	1	14.3	Very Poor
Johnny Moore Creek	3	41.7	Fair	1	64.3	Good
Kane Creek	2	59	Fair	N/A		
Little Hunting Creek	6	22.7	Poor	5	18.6	Poor
Little Rocky Run	8	19.8	Very Poor	4	60.7	Good
Mill Branch	6	41.1	Fair	2	17.9	Very Poor
Nichol Run	9	60.6	Good	1	57.1	Good
Occoquan	4	87.9	Excellent	N/A		
Old Mill Branch	1	75.5	Good	N/A		
Pimmit Run	8	16.8	Very Poor	4	5.4	Very Poor
Pohick Creek	37	30.2	Poor	17	53.4	Fair
Pond Branch	5	58.1	Fair	2	50	Fair
Popes Head Creek	15	55.3	Fair	9	65.1	Good
Ryans Dam	1	90.6	Excellent	N/A		
Sandy Run	9	60.6	Good	1	64.3	Good
Scotts Run	2	19.3	Very Poor	1	7.1	Very Poor
Sugarland Run	6	43.6	Fair	3	47.6	Fair
Turkey Run	1	17.1	Very Poor	N/A		
Wolf Run	7	78.1	Good	2	42.9	Fair
Fairfax County	268	38	Poor	129	42.1	Fair



Figure 4-6 Staff sampling water for bacteria. Photo by Fairfax County.

Bacteria Monitoring

In 2010, 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 2010, SWPD completed its seventh year collecting data for the bacteria monitoring program since acquiring the program from the Fairfax County Health Department.

To determine levels of *E. coli* in county streams, grab samples of stream water were taken at 40 sites in 15 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 third quarter of 2010 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 2010, 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

Water Chemistry Results	
Temperature (°C)	
Minimum.....	0.25
Maximum.....	26.1
Average	10.1
Dissolved Oxygen (mg/L)	
Minimum.....	2.5
Maximum.....	138.8
Average	15.8
Specific Conductance (µs/cm)	
Minimum.....	83
Maximum.....	2323
Average	429.9
pH	
Minimum.....	5.1
Maximum.....	11.5
Average	7.4
Nitrate (mg/L)	
Minimum.....	<0.1
Maximum.....	4.9
Average	1.6
Total Phosphorous (mg/L)	
Minimum.....	<0.1
Maximum.....	<0.1
Average	<0.1

(MPN) of 2420. The remaining chemical parameters are recorded in the field using a handheld multi-probe water quality meter.

In 2010, 25 percent of Fairfax County’s bacteria monitoring locations were consistently below VDEQ’s standard of 235 units per 100 mL of water (Figure 4-7). Fairfax County concurs with officials from the VDEQ and the Virginia Department of Health, who caution that it is impossible to guarantee that any natural body of water is free of risk from disease-causing organisms or injury.

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.”

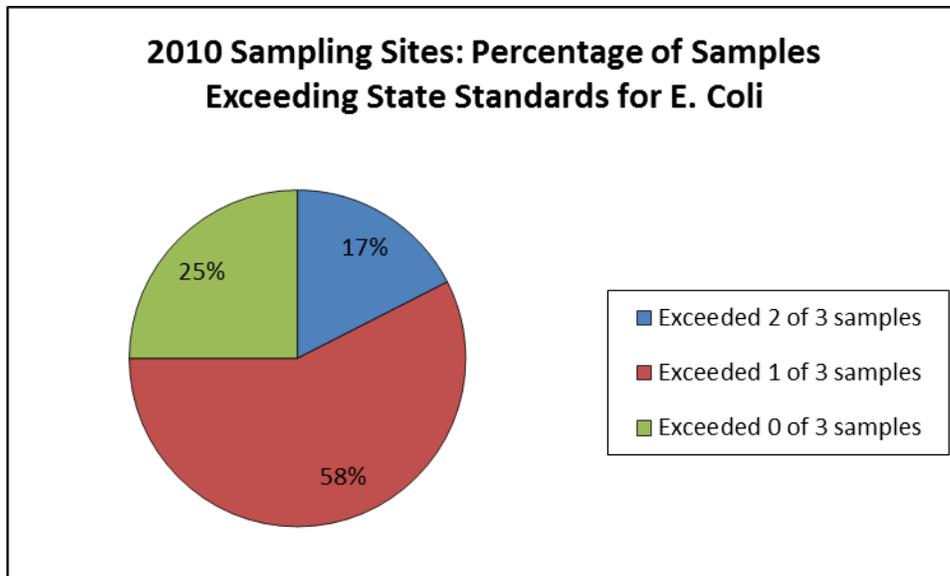


Figure 4-7 Percentage of sites exceeding Virginia’s instantaneous water quality standard for *E. coli*.

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 early 2011 the Virginia Department of Environmental Quality (VDEQ) released its summary of water quality conditions in Virginia from January 1, 2003, to December 31, 2008. This report is released on a bi-annual basis. 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 2010 Water Quality Assessment Integrated Report can be found at <http://www.deq.state.va.us/wqa/ir2010.html>. Please refer to this website for the most up to date listing of impaired waters in Virginia. Water bodies are often listed for multiple impairments based on elevated levels of pollutants, high levels of contaminants in fish or reduced numbers of aquatic organisms (macroinvertebrates and/or fish). 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.

Once a water body has been listed as impaired, a Total Maximum Daily Load (TMDL) report identifying the sources causing the water quality problem and the reductions needed to resolve it must be developed by the VDEQ and submitted to the U. S. Environmental Protection Agency for approval. Upon approval, state law requires the development of a TMDL implementation plan outlining both point and non-point source controls needed to restore water quality. These specific controls may be incorporated into any Virginia Pollutant Discharge Elimination System (VPDES) or Virginia Stormwater Management Program (VSMP) permits identified as contributing to the water quality impairment. These permits are issued by the commonwealth and are used to regulate the inputs of pollutants into receiving waters. The county holds a VPDES 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.

Accotink Creek has been identified as an impaired water body and the EPA is currently developing a benthic TMDL which proposes a significant reduction in in-stream flow in Accotink Creek. The Accotink Creek TMDL is scheduled for completion in early 2011. In December 2010, the EPA published the final TMDL for the Chesapeake Bay watershed, in which Fairfax County is the most populous local jurisdiction. This multi-state initiative set restrictions on nutrient and sediment pollution throughout a 64,000-square-mile watershed.

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.



Figure 4-8 Volunteers collecting data as part of the stream monitoring program. Photo by NVSWCD.

Additional information on the VDEQ water quality program and the draft 2010 Integrated Report is available at www.deq.virginia.gov/water/homepage.html.

Volunteer monitoring

Northern Virginia Soil and Water Conservation District (NVSWCD) continued its successful volunteer stream monitoring program in 2010. 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.

Approximately 65 volunteers collected data at 33 sites four times during 2010. In addition, 36 public stream monitoring workshops and field trips were held throughout the county and 250 county residents attended. At each workshop or field trip biological monitoring was performed and information was presented on stream ecology, stormwater runoff, urban hydrology and watersheds. The program builds awareness of watershed issues among the participants. A monthly *Watershed Calendar*, listing training and other events of interest, is emailed to 805 recipients.

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 participate in the monitoring program using the SOS protocol, and they submit data on Reston streams to NVSWCD. Currently, 11 sites are monitored by 18 volunteers.

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 park 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 (five-ten year) monitoring effort to describe countywide conditions and trends in water-quality (e.g. nutrients and sediment) and water-quantity. Ultimately, the information gathered will be used to evaluate the benefits of projects implemented under the watershed planning and stormwater management programs.

The monitoring network designed to fulfill the objectives of the study consists of four automated continuous water-resources monitoring stations (Figure 4-9) and ten less-intensely monitored sites. The four automated stations were constructed in 2007 and achieved full operational capability in 2008. Instruments at these stations collect streamflow data every five minutes 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 4-9 Autosampler shelter at Flatlick Branch. Photo by Fairfax County.

Data for this study is compiled based on the USGS ‘Water Year’, which for 2010 runs from October 1, 2009 through September 30, 2010.

Continuous Data Collection

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

Sample Collection

- Grab samples were collected monthly at all 14 monitoring stations, resulting in 204 samples collected and analyzed (including QA samples). Streamflow and water quality data were measured at the time of sampling and samples were analyzed for nutrients and suspended sediment concentration.
- Storm event samples were collected using automated samplers at the four intensive monitoring stations. These samples were collected in response to elevated turbidity and streamflow conditions during storms, resulting in the collection of 210 samples that were analyzed for the same suite of nutrients and suspended sediment concentration as the monthly grab samples.
- In addition to the samples collected by the automated samplers, 11 comparison samples were collected during stormflow events to evaluate the representativeness of the point sample collected by the autosampler, as compared to the entire cross-section of the stream.

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 2010, 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 planting
 - 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 the 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.onlyrain.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’s public education program raises awareness about stormwater issues facing the county, educates residents about watersheds and stormwater management, and offers opportunities for residents to become involved in efforts to restore and protect Fairfax County’s waterways. Educational presentations help residents to recognize connections between water quality problems in local streams and impacts on the Occoquan Reservoir, the Potomac River and the Chesapeake Bay. In 2010, the county presented this

Figure 5-1 Pledges made by children to help take care of the environment at Fall for Fairfax. Photo by Fairfax Co.

information to homeowner's associations, school groups (teachers and students), civic associations, Fairfax Master Naturalist trainees, Board of Supervisor's town hall meetings, resource fairs and various environmental events.

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 2010, Fairfax County participated as an exhibitor or environmental educator at approximately 20 events, including: Fall for Fairfax, Earth Day/Arbor Day, resource fairs and environmental fairs.

Northern Virginia Soil and Water Conservation District

In 2010, NVSWCD made presentations, provided displays, and sponsored events that included:

- Demonstrated the Enviroscape watershed model six times to 260 students in schools and scout programs.
- Gave 54 presentations to audiences in industry, government, youth and the general public, in which 2,236 people learned about rain gardens and other low impact development techniques, water conservation, best management practices for horse-keeping operations, soil concepts, art with soils, stream cleanups, water quality monitoring, award-winning erosion and sediment controls on construction sites, ecological concepts and nonpoint source pollution. Four of the workshops focused on the design and installation of rain gardens; two were attended by 89 industry professionals and two were attended by 122 residents.
- Provided displays and publications about environmental landscaping, stream restoration, volunteer monitoring, soils, storm drain marking, rain barrels and other environmental topics at 15 events; 1,325 publications were distributed.
- Sponsored six Saturday morning *Green Breakfasts* featuring presentations on: Stormwater Policy and Accomplishments-Looking back and looking forward; Wildlife Management in Fairfax County-Urban Wildlife, Behavior and Ecology, and our Environment; Forest Health and Forest Fire; Managing Growth-Where We Were-Where Are We Now-Where Are We Going-and How Important is this to Becoming Green?; Bringing Native Plants and Wildlife into the Managed Landscape; In the Year 2030....What Will Northern Virginia Look Like?

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 2010, SWMP:

- Gave approximately 13 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, Fall for Fairfax, 4-H fair held at Frying Pan Park and the Alice Ferguson Foundation's Trash-Free Potomac River Watershed Initiative.

- Gave 72 presentations about solid waste and recycling practices to students, community groups and business leaders. In addition, gave 22 presentations to students in the Fairfax County Public Schools regarding these practices.

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 on May 2, 2010 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, FCPA reached more than 53,000 people in 2010 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, rain barrel workshops and fishing programs. Three walks along Lake Anne were held in October to view Reston streams prior to restoration and a walk of Snakeden Branch and The Glade stream restoration was held in May. Two rain barrel workshops were held by Reston Association in May and June, 2010, where 60 barrels were made. An erosion workshop for clusters and condos occurred July 15 at Isaac Newton Square.

Reston Association also includes watershed education, stream and lake exploration and fishing and boating activities at its summer camp programs for children ages three to 16. Reston Association held eight summer camp programs for 1,262 campers between June 28 and August 20, 2010.

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. The Northern Virginia Stream Restoration Exhibit was at the Reston Museum in June describing why streams in Reston need restoration, how the streams are being restored, benefits of stream restoration and project progress. In addition, the exhibit featured two scale models representing an impaired urban stream and a restored urban stream.

Virginia Department of Forestry

Virginia Department of Forestry (VDOT) works regularly 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 63 such activities presented by VDOT in 2010.

Communication Initiatives

Printed Materials/Mailings

Fairfax County Stormwater Management

In 2010, the County distributed educational fact sheets on watersheds, volunteer opportunities, swimming pool water, stream health actions steps, picking up the dog waste, hurricane preparedness, humane removal of geese, the stormwater drainage system and clean streams. An educational flood protection was mailed to 20,000 county residents that live in or adjacent to county floodplains.

The county expanded on the Stormy the Raindrop character through the addition of a second activity book, “Stormy the Raindrop’s Watershed Journey,” depicting Stormy’s travels from Fairfax County to the Chesapeake Bay. The activity book was created with the help of the Fairfax County Public School system to ensure that it met the Standards for Learning at a 4th grade level. More than 1,800 copies of the “Adventures of Stormy the Raindrop” activity book and almost 1,500 copies of the “Stormy the Raindrop’s Watershed Journey” activity book were distributed at various libraries, district offices and events. Both activity books are available on Stormy the Raindrop’s website at: www.fairfaxcounty.gov/dpwes/stormwater/stormy/.



Figure 5-2 Stormy message appearing on dog waste bag dispensers.

In addition, the county provided 1,500 reusable bags with the Stormy the Raindrop image and “Preventing litter in streams one bag at a time” printed at the top of the bag to attendees of Fall for Fairfax. Almost 200 dog waste bag dispensers featuring Stormy were provided to the Fairfax County Animal Shelter for residents who adopted a dog from their facility (Fig. 5-2).

Stormwater management staff also provided 19 media interviews for print, television and radio news and feature stories. Topics included: stream restorations, picking up the dog waste, the snow storm of 2010, the Potomac watershed cleanup, mosquito control, watershed management plans, special flood hazard areas and the new digital flood insurance rate maps, water quality, how to flood proof a home, flooding in Fairfax County, the dam breach in Kingstowne and pollution in the Chesapeake Bay.

Health Department

The Health Department mailed 14,866 flow diversion valve reminder notices in 2010. 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 FY2010 6,241 non-compliance letters were mailed to owners of homes that have not pumped out their septic tank during the five year period required by County Code. If homeowners fail to

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

Northern Virginia Soil and Water Conservation District

In 2010, NVSWCD published three editions of Conservation Currents. Topics included Emerald Ash Borer, Celebrated Trees, Consequences of a Record Snowfall, News from the Chesapeake Bay, Stewardship Opportunities, Audubon Wildlife Habitat, Oil Spill & Conservation, Floodplains, Science Fair Awardees, Youth Conservation Camp, Rain Gardens at Home, Fall Color of Trees, Composter Workshop, and the 2011 Artistic Rain Barrel program. NVSWCD sent 2,500 print copies per issue, mainly to homeowner associations who are encouraged to reprint articles in their newsletters. Many articles are also posted on the NVSWCD website and there is a growing list of e-subscribers.

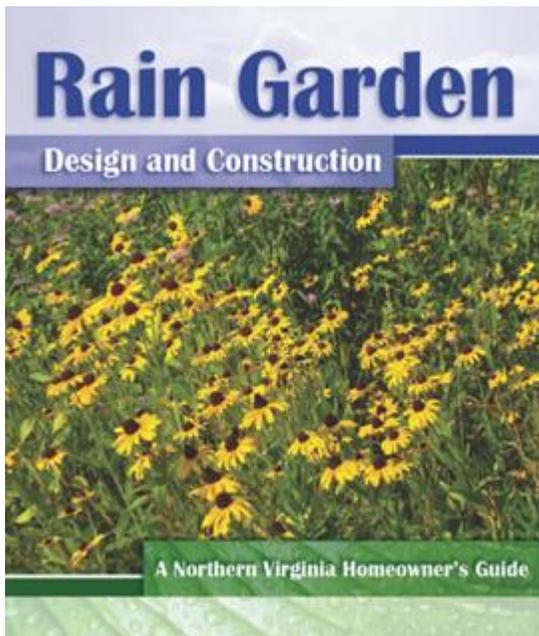


Figure 5-3 A homeowner's guide to constructing a rain garden on their property. Photo by NVSWCD.

NVSWCD, partnering with the Park Authority, continued to distribute copies of their manual *Rain Garden Design and Construction: A Northern Virginia Homeowner's Guide* (Fig. 5-3). It has all the instructions and calculations needed for a homeowner to build a rain garden on his or her own property. The manual is available in hard copy and electronic formats at www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf and by the end of September 2010 had been downloaded 36,000 times. NVSWCD also published a Residential LID Landscaping Guide for homeowners, which provides design and installation information for several low impact development practices appropriate for solving common drainage problems. It includes sources of supplies and plant materials and is available in hard copy and electronic formats. In addition, *Earth Friendly Suburban Horse Farming* was created and published in 2010, as mentioned in Chapter 3. In 2010, NVSWCD

distributed a total of 1,876 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 continued to publish an 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

Television

Fairfax County Stormwater Management

The county created educational television programs which include a “pick up the dog waste” public service announcement (PSA); an anti-litter PSA and a PSA entitled, “Stop Bagging our Streams” which encourages residents to use fabric rather than plastic shopping bags. These programs air on channel 16 and are posted to You Tube. Stormwater management staff also provided 19 media interviews for print, television and radio news and feature stories, as mentioned above.

Radio

Regional Stormwater Education Campaign

As a member of the Northern Virginia Clean Water Partners (Partners), Fairfax County participates in the annual regional stormwater education campaign. In 2010, Fairfax County continued to support the Northern Virginia Clean Water Partners regional stormwater education campaign. By pooling outreach funds with other jurisdictions to reach a wider audience, the campaign has used radio and internet advertising to reduce pollution-causing behaviors among Northern Virginia residents.

In 2010, the Partners selected a new radio public service advertisement entitled “*Dog Beep*”. The City of Los Angeles’ Department of Public Works produced “*Dog Beep*” and provided permission for the Partners to feature it in the DC area. The Partner will conduct a telephone survey following the radio campaign to measure effectiveness at increasing awareness and changing behaviors. In addition, the advertisement will feature an action-oriented tagline at the end to remind residents that storm drains flow to local streams, and includes the web site address for more information:

Remember, what goes down the storm drain flows to the Potomac River and Occoquan Reservoir, our sources of drinking water. So please pick up after your pet! Brought to you by the Northern Virginia Clean Water Partners, representing local governments, water and sewer authorities, and Northern Virginia Regional Commission.
www.onlyrain.org

Fairfax County Solid Waste Management

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

Digital Media

Regional Stormwater Education Campaign

During the 2010 campaign, the Partners focused on the issue of pet waste and created a web blog about dogs (<http://www.northern-virginia-dog-blog.com/>). The Dog Blog features interesting articles about dogs and weaves in a message about picking up pet waste into the articles a specific number of times per month. In September and October 2010, the Partners featured several contests on the blog to encourage viral marketing of the blog among residents of Northern Virginia. Through August 2010, the Dog Blog had 3,693 views. A trivia quiz was created and featured on the blog, and 328 people completed the trivia quiz. As of September 2010, 87 percent of approximately 120 visitors who completed the poll stated they always pick up after their dog.

The Only Rain web site (www.onlyrain.org) that was created in 2009 was enhanced for the 2010 campaign, with new information and links to the dog blog.

Stormwater Management

A new website and brochure were created to educate residents about proper discharge of swimming pool water (www.fairfaxcounty.gov/dpwes/stormwaer/pooldischarge.htm).

Northern Virginia Soil and Water Conservation District

The NVSWCD website is a source of information for residents to help them manage their land and protect water quality by controlling stormwater, preventing erosion and encouraging native vegetation and can be found at www.fairfaxcounty.gov/nvswcd. One of the resources, *You and Your Land-a Homeowner's Guide for the Potomac Watershed*, provides comprehensive information. In 2010, NVSWCD disseminated information on county environmental programs and events monthly via two email lists, the *Green Breakfast* groups (505 recipients) and the *Watershed Calendar* group (an average of 805 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. Dedicated a portion of its website specifically for students in the county to educate and familiarize them with the practice of recycling.
- Continued to maintain SCRAPmail, an electronic resource for teachers. This e-mail subscription allows interested teachers, students and school administrators to receive periodic news items, event announcements, and updates and reviews on environmental education resources available to county schools.

- Continued to electronically distribute SCRAPBook, (Schools/County Recycling Action Partnership), which is a compendium of resources dedicated to conducting environmental education in the schools from the Department of Public Works and Environmental Services. This document is available on the website at: <http://www.fairfaxcounty.gov/dpwes/recycling/students.htm>.

Web Podcasts

Podcast messages were aired through the county's web site for a weekly audience of about 350 listeners on topics such as dam safety, picking up pet waste, hurricane preparedness and the proper discharge of swimming pool water.

Storm Drain Marking Program

Fiscal year 2010 marked the fifth year of NVSWCD's countywide storm drain marking initiative that is staffed by NVSWCD and funded by Fairfax County (at approximately \$12,000 per year for plastic markers and glue). The objective is to facilitate environmental stewardship among



Figure 5-4 Volunteers marking storm drains with labels that contain a "no dumping" message.

Fairfax County residents and educate the public about non-point source pollution prevention. During each storm drain marking project, volunteers engage in outreach in their communities, distributing educational fliers door-to-door and writing newsletter articles. They then place a pre-printed label with a "no dumping" message on the storm drains in their neighborhoods (Figure 5-4). In calendar year 2010, the Storm Drain Marking Program coordinated 44 projects that placed markers on 4,605 storm drains and educated 19,717

households on ways they could take action to protect water quality. Each household received a flier about the causes and prevention of non-point source pollution and how to properly dispose of used motor oil, pet waste, paint, fertilizer, yard debris and other pollutants. In 2010, 636 volunteers contributed 1,927 hours to the program. Since the program began, 3,012 volunteers have helped to complete 175 projects which resulted in outreach to 281,702 households and labeling of 18,092 storm drains.

Rain Barrel Program

In 2010, NVSWCD coordinated a regional rain barrel initiative for Northern Virginia in cooperation with the Cities of Fairfax, Falls Church and Alexandria, Arlington County and the non-profit, Arlingtonians for a Clean Environment. Eight "build-your-own" rain barrel workshops and two pre-made rain barrel sales were held in Northern Virginia. In 2010, the program held one free rain barrel workshop for teachers and one "train the trainer" event. Nine

of the 12 events were held within Fairfax County. Four hundred fifty-one people participated in these programs. A total of 588 rain barrels were distributed, including 35 free barrels at training events, 273 barrels made at “build-your-own” workshops, and 280 barrels sold at other distribution events.

Watershed Cleanups

In 2010, Fairfax County fulfilled the floatables monitoring requirements of the VPDES permit by actively participating in a regional data-sharing partnership with numerous other local agencies. Efforts were made to align the various data collecting and recording strategies used by participating entities so that differences in stream cleanup data sets could be reconciled, and the data integrated to yield a more comprehensive picture of the impacts of floatable trash and debris and the effectiveness of litter control programs in the region.

The county continued to work with and support the following organizations that coordinate large and small-scale 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 2010, approximately 89 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



Figure 5-5 Volunteers displaying the huge amount of trash they collected during a cleanup. Photo by NVSWCD.

(see below) and the county wastewater treatment plant. These cleanups were advertised in publications such as the Department of Solid Waste’s ScrapBook and the Fairfax County Park Authority’s ParkTakes Magazine, as well as on the internet. Staff from the Stormwater Planning Division, Division of Solid Waste, Wastewater Management Division, and the Northern Virginia Soil and Water Conservation District participated in these cleanups. More than 2,115 volunteers removed approximately 1,673 bags of trash and litter, 340 tires, 2,239 cigarette butts, and over 6000 plastic shopping bags from Fairfax County streams. According to Clean Virginia Waterways, nine stream and shoreline cleanups were held in the county during September and October 2010 as part of the International Coastal Cleanup.

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

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 2010. At least 60 stream cleanups were conducted on county parkland as part of the Alice Ferguson Foundation's Potomac Watershed Cleanup event. These events provided an excellent learning opportunity for volunteers.

In addition, the Park Authority continued to organize separate clean up events in the spring. This year the Lake Accotink Park annual Spring Watershed Clean-up Day attracted more than 250 volunteers, who collected 150 trash bags which filled two dumpsters. A separate fall clean up event at Lake Accotink included 150 volunteers who contributed a total of 450 volunteer hours



Figure 5-6 Volunteers participating in the annual Alice Ferguson Foundation Potomac River Watershed cleanup. Photo by Fairfax County.

and collected about 700 pounds of trash from the lake shore, trails and roadways surrounding the park. Lake Accotink staff worked with Eagle Scout Candidate Tim Polnow of Springfield who completed an erosion mitigation project adjacent to the Heming Avenue entrance to Lake Accotink Park. The goal of the project reduced the amount of sediment entering a small feeder stream of Accotink Creek from a social trail. Tim installed two terrace structures to more evenly disperse water exiting the park during heavy rainfall. Hidden Pond Nature Center

hosted two clean-ups in Pohick Stream Valley which collected approximately 18 cubic yards 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 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.

Reston Association participated in both the Potomac River Watershed Cleanup in April and the International Coastal Cleanup in September. Volunteers helped collect a total of 222 bags of trash and four tires in the spring and 59 bags of trash from three locations in Reston in the fall.

Potomac Watershed Trash Summit

Several staff members attended the annual Potomac Watershed Trash Summit sponsored by the Alice Ferguson Foundation in Washington DC in September 2010. The Summit brought together nearly 300 key stakeholders in the region to plan, discuss, and take action towards a Trash Free Potomac Watershed by 2013. There were several morning roundtable discussions on such topics as trash TMDL implementation, composting and litter enforcement followed by an afternoon plenary session which featured the unveiling of the Potomac Watershed Regional Anti-Litter Campaign and a dialogue with key stakeholders who were responsible for the Anacostia Trash TMDL and its implementation.

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 that are open every weekend and three community events held annually at other locations around the county.

The SWMP continued to accept 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 2010, the SWMP continued its 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 2,000,000 pounds of electronic waste, equating to about 50 tons of lead, were prevented from being introduced into the Fairfax County environment, significantly reducing the opportunity to negatively impact stormwater runoff.

In 2010, 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. Rechargeable batteries are also accepted at the county's HHW facilities.

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 donated and installed more than 1,840 native trees, shrubs, and herbs and the necessary tree protectors, for the enrichment of nine sites (Table 5-1). Earth Sangha also donated approximately 440 plants for buffer projects at Wakefield Park, Eleanor C. Lawrence Park, Hidden Oaks Nature Center, Cub Run Recreation Center, and Valley Crest Park. Two planting sites within the Thompson Creek drainage at the Bureau of Land Management’s Meadowood Recreation Area were maintained with the installation of additional tree protectors. Roughly 3,000 plants were provided to local schools, churches, HOAs, restoration organizations, government agencies and individuals for restoration projects, the majority of them in Fairfax County. All plants were propagated by Earth Sangha from local, wild native plant populations.

Table 5-1 2010 Earth Sangha buffer restoration activities.

<i>Site</i>	<i>Activity type</i>	<i>Volunteers</i>	<i>Plants</i>
Cardinal Glen Stormwater Pond	Enrichment planting	25	117
Eakin Park	Enrichment planting/invasives removal	8	35
Flag Run Park	Invasives removal	3	0
Follylick SVP	Enrichment planting	38	300
Franklin Middle School	Enrichment planting	8	70
Rocky Run SVP at Awbrey Patent	New & enrichment planting/invasives removal	51	175
Roundtree Park (2 events)	Invasives removal	58	0
Roundtree Park	Enrichment planting	30	156
Rutherford Park	Planting/invasives removal	11	152
Rutherford Park (2 events)	New planting	34	640
Waples Mill	New & enrichment planting	33	195
Totals		299	1,840

The Fairfax County Park Authority, Fairfax ReLeaf and the Virginia Department of Forestry hosted independent stream buffer restorations in the county in 2010. The Park Authority continued to maintain and monitor the previous riparian buffer enhancement projects installed in the last four years. 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 additional planting projects in the RPA unrelated to the county’s buffer planting program. One such project in 2010 included the plantings of 136 native shrubs, grasses and forbs by an elementary school class with sixty students, parents and teachers. Girl Scouts worked with staff from Hidden Pond Nature Center to plant 200 willow whips to control erosion in Pohick Stream Valley Park.

In 2010, Fairfax ReLeaf planted 3,208 trees in Fairfax County (Table 5-2). They also distributed 3,637 trees in the county.

Table 5-2 2010 Fairfax ReLeaf planting projects.

<i>Location</i>	<i># Trees</i>
Wolftrap	250
Fairhill ES	20
Greenbriar West ES	15
Mt. Vernon RECenter, planted by University of Phoenix	124
Rachel Carson MS	30
Westbriar Elementary School	31
Idylwood Towers 1 & 2, Temple group and Boy Scouts	55
James Madison High School, Kate Bokscor's project	43
Greg Hagar, Eagle Sout project w/ BLM	100
Columbia Elementary School (ACT/United Airlines)	288
Waverly Park (WQIF grant)	320
George C. Marshall HS	10
Peace Lutheran Church Project Manager training	5
Deborah Clay Mendez	80
Peggy Einhorn	60
Milka Ashley	100
Kay Fowler	25
Meghan Fellows	13
Jefferson Manor Park	20
John Dudzinsky - Eagle Scout project	100
Marian Phelps	5
Cardinal Forest Condominium Unit Owners Association	100
AeRahn Shupp	3
Andrea Keays	6
Diane Blust	8
Reston Association (Nicki Foremsky)	115
Bob Landsman	15
Jinx Fox - BLM	110
Oakton Glen HOA	150
Pine Ridge Park	50
Park Authority planting - NVCC & open vol. (2x's)	60
Rachel Carson Middle School	26
Wolf Trap	301
Bull Run Elementary School	167
Cardinal Forest Elementary School	121
Groveton Elementary School	50
Peace Lutheran Church Project Manager training	14
Marymead Common Area (Ed)	10
BLM	125
Abid Joyia - Eagle Scout project	2
Curt LeVan	6
Bob Cattell (HOA)	35
Robert Landsman, Hayfield View development	10
Danny Burk	19
Lily Whitesell	11
TOTAL	3,208

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 2010, VDOF worked with volunteers from organizations such as Fairfax ReLeaf, Eagle Scouts, homeowner associations and school groups and planted approximately 1,200 seedlings in the county.

The Park Authority, with strong volunteer support, continued the aggressive management of invasive, non-native plants on over 50 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. Two hundred thirty-seven native trees, shrubs and herbaceous (ground cover) plants were planted at IMA sites in 2010. The Park Authority also contracts for herbicide removal of invasive species at selected sites. In 2010, approximately 260 acres were treated with selective herbicide for the support of invasive species eradication.

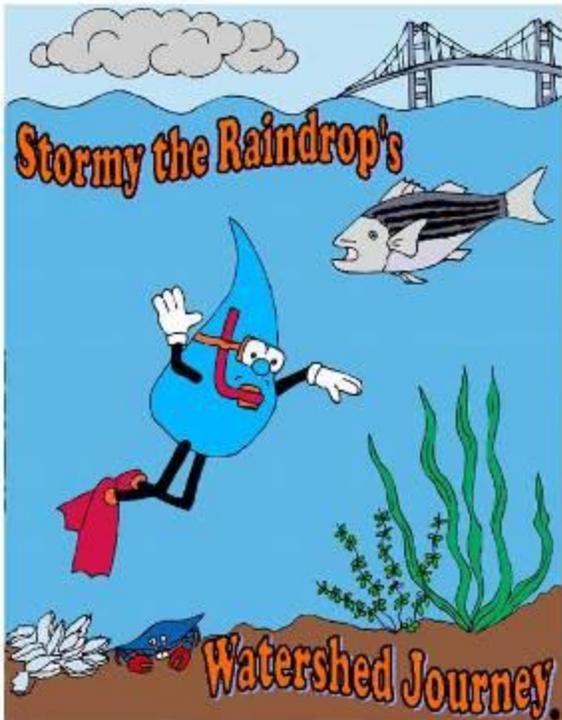


Figure 5-7 Cover of the “Stormy the Raindrop’s Watershed Journey” activity book.

book, Stormy the Raindrop’s Watershed Journey, was created in 2010 with help from the FCPS system to ensure it met the Standards of Learning at a fourth grade level (Fig 5-7). Plans are underway to create a teacher’s guide to the activity book, as well as to translate the book into Spanish.

Staff continuously receives requests to speak to various schools and age groups throughout the year, including Science Honor Society meetings and high school Science Fairs.

Sewer Science

The Sewer Science Program teaches county high school students about municipal wastewater treatment and stormwater management using specially designed tanks, analytical equipment,

Reston Association sponsored a lake cleanup on June 5, 2010, during which volunteers removed Purple Loosestrife, an invasive aquatic plant, from Newport Lake.

In 2010, Fairfax County continued to partner with NVSWCD in its annual seedling sale. A variety of 6,650 native tree and shrub seedlings were sold to help promote urban reforestation, habitat enhancement and water quality protection. The theme, Nature’s Palette, offered a colorful variety of eight species.

Public School Environmental Education Partnerships

Fairfax County Public Schools Curriculum

Stormwater Management worked together with Fairfax County Public Schools in 2009 to provide

stormwater and watershed educational materials to all public elementary schools. The activity

book, Stormy the Raindrop’s Watershed Journey, was created in 2010 with help from the FCPS system to ensure it met the Standards of Learning at a fourth grade level (Fig 5-7). Plans are underway to create a teacher’s guide to the activity book, as well as to translate the book into Spanish.

Staff continuously receives requests to speak to various schools and age groups throughout the year, including Science Honor Society meetings and high school Science Fairs.

Sewer Science

The Sewer Science Program teaches county high school students about municipal wastewater treatment and stormwater management using specially designed tanks, analytical equipment,

presentations and a custom student workbook. The program is a collaborative effort of three DPWES programs: Solid Waste Management, Stormwater Management, and Wastewater Management. The stormwater component of the program promotes an understanding of stormwater, its relationship with wastewater, how the water and the land are connected and how each individual can make a difference in the health of the environment. In 2010, Stormwater Management staff continued to partner with Wastewater Management and Solid Waste Management staff to bring the program to six schools, instructing more than 320 students during 13 presentations.

Thomas Jefferson High School Mentoring Program

Fairfax County Stormwater Management staff continues to work with Thomas Jefferson High School students to identify potential sources of *E. coli* in surface water using new and innovative techniques. There was one year long experiment run during the 2009-2010 school year. Over the past five 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 2010, 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 22 recycling presentations to middle and elementary school students
- Hosted 34 tours of facilities for students of all ages
- Sent information about recycling to approximately 150,000 Fairfax County Public School students
- Awarded Johnnie Forte environmental grants of \$500 each to 11 schools to fund school environmental projects involving litter prevention, litter control or recycling

Reston Association's Watershed Education Programs for Students

Reston Association offers a watershed field trip program for students in grades three through seven. 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 Snakeden Branch. They also discuss ways that residents can protect the watershed. In 2010, Reston Association conducted the watershed field trip for 46 sixth grade students. Also, it provided a meaningful watershed experience for 318 seventh grade students during field trips to The Glade and Snakeden Branch.

Reston Association also loans a traveling watershed education trunk to area schools which includes an interactive watershed model. In 2010, the trunk was loaned to two elementary schools and used with 175 students.

Envirothon

Envirothon is a hands-on natural resources competition for high school teams. Training takes place throughout the year and competitions are held at the local, regional, state and national levels. NVSWCD sponsors the local program in Fairfax County. In 2010, NVSWCD provided training to teams from Madison, West Potomac, George Marshall, Langley, and Centreville in the local Envirothon competition held at the Government Center. The top two teams from the local competition- Madison and Centreville - represented Fairfax County in the regional competition at EC Lawrence Park in Centreville. Madison High School advanced on and represented the county at the state competition.

Technical Support and Training

Land Development Services

- Conducted training sessions with DCR on joint monthly Virginia Stormwater Management Permit (VSMP) inspections
- Conducted a training course on erosion and sediment controls for Stormwater Planning staff and the Engineering and Surveyors Institute
- Provided information for an EPA fact sheet highlighting Fairfax County's super silt fence
- Conducted dam monitoring training to LDS staff

Northern Virginia Soil and Water Conservation District

- Provided technical advice to 326 homeowners and homeowner associations, which included 140 on-site visits, to advise on erosion, drainage, pond management and other environmental problems
- Provided soils information to 137 consultants, realtors and homeowners. In addition, the Web Soil Survey and the county's GIS department make soils information easily accessible to professionals and the public.
- Technical assistance was provided to county agencies 49 times to solve problems and assist with projects
- Responded to 1,400 information inquiries by telephone, email and office visits

Environmental Horticulture Division of Fairfax Cooperative Extension

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

In 2008, VCE started a Master Gardener volunteer program to provide educational and technical services to homeowners with regard to home lawn management. Fairfax County created the Home Turf Nutrient Management program to bring awareness to local water quality as it is

impacted by residential lawn care practices. In 2010, VCE Master Gardeners received 20 hours of training on turf best management practices. Local Master Gardener volunteers, under the guidance of the local Extension agent, began the program by using Master Gardener interns as their first clients. Twenty homeowners had their lawns measured, 25 soil tests were submitted, and 20 urban nutrient management plans were written and given to their respective homeowner. In 2009, a VCE Master Gardener volunteer took on leadership of this program and helped develop nutrient management plans which promote best management practices. In 2010, the first live year, VCE had 20 clients.

VCE also trained 493 commercial pesticide applicators for re-certification in Northern Virginia. Participants were instructed on pesticide safety, application, storage and disposal.

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 and improve the water quality in our streams and water bodies.

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

Stormwater staff worked 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 were adopted September 17, 2010. As part of the adoption process, the county revised its floodplain regulations.

Redevelopment Plans

Stormwater Planning Division staff participated in the formation of the stormwater management section of two Fairfax County redevelopment plans. As a member of the stormwater working group, Stormwater Planning staff provided technical guidance on stormwater recommendations for the Tysons Corner Comprehensive Plan and the Baileys Crossroads Comprehensive Plan. Staff contributions to the Baileys Crossroads plan resulted in the promotion of stormwater best management practices where no controls currently exist. Through the incorporation of LEED water quality and quantity standards, low impact development techniques, and on-site retention, innovative stormwater recommendations will help make stormwater management a significant design consideration in the redevelopment of Tysons Corner.

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